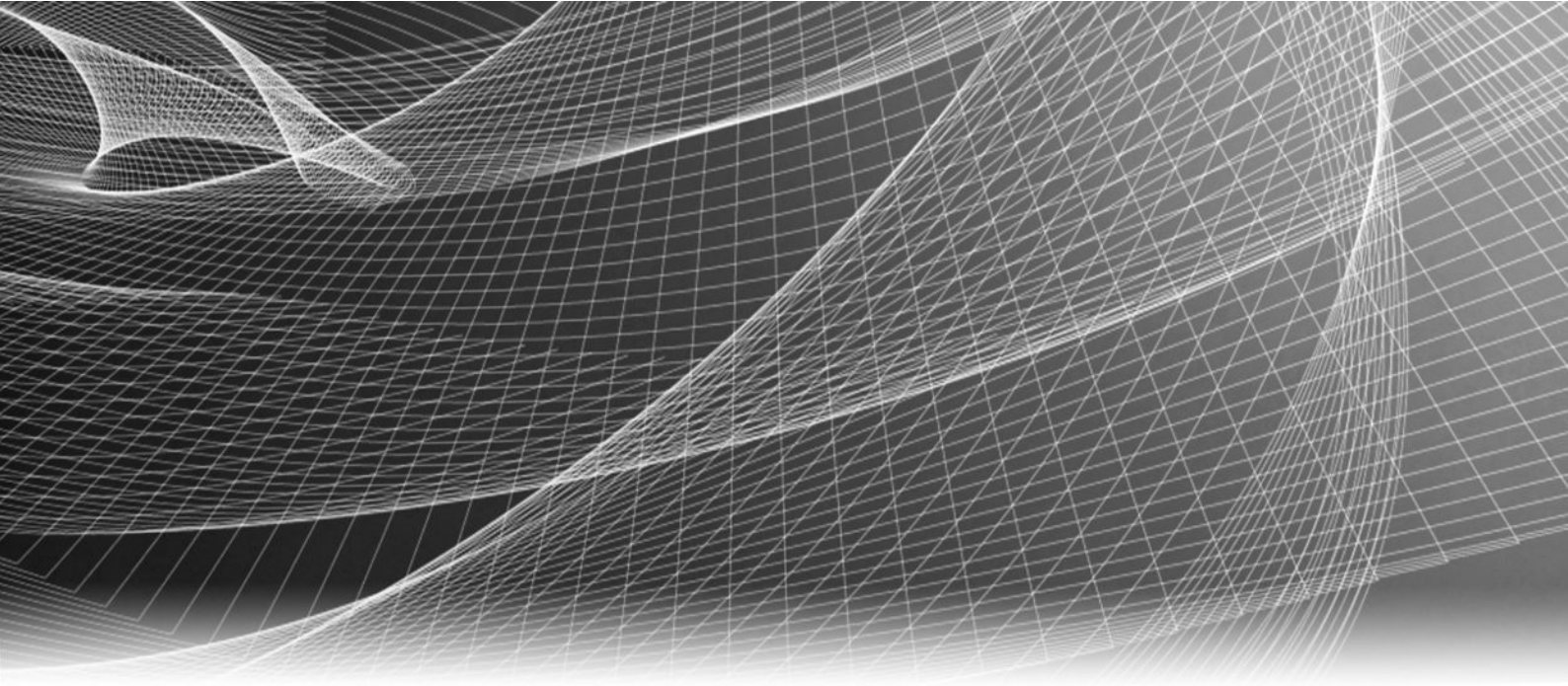

EMC® ViPR® Controller

Version 2.3

Integration with VMAX and VNX Storage Systems Guide

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CHAPTER 1

ViPR Controller Integration with VMAX and VNX Overview

This guide shows ViPR Controller System Administrators how to integrate VMAX and VNX functionality into the Virtual Data Center (VDC). It covers the ViPR Controller services that support FAST (fully automated storage tiering), block volume expansion, Symmetrix Remote Data Facility (SRDF), and the creation and management of meta volumes on VMAX and VNX storage systems.

Related documents

The *ViPR Controller Support Matrix* provides the version requirements for the VMAX and VNX physical assets. You can find this document on the EMC Community Network at community.emc.com.

Before you begin the VDC configuration, review the *ViPR Controller Virtual Data Center Requirements and Information Guide*.

These guides explain how to configure VDC:

- *ViPR Controller User Interface Virtual Data Center Configuration Guide*.
- *ViPR Controller REST API Virtual Data Center Configuration Guide*.

Access these documents from the ViPR Controller Product Documentation Index .

CHAPTER 2

ViPR Controller Support for FAST Policies

This chapter contains the following topics:

ViPR Controller support for fully automated storage tiering for a volume

The ViPR Controller service **Change Virtual Pool** enables you to change the fully automated storage tiering (FAST) policy on a volume with the operation **Change Auto-tiering Policy or Host IO Limits**.

A VMAX array typically has several types of storage, and that storage supports a number of RAID types. Most VMAX arrays support the following drive types:

- Flash drives
- Enterprise hard disk drives (10K and 15K rpm)
- High-capacity SATA disk drives

The performance of your array partially depends on the placement of frequently-accessed data on high-speed disks such as Flash, and infrequently-accessed data on slower storage, such as SATA drives.

VMAX moves data among drive types in order to optimize your array performance. This feature is called VMAX FAST VP.

ViPR Controller supports Service Level Objectives on VMAX3 arrays, as explained in Service Level Objectives (SLO) on VMAX3 on page 9.

Note

ViPR Controller does not support FAST DP.

FAST settings in virtual pools

The following table describes the fields in the virtual pool configuration panels that relate to Fully Automated Storage Tiering (FAST) policies.

Table 1 FAST Settings in Virtual Pools

Field	Description
Unique Auto-tiering Policy Names	Enable this option to display unique auto-tiering names in the Auto-tiering policy selection list. The array system administrator builds unique auto-tiering policy names through Unisphere or another client. Disable this option to display array-generated auto-tiering names. The array builds auto-tiering policy names from the array ID, the unique policy name, and the string **FASTPOLICY**. For example: SYMMETRIX+000196701972+FASTPOLICY+Green
Auto-tiering Policy	This field contains the name of the auto-tiering policy. After you select this value, ViPR Controller displays only physical storage pools with that auto-tiering policy. If you create a volume in this virtual pool, ViPR Controller applies the auto-tiering policy specified in this field to that volume.

Notes on unique policy names

Some planning is required to use unique FAST policy names in your virtual pool.

On a VMAX, you build unique FAST policy names with Unisphere. If you enable the `Unique Auto-tiering Policy Names` check box, ViPR displays the FAST policy names that you built on the VMAX array.

Unisphere enforces uniqueness in auto-tiering policy names on the VMAX array, but ViPR can include more than one VMAX in a virtual pool. This situation presents a complication for the ViPR administrator, because if two policies on two VMAX arrays have the same name, the FAST policies may not be identical. In this scenario, the ViPR user interface displays only one instance of the name, and ViPR chooses which FAST policy to apply to volumes in that virtual pool.

If you build a virtual pool that includes multiple VMAX arrays, and you want to use unique auto-tiering policy names, verify that the FAST policy names on the VMAX arrays are unique to all VMAX arrays in the virtual pool. If you are not sure of this, do not enable `unique auto-tiering policy names`.

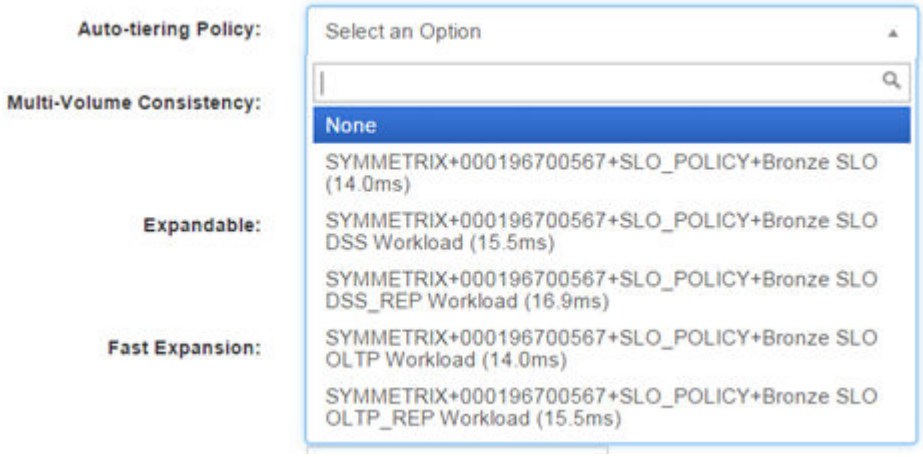
Unique auto-tiering policy names are required for many **Change Virtual Pool** service operations, such as changing a virtual volume from VPLEX Local to VPLEX Distributed.

Service Level Objectives (SLO) on VMAX3

ViPR Controller supports Service Level Objectives on VMAX3 arrays.

Service Level Objectives are similar to VMAX FAST policies. They are pre-defined at the factory, and are displayed in ViPR through the Auto-tiering Policy field. the following figure shows the Auto-tiering Policy field in the Hardware panel of the virtual pool.

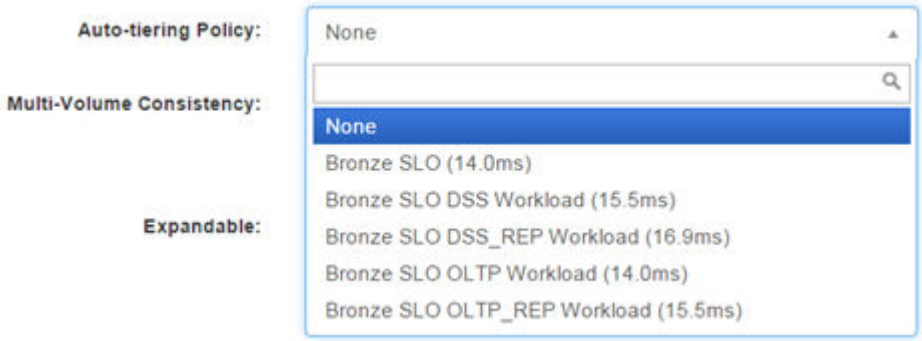
Figure 1 SLOs with no unique naming



The name of the SLO in the ViPR Controller virtual pool configuration shows the Symmetrix ID, the policy, the workload and the average response time of the SLO. **None** indicates that the **Optimized** SLO is selected for the volumes created with this virtual pool.

Enable **Unique Auto-tiering Policy Names** to display SLOs with unique names that match those displayed in Unisphere:

Figure 2 SLOs with unique names



ViPR Controller and FAST policies: Notes and limitations

ViPR Controller handles FAST policy management according to certain guidelines that are explained in this discussion.

Here are the guidelines to follow:

- You can only change the SLO value for stand-alone VMAX3 volumes.
- You cannot change the SLO value for a VPLEX virtual volume with back-end physical storage on VMAX3.
- You cannot build FAST policies in ViPR Controller. Storage array administrators build FAST policies with Unisphere or another interface.
- When you change a FAST policy for a volume, ViPR Controller changes the FAST policy for the entire storage group. Therefore, all volumes part of a VMAX storage group must be specified for the operation to be successful.
- To determine the storage groups in which your volumes reside, run Unisphere or use the Solutions Enabler CLI.
- You cannot change the FAST policy of a VPLEX virtual volume that has back-end physical storage on a VMAX.
- In Unisphere, you apply FAST policies to volumes when you add the volume to a storage group on the array. In ViPR Controller, you can add a volume to a storage group by exporting the volume to a host. ViPR Controller adds the volume to a storage group on the VMAX, and applies the FAST policy.
- An unexported volume can reside in a virtual pool that has a FAST policy defined. However, the FAST policy is not in effect for that volume until you export the volume to a host or cluster.
- When adding a new node to a one node cluster with a FAST policy or exporting an already exported FAST volume to a different host, ViPR Controller creates a new masking view in a cascaded fashion with the same volume dropped into the storage group that is associated with the new masking view. Since the volume was originally in a storage group with a FAST policy, no other FAST policies are applied to this volume. The storage group in the new masking view is named ‹*storage_group_name*›_NonFast.
- For VMAX, you cannot migrate a volume spanning across disks in the same storage pool to another storage pool using a FAST policy.
- ViPR Controller supports phantom storage groups in VMAX but not in VMAX3.
- If you want to use existing masking views without ingesting them, you cannot change the FAST policy on the phantom storage groups. To be able to change the FAST policy

on phantom storage groups, ingest the masking views into ViPR Controller. This ensures that ViPR Controller can manage all volumes in this group.

ViPR Controller and FAST Policies on VNX

VNX arrays also support FAST policies. The VMAX and VNX arrays handle FAST policies differently.

With VNX, you can change the FAST policies for exported and un-exported volumes.

On a VNX, a FAST policy is directly associated with the volume.

All volumes provisioned on a VNX are assigned to the **Auto Tier**. If you set the virtual pool auto-tiering field to **None**, VNX assigns volumes provisioned using that virtual pool to the **Auto Tier**.

You can change the FAST policy of a VNX volume to one of the other tiering options that VNX offers.

VNX does not have the storage group limitation. The storage group limitation on page 11 is exclusively on VMAX arrays.

The physical storage pool in which the volume resides must be available in both the original and target virtual pools. Check both the source and target virtual pools to ensure that the physical storage pool in which your volume resides matches both virtual pools.

Change FAST policies on an unexported block volume

You can use ViPR Controller to change the FAST policy on any volume in ViPR Controller. Changing the FAST policy on an exported block volume is more complicated than changing the FAST policy on an unexported volume.

The reason for this is that an unexported volume is not assigned to a storage group. If the volume has no storage group assignment, you can build the target virtual pool, then change the FAST policy for the volume using Change Virtual Pool. Building a target pool is explained in Duplicate a virtual pool on page 16.

Choose the appropriate procedure for your environment:

- Add a FAST policy to a volume on page 17
- Change a FAST policy of a volume on page 18
- Remove a FAST policy from a volume on page 19

Change the FAST policy for an exported volume

ViPR Controller has a limitation on changing the FAST policy on a VMAX volume that has been exported to a host.

When you use a ViPR Controller service to export a volume to a host, the VMAX array adds that volume to a storage group as part of the service orchestration. To apply (or change) the FAST policy for a volume in a storage group, change the FAST policy for all volumes in the storage group, or the ViPR Change Virtual Pool service will fail.

You need the following information to run Change Virtual Pool on an exported VMAX volume.

- The storage groups to which your volume belongs.
- The names of the other volumes that share a storage group with your volume.

- The name of the physical storage pool that contains your volume.

This information is available in Unisphere.

Has my volume been exported?

Each volume created in ViPR Controller has a list of exports. The following procedure shows how to determine if a volume has been exported.

Before you begin

Create the volume from ViPR Controller using the **Block Storage Services** › **Create Block Volume** service, or an equivalent service.

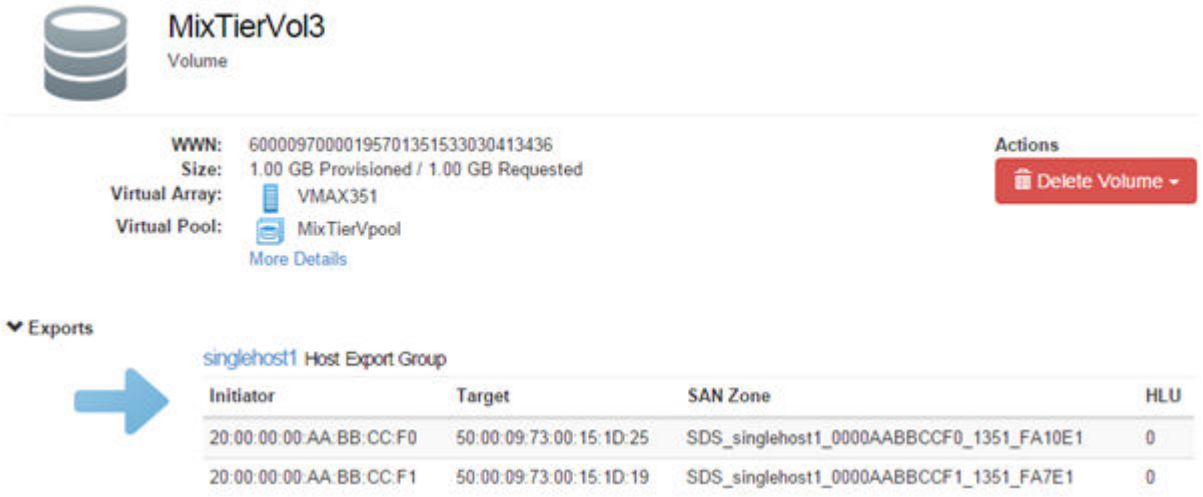
Procedure

1. Log in to ViPR Controller as a system administrator.
2. Select **Resources** › **Volumes**.
3. Click the volume that you want to examine.

Results

If the volume has been exported, the exports are listed below the volume description, as shown in the following figure.

Figure 3 Volume with Exports



If your volume has been exported, you must identify the other volumes in the storage group on the VMAX, as described in Get the list of volumes that share a storage group with your volume on page 13.

If the volume has not been exported, the exports list is empty.

Figure 4 Volume with no exports

If your volume has not been exported, you can run the Change Virtual Pool service to change the FAST policy. See Change FAST policies on an unexported block volume on page 11.

Get the list of volumes that share a storage group with your volume

Once you determine that your volume has been exported, you know that your volume resides in a storage group on your VMAX. In order to change the FAST policy, you must compile a list of all volumes in the storage group. This list will be required when you run the Change Virtual Pool service.

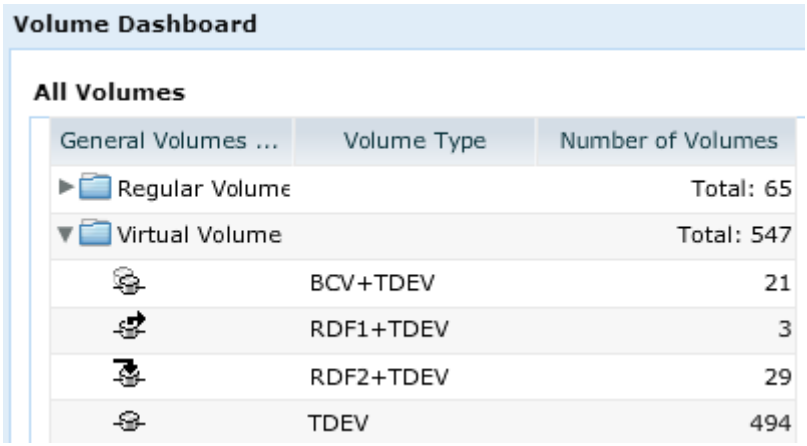
Before you begin

You must have a volume that was created by ViPR.

The volume must have exports.

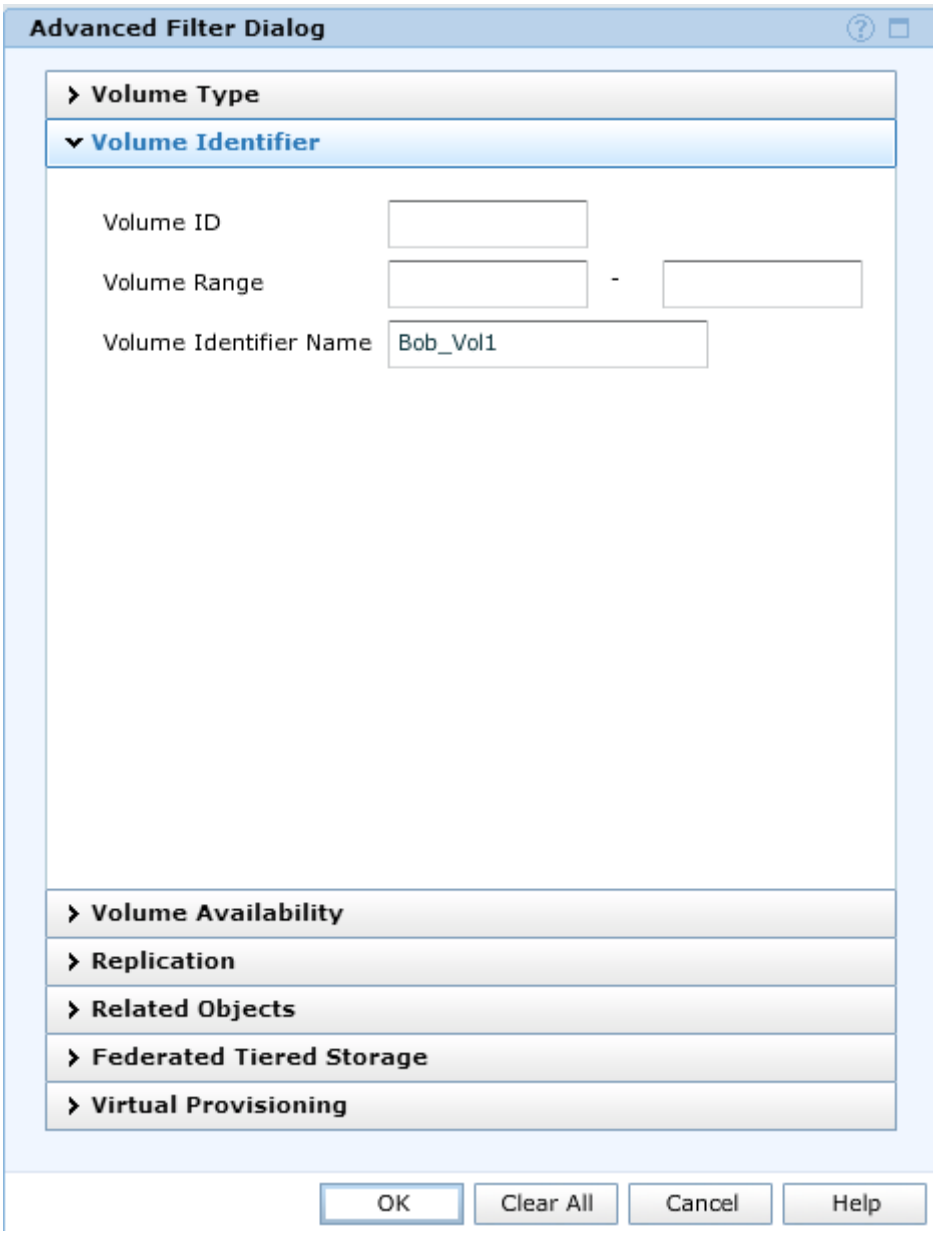
Procedure

1. Log in to Unisphere.
2. Click the array on which you built your volume.
3. Select **Storage** › **Volumes**.
4. Open the **Virtual Volume** list, and then double-click **TDEV**.



The Thin Volumes list opens.

5. Find the volume you created by using the Advanced Filtering feature of Unisphere. Enter the name of the volume that you created in the **Volume Identifier Name** field, and then click **OK.**



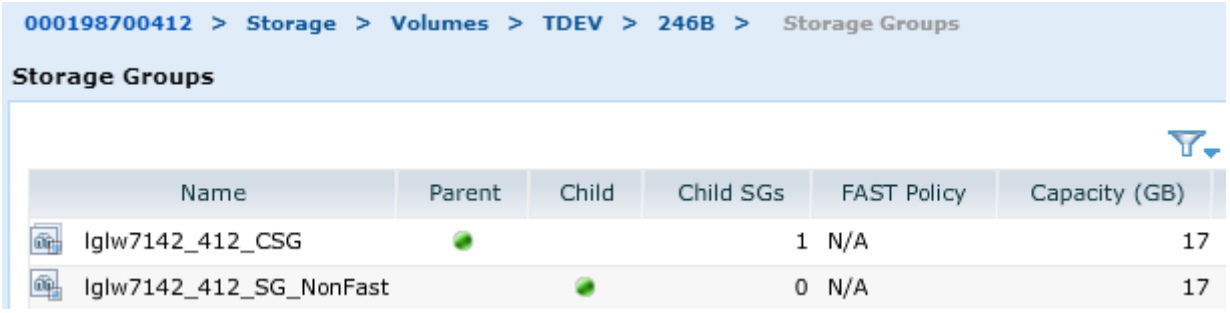
   The volume list displays your volume.

6. Double-click the volume to view the volume properties.

   The Volume properties provide a **Storage Groups** link in the **Related Objects** box.

7. Click **Storage Groups**.

   Unisphere displays the Storage Groups to which your volume belongs.

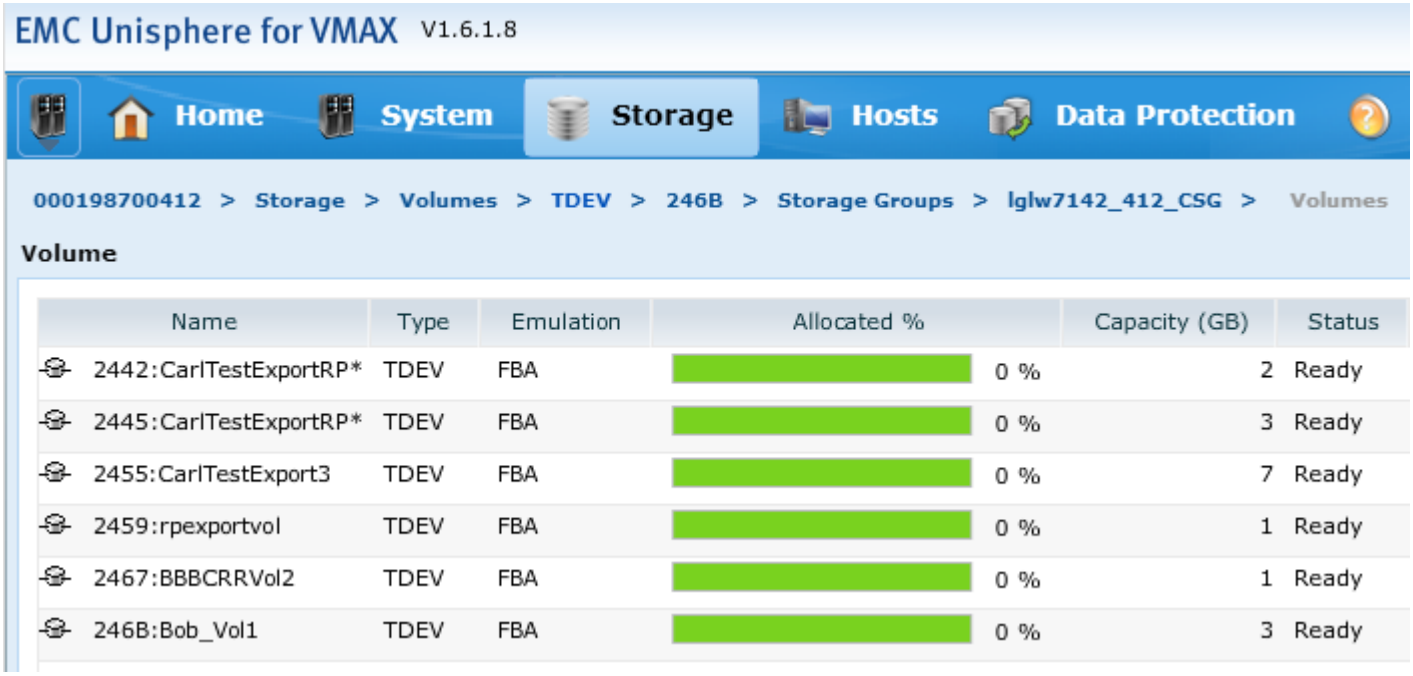


8. Double-click the parent storage group.

   Unisphere displays the storage group properties. This screen includes a **Related Objects** list.

9. Click **Volumes** in the **Related Objects** list. Unisphere displays the complete list of storage groups to which the volume belongs.

Figure 5 Storage Groups List



You can use this list of volumes to run **Change Virtual Pool** to change a FAST policy on page 18.

Get the physical storage pool for your volume

Learn how to identify the physical storage pool that contains your volume.

Before you begin

Create the volume from ViPR Controller by using the service **Block Storage Services** › **Create Block Volume** or an equivalent service.

Procedure

1. To log in to Unisphere and migrate to the Volume Properties page for your volume, follow steps 1 through 6 in Get the list of volumes that share a storage group with your volume on page 13.

   The Volume Properties provide a **Bound Pool Info** link in the **Related Objects** box.

2. Click the **Bound Pool Info** link.

   Unisphere displays the storage pool in which your volume resides.

3. Record the pool name. You will need it to assure that your source and target virtual pools will support the **Change Auto-tiering** operation.

Duplicate a virtual pool

To change the FAST policy of a volume from ViPR Controller, move the volume from its current virtual pool to another virtual pool that has the new FAST policy applied.

Before you begin

The virtual pool that contains the volume and the virtual pool into which you move the volume must be identical, except for the FAST policies. If any other virtual pool settings differ between the source and target virtual pools, the Change Virtual Pool operation fails.

This procedure shows how to create the target virtual pool.

Procedure

1. Log in to ViPR Controller as a system administrator.
2. Choose **Virtual Assets** › **Block Virtual Pools**.
3. Select the virtual pool to duplicate by clicking the check box next to the virtual pool.
4. Click **Duplicate**.

   ViPR Controller creates a new virtual pool from the name of your source virtual pool. For example, if your virtual pool is called **`MyPool`**, ViPR Controller creates a virtual pool called **MyPool_copy** and then opens the **Create Virtual Pool** panel so that you can edit its parameters.

5. Change the **Hardware** › **Auto-tiering policy** setting.
6. Click **Save.**

Check the duplicate virtual pool for your physical storage pool

To run **Change Virtual Pool** to change the FAST policy for a volume, the volume must reside in a physical storage pool that matches both the source and target virtual pools.

Before you begin

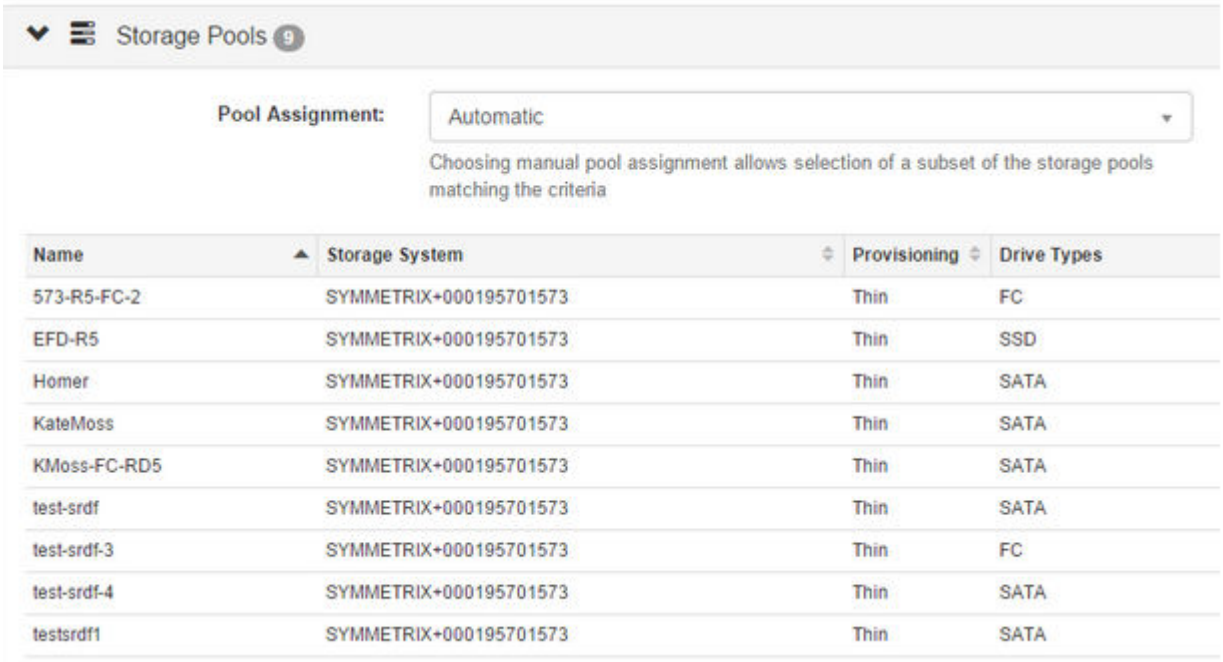
To check to see which physical storage pool contains your volume, see Get the physical storage pool for your volume on page 16.

After you determine which physical storage pool contains your volume, check both the source and target virtual pools for your physical storage pool. This is to assure that the FAST policy change in the target virtual pool did not filter out the physical storage pool that contains your volume.

Procedure

1. Log in to ViPR as an administrator.
2. Select **Virtual Assets** › **Block Virtual Pools.**
3. Click the target virtual pool in the **Block Virtual Pools** list.
4. Expand the **Storage Pools** list.

Figure 6 Storage Pools



Name	Storage System	Provisioning	Drive Types
573-R5-FC-2	SYMMETRIX+000195701573	Thin	FC
EFD-R5	SYMMETRIX+000195701573	Thin	SSD
Homer	SYMMETRIX+000195701573	Thin	SATA
KateMoss	SYMMETRIX+000195701573	Thin	SATA
KMoss-FC-RD5	SYMMETRIX+000195701573	Thin	SATA
test-srdf	SYMMETRIX+000195701573	Thin	SATA
test-srdf-3	SYMMETRIX+000195701573	Thin	FC
test-srdf-4	SYMMETRIX+000195701573	Thin	SATA
testsrdf1	SYMMETRIX+000195701573	Thin	SATA

Results

The physical storage pool that contains your volume must appear on this list. If it does not, you will not be able to assign your volume to this virtual pool.

Add a FAST policy to a volume

This procedure describes how to apply a FAST policy to a volume by moving that volume to a virtual pool that has an auto-tiering policy.

Before you begin

Build a volume from ViPR Controller by running the service **Block Storage Services** › **Create Block Volume** or an equivalent service.

When you create the volume, the virtual pool that you specify must have the auto-tiering policy field set to **None**.

Procedure

1. To duplicate the virtual pool to which the volume currently belongs, follow the instructions in Duplicate a virtual pool on page 16. In the target virtual pool, set the **Auto-Tiering policy** field to to the name of the FAST policy that you want to apply to

the volume. The source and target virtual pools must differ only in the auto-tiering policy field. If there are other differences, the **Change Virtual Pool** service will fail.

2. Run **Block Storage Services** › **Change Virtual Pool**.
3. Set the fields in the **Change Virtual Pool** dialog as shown in the following table.

Table 2 Add a FAST Policy Service Settings

Field	Value
Project	Choose the project that contains the volume.
Virtual Pool	Choose the virtual pool in which the volume currently resides. This virtual pool has the auto-tiering policy set to **None**.
Operation	Choose **Change Auto-tiering Policy or Host IO Limits**.
Target Virtual Pool	Specify the duplicate virtual pool you created in step 1.
Volume	Select the volume you want to add to the virtual pool, and any other volumes that share a storage group with that volume on the array.

4. Click **Order.**

Change the FAST policy for a volume

This procedure explains how to change the volume's FAST policy by moving that volume to a virtual pool that has another auto-tiering policy.

Before you begin

Build a volume from ViPR Controller by running the service **Block Storage Services** › **Create Block Volume** or an equivalent service.

When you create the volume, the virtual pool that you specify must have the auto-tiering policy field set.

Procedure

1. Follow the instructions in Duplicate a virtual pool on page 16 to duplicate the virtual pool to which the volume currently belongs. In the target virtual pool, change the **Auto-Tiering policy** field to the name of the FAST policy that you want to apply to the volume. The source and target virtual pools must differ only in the auto-tiering policy field. If there are other differences, the **Change Virtual Pool** service will fail.
2. Run **Block Storage Services** › **Change Virtual Pool**
3. Set the fields in the Change Virtual Pool dialog box as shown in the following table.

Table 3 Change FAST Policy Service Settings

Field	Value
Project	Choose the project that contains the volume.
Virtual Pool	Choose the virtual pool in which the volume currently resides. This virtual pool has the auto-tiering policy set.
Operation	Choose **Change Auto-tiering Policy or Host IO Limits**.

Table 3 Change FAST Policy Service Settings (continued)

Field	Value
Target Virtual Pool	Specify the duplicate virtual pool you created in step 1.
Volume	Select the volume you want to add to the virtual pool, and any other volumes that share a storage group with that volume on the array.

4. Click **Order.**

Remove the FAST policy from a volume

This procedure explains how to remove the FAST policy from the volume by moving that volume to a virtual pool that has no auto-tiering policy.

Before you begin

Build a volume from ViPR Controller by running the service **Block Storage Services** › **Create Block Volume** or an equivalent service.

When you create the volume, the virtual pool that you specify must have the auto-tiering policy field set.

Procedure

1. To duplicate the virtual pool to which the volume currently belongs, follow the instructions in Duplicate a virtual pool on page 16. In the target virtual pool, set the **Auto-Tiering policy** field to **None**. The source and target virtual pools must differ only in the auto-tiering policy field. If there are other differences, the **Change Virtual Pool** service will fail.
2. Run **Block Storage Services** › **Change Virtual Pool**.
3. Set the fields in the **Change Virtual Pool** dialog box as shown in the following table.

Table 4 Remove Virtual Pool Service Settings

Field	Value
Project	Choose the project that contains the volume.
Virtual Pool	Choose the virtual pool in which the volume currently resides. This virtual pool has the auto-tiering policy set.
Operation	Choose **Change Auto-tiering Policy or Host IO Limits**.
Target Virtual Pool	Specify the duplicate virtual pool that you created in step 1.
Volume	Select the volume you want to add to the virtual pool, and any other volumes that share a storage group with that volume on the array.

4. Click **Order.**

CHAPTER 3

ViPR Controller Support for Block Volume Expand

This chapter contains the following topics:

Expand Block Volume Overview

Learn the requirements and limitations of the ViPR Controller **Expand Block Volume** service.

To increase the storage capacity of any volume in ViPR Controller, run one of the following ViPR services:

- To expand a volume mounted on a Linux host, run **Service Catalog** › **Block Services for Linux** › **Expand Linux Mount**.
- To expand a volume mounted on a Windows host, run **Service Catalog** › **Block Services for Windows** › **Expand Volume on Windows**.
- To expand an unmounted volume, run **Service Catalog** › **Block Storage Services** › **Expand Block Volume**.

Expand block volume services and requirements

ViPR Controller can expand any volume you provision (or ingest) using these services:

- **Block Storage Services** › **Create Block Volume**.
- **Block Storage Services** › **Create Block Volume for a Host**.
- **Block Storage Service** › **Ingest Unmanaged Volumes**.

You can expand a VPLEX virtual volume.

You can expand a VPLEX virtual volume that has RecoverPoint protection.

Expand block volume limitations

You cannot expand certain types of volumes through the ViPR Controller services.

- RecoverPoint target volumes. When you expand RecoverPoint source volumes through the ViPR Controller services, ViPR Controller expands target volumes.
- SRDF target volumes.
- RecoverPoint journal volumes.
- VMAX3 volumes

Block Storage Services › Expand Block Volume

Expand the storage capacity of a block volume.

Before you begin

You must be logged in as a user with admin rights to the project that contains the volume you want to expand.

The volume must meet all the prerequisites in Expand block volume requirements on page 22.

Procedure

1. From the ViPR service catalog, run **Block Storage Services** › **Expand Block Volume**.
2. In the **Project** field, select the project that contains the volume.
3. In the **Volume** field, select the volume to expand.

4. In the **Size** field, enter a size number larger than the current size of the volume.
5. Click **Order**.

After you finish

According to RecoverPoint best practices, your RecoverPoint journal volumes should be 2.5 times as large as the volumes they protect. To comply with best practices, when you expand a VPLEX virtual volume with RecoverPoint protection, expand the RecoverPoint journal volumes.

To adjust the journal volume size, use Unisphere for RecoverPoint. For more information, see the *EMC RecoverPoint Administrator's Guide*.

Expand a block volume mounted on a Linux host

The **Expand Linux Mount** service expands a volume that is mounted on a Linux host.

Before you begin

Run a ViPR service such as **Create Block Volume** to create the volume. Alternatively, call **Ingest Unmanaged Volumes** to bring an external volume under ViPR management.

Discover the Linux host. To add a host, select **Physical Assets** › **Hosts**.

You must be logged in as a tenant administrator with access to the Linux host where the volume is mounted.

Do not access storage during an expand operation. Users that access storage while the service is running can experience an access disruption.

Procedure

1. Log in as a tenant administrator with access to the Linux host where the target volume is mounted.
2. Choose **Block services for Linux** › **Expand Linux Mount** from the ViPR Controller service catalog.
3. In the **Linux Host** field, select the Linux host where the volume is mounted.
4. In the **Volume** field, select the volume that you want to expand.
5. Choose the new size of the volume.
6. Click **Order.**

Expand a block volume mounted on a Windows host

The **Expand Volume on Windows** service non-disruptively expands a volume that was mounted on a Windows host.

Before you begin

Run a ViPR Controller service such as **Create Block Volume** to create the volume. Alternatively, call **Ingest Unmanaged Volumes** to bring an external volume under ViPR Controller management.
Discover the Windows host. To add a host, select **Physical Assets** › **Hosts**.

You must be logged in as a tenant administrator with access to the Windows host where the volume is mounted.

Procedure

1. Log in as a Tenant Administrator with access to the Windows host where the target volume is mounted.
2. From the ViPR Controller service catalog. select **Block services for Windows** › **Expand Volume on Windows**.
3. Select the storage type: An **Exclusive** volume means that this volume is mounted on a specific host. A **Shared**volume indicates that the volume is mounted on a Windows cluster.
4. Choose the Windows host or cluster where the volume is mounted.
5. In the **Volume** field, select the volume to expand.
6. In the **New Size** field, enter the new size of the volume.
7. Click **Order.**

Orchestration: Expand a VPLEX virtual volume with RecoverPoint protection

ViPR Controller supports the expansion of VPLEX virtual volumes that have RecoverPoint protection. An *orchestration* is a series of functions performed by ViPR Controller in a specific order that accomplishes a requested task.

Before you begin

To build the volume, follow the instructions in ViPR Support for *VPLEX High Availability Volumes with RecoverPoint Protection*.

To expand the volume, run one of the services described earlier from the ViPR Controller service catalog. The sequence that follows describes the orchestration ViPR Controller performs after you submit the expansion request.

Procedure

1. Remove the RecoverPoint replication set for the volume.
2. Use native array tools to expand the physical volume.

   ViPR expands the RecoverPoint source and target volumes. It cannot expand the RecoverPoint journal volumes.
3. Re-create the RecoverPoint replication set.

Results

ViPR Controller expands the volume to the size requested by the user. The expand service does not change the worldwide name (WWN) of the volume.

CHAPTER 4

ViPR Controller Support for Meta Volumes on VMAX Arrays

This chapter contains the following topics:

ViPR Controller support for meta volumes on VMAX

ViPR Controller manages, creates, and modifies VMAX meta volumes when it creates and expands volumes on an VMAX array.

ViPR Controller provides a number of services that create volumes on block storage:

- **Block Storage Services** › **Create Block Volume**
- **Block Storage Services** › **Create Block Volume for a Host**
- **Block Services for Windows** › **Create and Mount Volume**
- **Block Services for Linux** › **Create and Mount Volume**

ViPR Controller also provides services that expand block storage volumes.

- **Block Storage Services** › **Expand Block Volume**
- **Block Services for Windows** › **Expand Volume on Windows**
- **Block Services for Linux** › **Expand Linux Mount**

Note

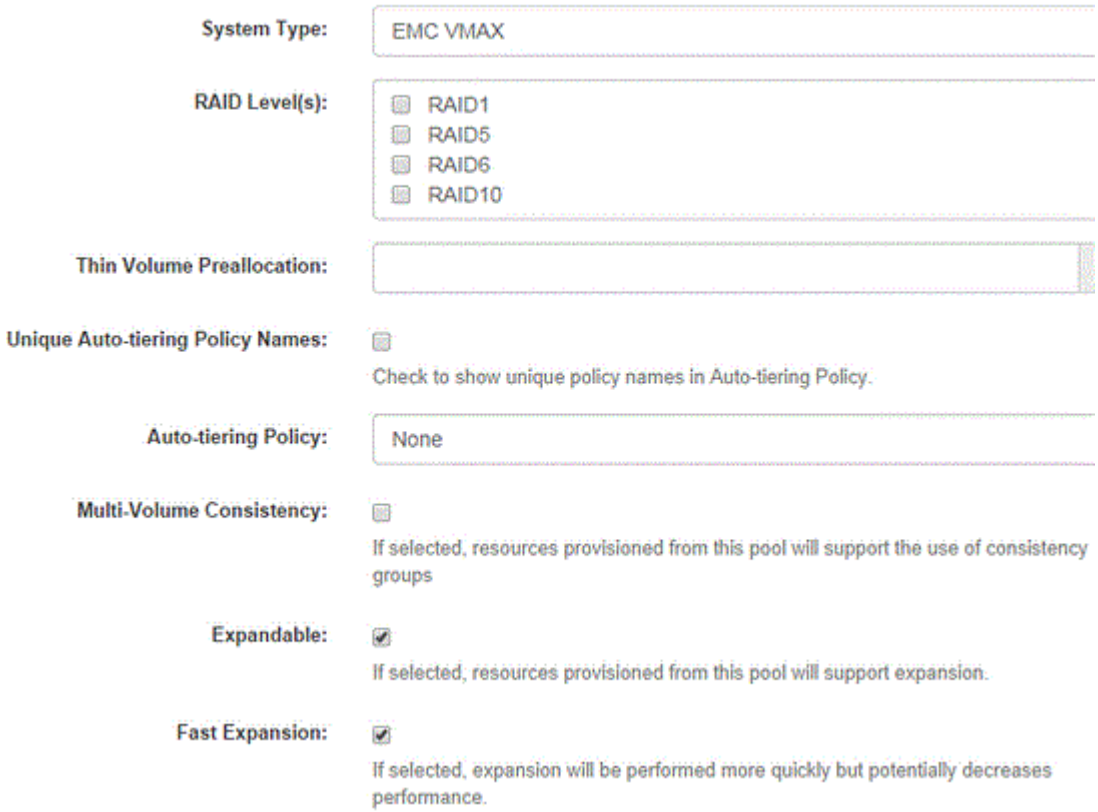
VMAX3 arrays do not use meta volumes of any kind. This discussion does not pertain to ViPR Controller integration with VMAX3 arrays.

Concatenated vs. striped meta volumes on VMAX arrays

VMAX supports both striped and concatenated meta volumes. ViPR Controller enables you to control the type of meta volume it creates.

By default, ViPR creates striped meta volumes. However, you control the type of meta volume that ViPR creates.

VMAX supports both striped and concatenated meta volumes.



If you enable `Fast Expansion`,ViPR Controller creates concatenated meta volumes in this virtual pool. If Fast Expansion is disabled, ViPR Controller creates striped meta volumes.

Note

The `Fast Expansion` option is available in the virtual pool configuration screens only if you select a `system type` of `EMC VMAX` or `EMC VNX Block`.

ViPR Controller striped volume creation in a VMAX thin pool

When a ViPR Controller user submits a request to create a striped volume in a thin storage pool, ViPR Controller determines whether to create a regular volume or a meta volume.

The following list describes the process and policies that ViPR Controller uses to determine when and how to build striped volumes in a thin pool.

- During VMAX array discovery, ViPR Controller adds physical storage pools.
- Each storage pool has an associated maximum volume size.
- You can retrieve the maximum volume size for a storage pool by performing a GET against that storage pool using the ViPR Controller REST API.
- The default maximum volume size of a storage pool on a VMAX is 240 GB. You can explicitly set the maximum volume size for a VMAX storage pool through the auto meta feature.
- If the VMAX auto meta feature is enabled, the maximum volume size is the `min_auto_meta_size` setting of the array.

Note

If you modify the `min_auto_meta_size` setting of any array under ViPR Controller management from Unisphere, the best practice is to immediately rediscover the array in order to synchronize the array settings with ViPR. If you do not rediscover the array, any volume creation or expansion could yield unpredictable results.

- ViPR Controller chooses one physical storage pool where it will create the volume. (ViPR Controller volumes do not span across physical storage pools.)
- ViPR Controller checks the maximum volume size of the storage pool and compares it to the size of the request that the user submitted through the service dialog box.
- If the requested volume size exceeds the maximum volume size of the storage pool, ViPR Controller creates a meta volume. If the requested volume size is smaller than the maximum volume size of the storage pool, ViPR Controller creates a standard volume.

Striped thin pool provisioning: Determine the number of meta members in a meta volume

When ViPR Controller creates a striped meta volume in a virtual pool that has thin provisioning, it calculates how many meta members to build according to the following rules:

- ViPR Controller retrieves the maximum meta member size from the storage pool object that ViPR Controller returned from an array discovery. (The default is 240GB.)
- If the requested volume size exceeds the maximum thin volume meta member size limit, build a meta volume. For requests smaller than the maximum thin volume meta member size limit, create a regular volume.
- Use 8 members total (including the head) until you reach the maximum capacity possible of 8 members. An eight member meta volume includes a meta head and seven meta members.
- If an 8 member meta volume is too small to fulfill the request, use a 16-member meta volume. If the 16-member meta volume is too small, use a 32-member meta volume.
- When requested capacity exceeds 32 meta members, add more members individually, for example, 33, 34, 35, until you achieve sufficient capacity.

ViPR Controller concatenated volume creation on VMAX

When a ViPR Controller user submits a request to create a concatenated volume, ViPR Controller determines whether to create a regular volume or a meta volume.

Concatenated vs striped meta volumes on page 26 describes the virtual pool settings you must set to force ViPR Controller to create a concatenated meta volume.

The following list describes the process and policies that ViPR Controller uses to determine when and how to build concatenated meta volumes.

- During VMAX array discovery, ViPR Controller adds physical storage pools.
- Each storage pool has an associated maximum volume size.
- You can retrieve the maximum volume size for a storage pool by performing a GET against that storage pool using the ViPR Controller REST API.
- The default maximum volume size of a storage pool on a VMAX is 240 GB. You can explicitly set the maximum volume size for a VMAX storage pool through the auto meta feature.

- If the VMAX auto meta feature is enabled, the maximum volume size is the `min_auto_meta_size` setting of the array.

  Note

  If you modify the `min_auto_meta_size` setting of any array under ViPR Controller management from Unisphere, the best practice is to immediately rediscover the array in order to synchronize the array settings with ViPR. If you do not rediscover the array, any volume creation or expansion could yield unpredictable results.

- ViPR Controller chooses one physical storage pool where it will create the volume. (ViPR Controller volumes do not span across physical storage pools.)
- ViPR Controller checks the maximum volume size of the storage pool and compares it to the size of the request that the user submitted through the service dialog box.
- If the requested volume size exceeds the maximum volume size of the storage pool, ViPR Controller creates a meta volume. If the requested volume size is smaller than the maximum volume size of the storage pool, ViPR Controller creates a standard volume.

After ViPR Controller chooses a storage pool, it creates the volume.

Concatenated meta volume: Determine the number of meta members in a meta volume

When ViPR Controller creates a concatenated meta volume, it sets the number of meta members according to the following process:

- Determine the maximum volume size. The ViPR Controller API GET on the storage pool returns this information.
- Create the number of meta members that ViPR Controller needs to fulfill the request.
- Ensure that all created meta members are the same size.

Example 1

Suppose the VMAX returns a maximum volume size of 240 GB.

The user asks ViPR Controller to create a 400 GB volume.

ViPR Controller creates 2 meta members of 200 GB apiece.

Example 2

Suppose the VMAX a maximum volume size returned of 240 GB.

The user asks ViPR Controller to create a 900 GB volume.

ViPR Controller creates 4 meta members of 225 GB apiece.

ViPR Controller striped volume creation in a VMAX thick pool

When a ViPR Controller user submits a request to create a striped volume in a thick storage pool, ViPR Controller determines whether to create a regular volume or a meta volume.

ViPR Controller uses the following process and policies to determine when and how to build striped volumes in a thick pool.

- During VMAX array discovery, ViPR Controller adds physical storage pools.
- Each storage pool has an associated maximum volume size.

- You can retrieve the maximum volume size for a storage pool by performing a GET against that storage pool using the ViPR Controller REST API.
- The default maximum volume size of a storage pool on a VMAX is 240 GB. You can explicitly set the maximum volume size for a VMAX storage pool through the auto meta feature.
- If the VMAX auto meta feature is enabled, the maximum volume size is the `min_auto_meta_size` setting of the array.

Note

If you modify the `min_auto_meta_size` setting of any array under ViPR Controller management from Unisphere, the best practice is to immediately rediscover the array in order to synchronize the array settings with ViPR. If you do not rediscover the array, any volume creation or expansion could yield unpredictable results.

- ViPR Controller chooses one physical storage pool where it will create the volume. (ViPR Controller volumes do not span across physical storage pools.)

Striped thick pool provisioning: Determine the number of meta members in a meta volume

When ViPR Controller creates a striped meta volume in a storage pool that has thick provisioning, it calculates how many meta members to build according to the following rules:

- If the request is between 32GB and 500GB, use a 4-member meta volume.
- If the request is between 500GB to 1024GB, use an 8-member meta volume.
- More than 1024GB, use a 16-member meta volume or a 32-member meta volume, according to requested capacity.
- When requested capacity is larger than 32 meta members, add more members individually. For example, add a 33rd meta member, then a 34th, until you reach sufficient capacity.

ViPR Controller volume expansion on VMAX

You can expand a volume on a VMAX if the volume was created in a virtual pool that has the `Expandable` option enabled. When a ViPR Controller user submits a request to expand a VMAX volume, ViPR Controller applies the following rules:

- Any volume expansion on VMAX results in a meta volume. This is a VMAX feature. Therefore, if you expand a volume that resides on a VMAX with ViPR Controller, the resulting volume will be a meta volume, even if the original volume was a regular volume and the expansion was small.
- If you expand a meta volume with a ViPR Controller service, ViPR Controller adds meta members until the total size of the volume meets or exceeds the size that the user specified in the service request.
- If the meta volume is a striped meta, striped data is redistributed to use new member volumes. This process can take some time. VMAX backs up the volume data to a BCV (Business Continuity Volume). Then it creates a striped meta volume of the requested size and copies the data to it.
- All meta members in a meta volume have the same size. For example:
  - When ViPR Controller expands a 256GB meta volume with 8 members to 320GB, it adds two new members, each of 32GB.

    - When ViPR Controller expands a 16GB regular volume to 256GB, ViPR Controller adds 15 new members, each of 16GB.
- When ViPR expands a regular VMAX volume into a meta volume, the result is a concatenated meta volume of the requested size.
- Expect some delays in accessing the data while expansion service processing is under way.

CHAPTER 5

ViPR Controller Support for Meta Volumes on VNX Arrays

This chapter contains the following topics:

ViPR Controller meta volume creation on VNX: notes and guidelines

When ViPR Controller creates volumes in a VNX storage pool, it applies the following guidelines:

- During VNX array discovery, ViPR Controller adds physical storage pools.
- Each storage pool has an associated maximum volume size.
- You can retrieve the maximum volume size for a storage pool by performing a GET against that storage pool using the ViPR Controller REST API.
- VNX supports meta volumes only for RAID groups (volumes created in concrete pools). They are always thick volumes.
- ViPR creates meta volumes for all VNX volumes larger than the maximum meta member size that the VNX array returns. The default volume size limit for a thick volume in a concrete storage pool on a VNX is 1.7TB.
- On a VNX, unified storage pools support only regular volumes.
- When ViPR Controller creates meta members in meta volumes, those meta members are the same size.
- ViPR Controller creates striped meta volumes on VNX. ViPR Controller does not create concatenated meta volumes on a VNX array.
- If a concatenated meta volume resides on the VNX outside of ViPR Controller, ViPR Controller can ingest it. Subsequently, ViPR Controller can expand that concatenated meta volume.

ViPR Controller provisioning on VNX: regular vs. meta volumes

When ViPR Controller receives a request to create a volume on a VNX array, it uses the certain criteria to determine the type of volume to create.

To determine the type of volume to create on the VNX, ViPR Controller completes the following processes:

1. ViPR Controller chooses one physical storage pool where it will create the volume. ViPR Controller volumes do not span across physical storage pools.
2. If you specify a thin virtual storage pool in the service dialog box, ViPR Controller provisions a regular volume up to the maximum volume size for the physical storage pool.
3. If you specify a thick virtual storage pool in the service dialog, ViPR Controller checks the maximum volume size of the storage pool and compares it to the size of the request that the user requested through the service dialog box.
4. If the requested volume size exceeds the maximum volume size of the storage pool, ViPR Controller creates a meta volume. If the requested volume size is less than the maximum volume size of the storage pool, ViPR Controller creates a standard volume.

ViPR Controller provisioning on VNX: Determine the number of meta members in a volume

During storage provisioning, ViPR Controller uses the following processes to determine the number of members to create in the meta volume:

- ViPR Controller builds the minimum number of meta members to fulfill the request.
- ViPR Controller creates meta members that are all the same size.
- No meta member exceeds the maximum meta member size. The value of the maximum meta member size resides in the storage pool object that ViPR Controller returns from a VNX array discovery.

ViPR Controller meta volume creation on VNX: examples

The following examples assume that the maximum volume size in the concrete storage pools is 1.7TB.

The user requests a volume of 6 TB. ViPR Controller creates a meta volume that has 4 meta members of 1.5 TB.

The user requests a volume of 10 TB. ViPR Controller creates a meta volume that has 6 1.7 TB meta members.

Expand a volume on a VNX array

You can expand a volume on a VNX if the volume was created in a virtual pool that has the Expandable option enabled. When you expand a VNX volume, ViPR Controller applies these policies:

- Thin Pool Volumes. Either thick or thin LUNs created in VNX Unified pools. ViPR Controller expands these volumes as regular volumes up to the regular volume size limit in the storage pool. ViPR Controller does not support meta volume expansion of these volumes. The volume size limit for thick volumes in a Unified CLARiiON storage pool is 11TB. The size limit for thin volumes is 17TB.
- Thick pool volumes. RAID group volumes that are thick LUNs provisioned from VNX concrete pools. ViPR Controller expands them as meta volumes.

CHAPTER 6

ViPR Controller Support for SRDF Remote Replication

This chapter contains the following topics:

ViPR Controller Support for SRDF Remote Replication Overview

ViPR Controller enables you to use the Symmetrix Remote Data Facility (SRDF) to replicate volumes automatically to a remote data center. ViPR Controller supports both asynchronous (SRDF/A) and synchronous (SRDF/S) protection modes.

ViPR Controller with SRDF automates these processes:

- Volume creation
- Zone and mask creation for volumes
- Initiation of SRDF connections
- Monitoring of SRDF connections

ViPR Controller and SRDF: supported features

ViPR Controller supports various SRDF configurations and operations.

ViPR Controller supports the following:

- R1 to R2 (point-to-point) configurations.
- On volumes using SRDF/A mode:
  - You can delete an SRDF/A volume from the group without disturbing the active asynchronous session.
  - If you delete the last volume from an SRDF/A group, ViPR Controller removes the consistency group from the array.
- You can perform SRDF operations for SRDF/S and SRDF/A protected volumes that are part of a ViPR Controller consistency group. These operations are performed on all volumes within that consistency group.

For a complete list of supported SRDF operations, see:

- Operations for SRDF/S and SRDF/A replication without CGs on page 48
- Operations for SRDF/S and SRDF/A replication with CGs on page 49

ViPR Controller and SRDF: limitations

ViPR Controller does not support certain SRDF functionality.

ViPR Controller does not support the following:

- SRDF/Star and SRDF/CG.
- Static RDF groups. A dynamic RDF group must use synchronous or asynchronous mode.
- Adaptive copy mode.
- Multiple SRDF copies
- SRDF integration with VPLEX

Prerequisites for Setting up SRDF with ViPR Controller

Review this section before setting up SRDF/S and SRDF/A configurations with ViPR Controller.

These are prerequisites for setting up SRDF/S and SRDF/A configurations with ViPR Controller:

- ViPR Controller system administrator privileges.
- The source and target VMAX arrays (running Enginuity 5876 or later) must be physically connected through proper RDF front-end directors.
- Before creating SRDF-protected volumes in ViPR Controller, you must configure an RDF group containing the source and target VMAX arrays. ViPR Controller cannot discover SRDF-protected volumes without at least one RDF group set on the array. The RDF group must:
  - Be a dynamic RDF group using synchronous or asynchronous mode.
  - Not contain any volumes. It must be an empty group that you manually create on VMAX.
  - Have the same name as the ViPR Controller project. Once a project is associated with an RDF group (that has the same name as the project), all SRDF-protected volumes that you subsequently create for that project use the same RDF group.

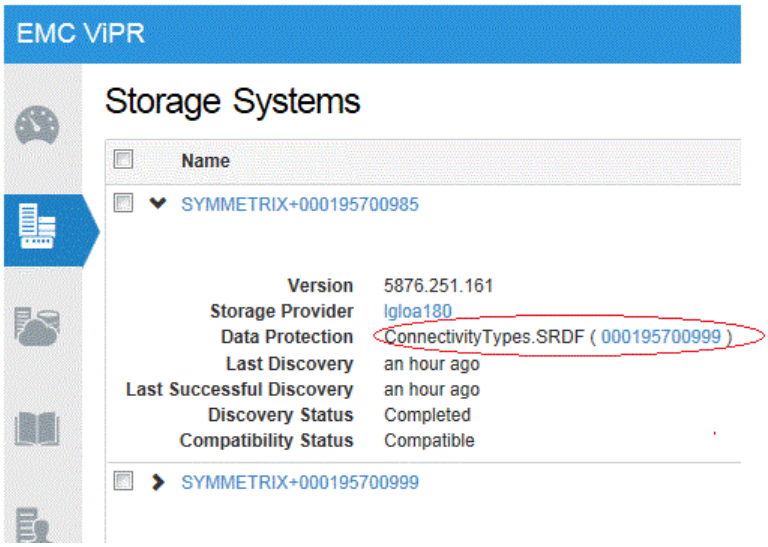
Configure ViPR Controller for SRDF protection between two sites

You can set up SRDF/S and SRDF/A protection between a source and target VMAX array in ViPR Controller.

Procedure

1. Verify that the following physical assets are discovered and managed by ViPR Controller:
   - Any hosts connected to the source and target VMAX arrays.
   - The source and target VMAX arrays. These arrays must have the required RDF connections. The following figure shows a Symmetrix system (VMAX) ending in 985 (source) with an SRDF connection to a Symmetrix system ending in 999 (target).

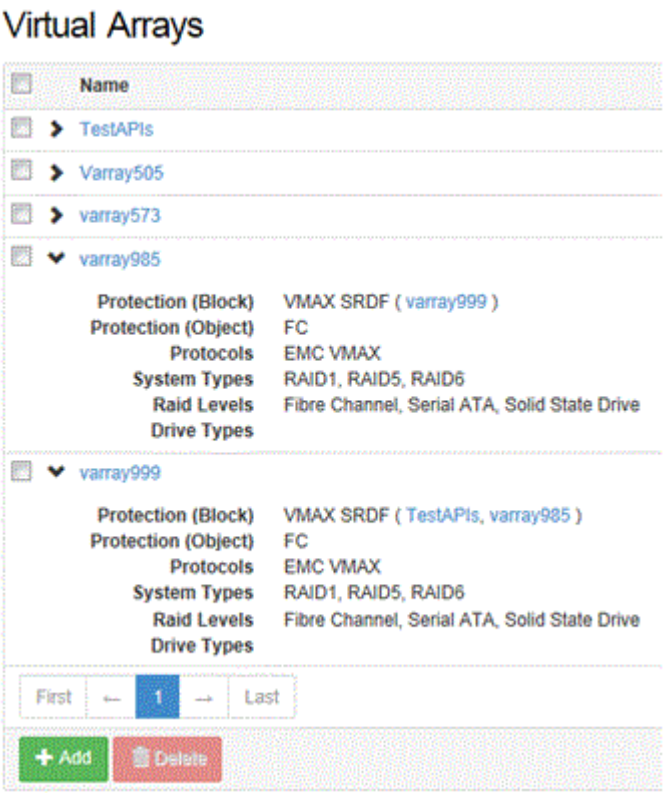
Figure 7 SRDF Connectivity Type



2. Create a virtual array for the source VMAX array and a virtual array for the target array.

   The following figure shows information about the source virtual array (varray 985) and the target virtual array (varray999).

   Figure 8 Virtual arrays with SRDF protection



   You can view a list of virtual arrays by selecting **Virtual Assets** › **Virtual Arrays**.

3. Create the target virtual pool. This virtual pool represents the target storage for SRDF disaster recovery. Select **Virtual Assets** › **Block Virtual Pools**, and then click **Add** to enter this information:

a. A name and description.
b. In the **Virtual Arrays** field, select the target VMAX array.
c. In **Hardware** › **System Type**, select **EMC VMAX**.
d. In **Storage Pools**, select **Automatic** or **Manual** as appropriate for your environment.
e. Enable **Hardware** › **Multi-Volume Consistency**.

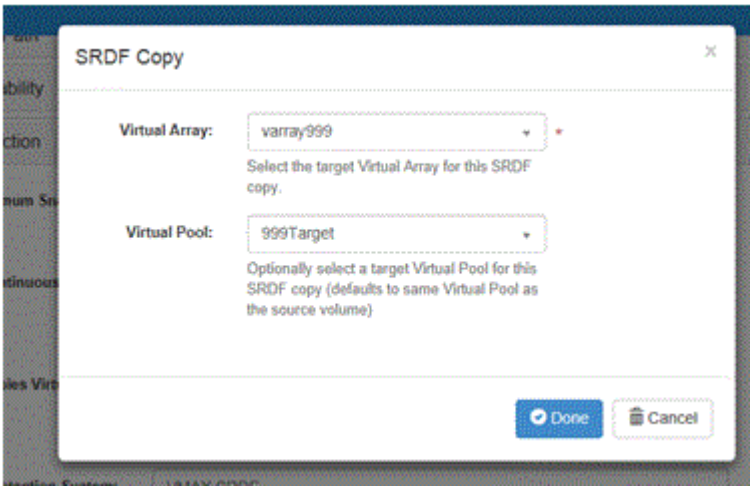
Note

Do not add a copy. You add a copy when you create the source virtual pool.

f. Click **Save**.

4. Create the source virtual pool. This is the virtual pool from which storage is provisioned. Select **Virtual Assets** › **Block Virtual Pools**, and then click **Add** to enter this information:
   a. A name and description.
   b. In the **Virtual Arrays** field, select the source VMAX array.
   c. In **Hardware** › **System Type**, select **EMC VMAX**.
   d. Enable **Hardware** › **Multi-Volume Consistency**.
   e. In **Data Protection** › **Protection System**, select **VMAX SRDF**.
   f. In **Data Protection** › **SRDF Copy Mode**, select **Synchronous** or **Asynchronous**.
   g. In **SRDF Copies**, click **Add Copy**.
   h. In the **SRDF Copy** dialog box, select the target virtual array you created in step 2 and the target virtual pool you created in step 3, and then click **Done**.

Figure 9 SRDF Copy dialog box



Note

ViPR Controller supports adding one SRDF copy per source.

   i. In **Storage Pools** › **Pool Assignment**, select **Automatic** or **Manual** as appropriate for your environment.
   j. Click **Save**.

5. Create a project to which you can add SRDF-protected volumes.

Note

For SRDF with CG, enable the **Multi-consistency** field.

a. In User mode, select **Tenant Settings** › **Projects**.

b. Click **Add** and then enter a project name with these properties:

- Must be the same name as the RDF group name on VMAX.
- Must be 10 characters or less, per Symmetrix RDF-naming restrictions.

c. Enter the AD/LDAP name of a user. This user becomes the project owner. If you do not enter a name, you become the project owner.

d. (Optional) Select the **Enable Quota** box to assign a quota to the project. This limits the amount of storage provisioned for the project.

e. Click **Save**.

6. Create a block volume in the project that you previously created.

a. Select **Service Catalog** › **Block Storage Services**, and then click **Create Block Volume for a Host**.

b. From the **Host** drop-down list, select the production server.

c. From the **Virtual Array** drop-down list, select the source virtual array that you created in step 2.

d. From the **Virtual Pool** drop-down list, select the source virtual pool to associate with the project.

e. Specify a name and size for the volume.

f. Open the **Advanced** panel, and choose a ViPR Controller consistency group for your volume.

g. Click **Order.**

For an SRDF-protected volume, ViPR Controller executes these steps in the background:

- Creates the volume on the source virtual array
- Creates a target volume of the same size on the target virtual array
- Creates the SRDF connections and synchronizes the source and target volumes
- Exports volumes to the host

7. (Optional) To verify that Unisphere displays the volumes that you created, open **Data Protection** › **Replication Groups and Pools** › **SRDF groups**.

Add SRDF protection to a volume in a consistency group

You can add SRDF/S and SRDF/A protection to a volume in ViPR Controller by running the Change Virtual Pool service in the Service Catalog.

Before you begin

The volume must exist on a VMAX array.

The volume must be part of a ViPR Controller consistency group.

The VMAX array must be part of an SRDF configuration.

Procedure

1. Set the virtual pool with these characteristics:
   - SRDF/S or SRDF/A protection
   - Multi-volume consistency
   - With the same settings as the associated volume's physical storage pool
2. Run **Block Storage Services** › **Change Virtual Pool**.
3. Select the project that contains the unprotected volume.
4. Select the virtual pool of the unprotected volume.
5. Select the operation **Add SRDF Protection**.
6. Select the target virtual pool that has SRDF protection enabled.
7. Select the volume you want to protect.
8. Click **Order.**

Prerequisites for SRDF-protected volume ingestion

You can ingest volumes that are in an SRDF/S or SRDF/S relationship into ViPR Controller.

Before you begin

Before you ingest volumes in an SRDF relationship, verify the following:

- You are a system administrator in ViPR Controller.
- The source and target arrays are configured for SRDF protection.
- The source and target arrays are discovered by ViPR Controller.
- The source and target arrays are added to different ViPR Controller virtual arrays.
- Volumes being ingested are not part of a ViPR Controller consistency group.

Note

Both the source and target virtual pools can belong to the same virtual array. However, it is recommended that you configure them into different arrays to ensure the disaster recovery relationship is clear.

For volumes protected by SRDF, you ingest both the source volume (R1) and the target volume (R2) into different virtual pools. The source virtual pool must contain physical storage pools on the source VMAX array. The target virtual pool must contain physical storage pools on the target VMAX array. You perform two ingest operations because the source and target volumes are ingested into different virtual pools.
Perform these steps before ingesting the source and target volumes into ViPR Controller:

Procedure

1. Verify that a virtual array with a virtual pool is set with SRDF protection. This is for ingesting the source volume.
2. Verify that a virtual array with a virtual pool is *not* SRDF protected. This is for ingesting the target volume.
3. Run the discovery process for both the source and target arrays. After discovery is completed on both arrays, see the discussion on Ingest unmanaged block volumes into ViPR Controller in the *ViPR Controller Ingest Services for Existing Environments Guide*.

Failover a block volume

You can failover a block volume using the Failover Block Volume service in the ViPR Controller Service Catalog.

Before you begin

You must have access to the block volume's project in ViPR Controller.

For ViPR Controller managed SRDF volumes in the event of a datacenter disaster: if for any reason the failover/swap of these SRDF volumes is performed outside of ViPR Controller, perform rediscovery of the underlying storage arrays before performing any actions on these resources in ViPR Controller.

Procedure

1. Choose **Block Protection Services** › **Failover block volume** from the ViPR Controller Service Catalog.
2. Select the project, volume, and failover target.
3. Click **Order**.
4. After the failover completes, return to the ViPR Controller Service Catalog to mount the volume to the disaster recovery server.
5. (Optional) You can swap the source and target destinations by selecting **Block Protection Services** › **Swap Continuous Copies**.

Support summary: virtual pool changes and array features

Change virtual pools for SRDF-protected volumes

The following table lists support for virtual pool changes.

Table 5 Virtual pool changes

Moving...	To...	Is...
A non-SRDF volume	An SRDF-protected virtual pool (SRDF/S or SRDF/A)	Supported Create the target volume on the target virtual array specified in the SRDF-protected virtual pool.
An SRDF-protected volume (SRDF/S or SRDF/S)	Another SRDF-protected virtual pool (SRDF/S or SRDF/A)	Not Supported
	A non-SRDF protected virtual pool	

Supported array features

The following table shows support for array features with ViPR Controller and SRDF.

Table 6 Array feature support

Feature	Supported?	Notes
FAST with SRDF	Yes	Select the FAST policy when you create the SRDF-protected virtual pool. Source and target volumes have the same FAST policy. If you move a non-SRDF volume with FAST protection to a target SRDF-protected pool, ViPR Controller applies the same FAST policy to the target.
Meta volumes with SRDF	Yes	
Expand an SRDF-protected meta volume	Yes for VMAX, No for VMAX3	When you run this disruptive operation: • The SRDF links are detached. • The RDF device is converted into a normal device. • The meta volume expands. • The normal device is converted back to an RDF device. • SRDF links are re-established.
Expand SRDF-protected volume (non-meta)	Yes for VMAX, No for VMAX3	

Support summary: SRDF operations

Common SRDF operations

The following are common SRDF operations that you can perform in ViPR Controller. For a complete list of supported SRDF operations, see:

- Operations for SRDF/S and SRDF/A replication without CGs on page 48
- Operations for SRDF/S and SRDF/A replication with CGs on page 49

Table 7 Common SRDF operations

SRDF operation	Description	Supported through ViPR Controller?			Notes
		UI	API	CLI	
SRDF Pairs functions					
Createpair	Creates dynamic SRDF pairs based on devices specified in a device file. By default, the Symmetrix ID specified in this operation is the R1 device. If you use the -R2 option, the R2 device becomes the default.	Yes	Yes	Yes	

Table 7 Common SRDF operations (continued)

SRDF operation	Description	Supported through ViPR Controller?			Notes
		UI	API	CLI	
Deletepair	Deletes dynamic SRDF pairing in the specified device group.	Yes	Yes	Yes	
Resume	Resumes I/O traffic on the SRDF links for the remotely-mirrored pairs in the group.	No	Yes	Yes	SRDF/S and SRDF/A support on entire consistency group.
Suspend	Suspends I/O traffic on the SRDF links for the remotely mirrored pairs in the group.	No	Yes	Yes	SRDF/S and SRDF/A support on entire consistency group.
Split	Splits an SRDF pair. This stops mirroring for the SRDF pairs in a device group.	No	Yes	Yes	SRDF/S and SRDF/A support on the entire consistency group.
Restore	Restores remote mirroring and initiates a data copy from the target (R2) side to the source (R1) side. This operation can be a full or incremental restore.	No	Yes	Yes	
Establish	Establishes an SRDF pair by initiating a data copy from the source (R1) side to the target (R2) side. This operation can be a full or incremental establish	No	Yes	Yes	Only an Incremental Establish is supported.
Failover and Failback functions					
Failover	Switches data processing from the source (R1) to the target (R2) side. If the source (R1) is operational, ViPR Controller suspends I/O traffic on the SRDF links and write-disables the devices on the source (R1) side to their local hosts. Then, ViPR Controller suspends traffic on the SRDF links, and write enables the devices on the target side to their local hosts.	Yes	Yes	Yes	SRDF/S and SRDF/A support on entire consistency group.
Failback	Switches data processing from the (R2) side back to the source (R1) side. If the target (R2) is operational, ViPR Controller does the following: 1. Write-disables the devices on the target side to their local hosts. 2. Resumes I/O traffic on the SRDF links. 3. Write-enables the devices on the source (R1) side to their local hosts.	Yes	Yes	Yes	SRDF/S and SRDF/A support on entire consistency group.

Table 7 Common SRDF operations (continued)

SRDF operation	Description	Supported through ViPR Controller?			Notes
		UI	API	CLI	
Swap	Swaps the SRDF personality of the designated SRDF devices. Source R1 devices become target R2 devices, and target R2 devices become source R1 devices.	Yes	Yes	Yes	Supported on both SRDF/S and SRDF/A. If the target volume is in a consistency group, the swap operation is applied to all volumes in the consistency group.
Snapshot and Clone Functions					
Create Snapshot	Creates a point-in-time copy of a volume.	Yes	Yes	Yes	
Delete Snapshot	Deletes a point-in-time copy of a volume.	Yes	Yes	Yes	
Restore Snapshot	Restores snapshot data to a volume.	Yes	Yes	Yes	
Create clone	Creates a full copy of a volume.	Yes	Yes	Yes	
Delete Clone	Deletes a full copy of a volume.	Yes	Yes	Yes	
Mirror Functions					
Create Mirror	Create a continuous copy of a volume	Yes	Yes	Yes	Mirrors in consistency groups are not supported for SRDF/S and SRDF/A replication.
Delete Mirror	Delete a continuous copy of a volume. **Note** Peform a pause operation before deleting a mirror.	Yes	Yes	Yes	

Unsupported SRDF operations

You cannot perform the following operations through ViPR Controller. However, you can run these operations through VMAX interfaces (such as Unisphere) on volumes that ViPR Controller manages. ViPR Controller recognizes the changes made through those interfaces.

- Swapping one half of an SRDF pair
- Explicitly flushing data from a source SRDF volume to a target SRDF volume
- Switching to adaptive copy mode

ViPR Controller does not support these SRDF operations:

- addgrp

- disable
- half_movepair
- merge
- movepair
- removegrp
- update
- checkpoint
- enable
- half_swap
- migrate
- ready
- rw_enable
- verify
- deactivate
- half_deletepair
- label
- modifygrp
- refresh
- set
- write_disable

For more information about SRDF, see the SRDF remote replication documentation on the EMC Online Support website at http://support.emc.com.

Operations for SRDF/S and SRDF/A replication without CGs

Review this section to determine the valid SRDF operations that ViPR Controller can perform on VMAX arrays not in consistency groups and protected by SRDF/S and SRDF/A remote replication.

Table 8 Supported operations for SRDF replication without CGs

Operation	VMAX3 to VMAX	VMAX3 to VMAX3	VMAX to VMAX3	VMAX to VMAX
Create SRDF Volume	Yes	Yes	Yes	Yes
Failover SRDF Volume	Yes	Yes	Yes	Yes
Failback SRDF Volume	Yes	Yes	Yes	Yes
Swap SRDF Volume	Yes	Yes	Yes	Yes
Split SRDF link	Yes	Yes	Yes	Yes
Establish SRDF link	Yes	Yes	Yes	Yes
Resync from R1 to R2	No	No	No	No
Restore from R2 to R1	Yes	Yes	Yes	Yes
SRDF stop	Yes	Yes	Yes	Yes

Table 8 Supported operations for SRDF replication without CGs (continued)

Operation	VMAX3 to VMAX	VMAX3 to VMAX3	VMAX to VMAX3	VMAX to VMAX
Delete SRDF Volumes	Yes	Yes	Yes	Yes
Change volume from non-SRDF Vpool to SRDF Vpool	Yes	Yes	Yes	Yes
Expand SRDF Volume	No	No	No	Yes
Create local Mirror from SRDF R1 Volume	Yes	Yes	Yes	Yes
Delete local Mirror of SRDF R1 Volume	Yes	Yes	Yes	Yes
Create Snapshot from SRDF R1 Volume	Yes	Yes	Yes	Yes
Restore Snapshot to SRDF R1 Volume	Yes	Yes	Yes	Yes
Resync Snapshot from SRDF R1 Volume	No	No	No	No
Delete Snapshot of SRDF R1 Volume	Yes	Yes	Yes	Yes
Create Clone from SRDF R1 Volume	Yes	Yes	Yes	Yes
Restore Clone to SRDF R1 Volume	Yes	Yes	Yes	Yes
Resync Clone from SRDF R1 Volume	Yes	Yes	Yes	Yes
Delete Clone of SRDF R1 Volume	Yes	Yes	Yes	Yes
Create local Mirror from SRDF R2 Volume	Yes	Yes	Yes	Yes
Delete local Mirror of SRDF R2 Volume	Yes	Yes	Yes	Yes
Create Snapshot from SRDF R2 Volume	Yes	Yes	Yes	Yes
Restore Snapshot to SRDF R2 Volume	Yes	Yes	Yes	Yes
Resync Snapshot from SRDF R2 Volume	No	No	No	No
Delete Snapshot of SRDF R2 Volume	Yes	Yes	Yes	Yes
Create Clone from SRDF R2 Volume	Yes	Yes	Yes	Yes
Restore Clone to SRDF R2 Volume	Yes	Yes	Yes	Yes
Resync Clone from SRDF R2 Volume	Yes	Yes	Yes	Yes
Delete Clone of SRDF R2 Volume	Yes	Yes	Yes	Yes

Operations for SRDF/S and SRDF/A replication with CGs

Review this section to determine the valid SRDF operations that ViPR Controller can perform on VMAX arrays in consistency groups and protected by SRDF/S and SRDF/A remote replication.

Table 9 Supported operations for SRDF replication with CGs

Operation	VMAX3 to VMAX	VMAX3 to VMAX3	VMAX to VMAX3	VMAX to VMAX
Create SRDF Volume	Yes	Yes	Yes	Yes

Table 9 Supported operations for SRDF replication with CGs (continued)

Operation	VMAX3 to VMAX	VMAX3 to VMAX3	VMAX to VMAX3	VMAX to VMAX
Failover SRDF Volume	Yes	Yes	Yes	Yes
Failback SRDF Volume	Yes	Yes	Yes	Yes
Swap SRDF Volume	Yes	Yes	Yes	Yes
Split SRDF link	Yes	Yes	Yes	Yes
Establish SRDF link	Yes	Yes	Yes	Yes
Resync from R1 to R2	No	No	No	No
Restore from R2 to R1	Yes	Yes	Yes	Yes
SRDF stop	Yes	Yes	Yes	Yes
Delete SRDF Volumes	Yes	Yes	Yes	Yes
Change volume from non-SRDF Vpool to SRDF Vpool	Yes	Yes	Yes	Yes
Expand SRDF Volume	No	No	No	Yes
Create local Mirror from SRDF R1 Volume	No	No	No	No
Delete local Mirror of SRDF R1 Volume	No	No	No	No
Create Snapshot from SRDF R1 Volume	Yes	Yes	Yes	Yes
Restore Snapshot to SRDF R1 Volume	Yes	Yes	Yes	Yes
Resync Snapshot from SRDF R1 Volume	No	No	No	No
Delete Snapshot of SRDF R1 Volume	Yes	Yes	Yes	Yes
Create Clone from SRDF R1 Volume	Yes	Yes	Yes	Yes
Restore Clone to SRDF R1 Volume	Yes	Yes	Yes	Yes
Resync Clone from SRDF R1 Volume	Yes	Yes	Yes	Yes
Delete Clone of SRDF R1 Volume	Yes	Yes	Yes	Yes
Create local Mirror from SRDF R2 Volume	No	No	No	No
Delete local Mirror of SRDF R2 Volume	No	No	No	No
Create Snapshot from SRDF R2 Volume	Yes	Yes	Yes	Yes
Restore Snapshot to SRDF R2 Volume	Yes	Yes	Yes	Yes
Resync Snapshot from SRDF R2 Volume	No	No	No	No
Delete Snapshot of SRDF R2 Volume	Yes	Yes	Yes	Yes
Create Clone from SRDF R2 Volume	Yes	Yes	Yes	Yes
Restore Clone to SRDF R2 Volume	Yes	Yes	Yes	Yes
Resync Clone from SRDF R2 Volume	Yes	Yes	Yes	Yes
Delete Clone of SRDF R2 Volume	Yes	Yes	Yes	Yes