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ViPR Controller Integration with VMAX and VNX Storage Systems Guide

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CONTENTS

Chapter 1	ViPR Controller Integration with VMAX and VNX Overview	5
Chapter 2	ViPR Controller Configuration Requirements and Information for VMAX storage systems	7
	VMAX configuration requirements and information before creating your virtual data center.....	8
	SMI-S provider configuration requirements for VMAX.....	8
	ViPR Controller upgrade requirements for SMI-S provider.....	10
	VMAX storage system.....	10
	VMAX virtual pool configuration requirements and recommendations.....	10
	VMAX3 virtual pool requirements and recommendations.....	11
	Add aliases to VMAX storage system initiator names	12
	Support for compression on VMAX3 All Flash Arrays.....	13
Chapter 3	ViPR Controller Configuration Requirements and Information for VNX for Block storage systems	15
	VNX for Block configuration requirements and information before creating your virtual data center.....	16
	SMI-S provider configuration requirements for VNX for Block.....	16
	VNX for Block storage system	17
	Enable performance data logging for VNX for Block.....	18
	EMC VNX for Block configuration requirements and recommendations	18
	EMC VNX for Block virtual pool requirements and recommendations	18
	EMC VNXe for Block export recommendations.....	19
Chapter 4	ViPR Controller Support for FAST Policies	21
	ViPR Controller support for fully automated storage tiering for a volume.....	22
	FAST settings in virtual pools.....	22
	Service Level Objectives (SLO) on VMAX3.....	23
	ViPR Controller and FAST policies: Notes and limitations.....	24
	ViPR Controller and FAST Policies on VNX.....	25
	Change FAST policies on an unexported block volume.....	25
	Change the FAST policy for an exported volume.....	25
	Has my volume been exported?.....	26
	Get list of volumes that share a storage group with your volume.....	27
	Get the physical storage pool for your volume.....	30
	Duplicate a virtual pool.....	30
	Check the duplicate virtual pool for your physical storage pool.....	30
	Add a FAST policy to a volume.....	31
	Change the FAST policy for a volume.....	32
	Remove the FAST policy from a volume.....	33
Chapter 5	ViPR Controller Support for Meta Volumes on VMAX Arrays	35
	ViPR Controller support for meta volumes on VMAX	36
	Concatenated vs. striped meta volumes on VMAX arrays.....	36
	ViPR Controller striped volume creation in a VMAX thin pool.....	37

	Striped thin pool provisioning: Determine the number of meta members in a meta volume.....	38
	ViPR Controller concatenated volume creation on VMAX.....	38
	Concatenated meta volume: Determine the number of meta members in a meta volume.....	39
	ViPR Controller striped volume creation in a VMAX thick pool.....	39
	Striped thick pool provisioning: Determine the number of meta members in a meta volume.....	40
	ViPR Controller volume expansion on VMAX.....	40
Chapter 6	ViPR Controller Support for Meta Volumes on VNX Arrays	43
	ViPR Controller meta volume creation on VNX: notes and guidelines.....	44
	ViPR Controller provisioning on VNX: regular vs. meta volumes.....	44
	ViPR Controller provisioning on VNX: Determine the number of meta members in a volume.....	45
	ViPR Controller meta volume creation on VNX: examples.....	45
	Expand a volume on a VNX array.....	45
Chapter 7	ViPR Controller Support for TimeFinder Operations on VMAX arrays	47
	ViPR Controller Support for TimeFinder Operations on VMAX Arrays.....	48
	TimeFinder Clone operations.....	48
	TimeFinder Snap (VDEV) operations.....	50
	TimeFinder VP Snap operations.....	51
	TimeFinder Mirror operations.....	52
	TimeFinder SnapVX operations.....	54
Chapter 8	ViPR Controller Support for SRDF Remote Replication	57
	ViPR Controller support for Symmetrix Remote Data Facility.....	58
	ViPR Controller and SRDF: limitations.....	58
	Support summary: SRDF operations.....	58
	ViPR Controller support for SRDF/A and SRDF/S operations.....	62
	Prerequisites for setting up SRDF/A and SRDF/S with ViPR Controller.....	63
	SRDF/A and SRDF/S support summary: virtual pool changes and array features.....	63
	SRDF operations supported for SRDF/S and SRDF/A replication.....	64
	Examples of ViPR Controller operations for SRDF/S and SRDF/A volumes and CGs.....	66
	ViPR Controller support for SRDF-Metro operations.....	73
	Requirements and information for setting up SRDF-Metro for ViPR Controller.....	73
	SRDF-Metro support summary: changing virtual pools and array features.....	74
	SRDF operations supported and unsupported for SRDF Metro replication.....	74
Chapter 9	ViPR Controller Ingest Support for VMAX Storage Systems	77
	Ingesting VMAX volumes into a consistency group.....	78

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), TimeFinder operations, and 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.

All ViPR Controller product documentation is available from the [ViPR Controller Product Documentation Index](#).

CHAPTER 2

ViPR Controller Configuration Requirements and Information for VMAX storage systems

This chapter includes the following information.

- [VMAX configuration requirements and information before creating your virtual data center](#)8
- [SMI-S provider configuration requirements for VMAX](#)8
- [VMAX storage system](#) 10
- [VMAX virtual pool configuration requirements and recommendations](#) 10
- [VMAX3 virtual pool requirements and recommendations](#)11
- [Add aliases to VMAX storage system initiator names](#) 12
- [Support for compression on VMAX3 All Flash Arrays](#) 13

VMAX configuration requirements and information before creating your virtual data center

This chapter provides the VMAX storage system configuration requirements and information required to add the storage systems to the ViPR Controller physical assets, and to configure the storage systems in the ViPR Controller virtual assets.

The requirements and information should be reviewed prior to adding the storage systems to ViPR Controller.

SMI-S provider configuration requirements for VMAX

ViPR Controller management of VMAX systems is performed through the EMC SMI-S provider. Your SMI-S provider and the VMAX storage system must be configured as follows before the storage system is added to ViPR Controller.

Gather required information

You need specific information to validate that the SMI-S provider is correctly configured for ViPR Controller and to add storage systems to ViPR Controller

- SMI-S provider host address
- SMI-S provider credentials (default is admin/#1Password)
- SMI-S provider port (default is 5989)

Enable properties

It is recommended, as a best practice, to set the Windows or UNIX, operating system variables for the SMI-S provider as follows:

Variable name	Value	Description
SYMCLI_CTL_ACCESS	PARALLEL	Specifies how to obtain a lock on the VMAX configuration database file before starting a VMAX control operation.
symcli_wait_on_db	1	When set to 1, SYMCLI will wait to obtain a lock on the VMAX configuration database when locked by another user. By default, a busy database will return an error.
symcli_wait_on_gk	1	When set to 1, causes the SYMCLI to wait for the retrieval of VMAX information when all gatekeepers are busy. Otherwise, a busy gatekeeper will cause an error.

For details refer to the *EMC Solutions Enabler CLI Command Reference*, which is available from [EMC Online Support](#).

When using SMI-S provider 8.1, you must always enable these properties:

- SYMAPI_USE_GNS, SYMAPI_USE_RDFD under `/var/symapi/config/options`
- GNS_REMOTE_MIRROR under `/var/symapi/config/daemon_options`

Start the daemon service

Before you begin the configuration:

- From the `/opt/emc/SYMCLI/bin` directory, start the daemon service:
`stordaeomon start storrdfd.`
- List the daemons: `/opt/emc/SYMCLI/bin/stordaeomon list`

You can see which daemons are currently running:

```
Available Daemons ('[*]': Currently Running):
[*] storapid          EMC Solutions Enabler Base Daemon
    storgnsd          EMC Solutions Enabler GNS Daemon
    storrdfd          EMC Solutions Enabler RDF Daemon
[*] storevntd         EMC Solutions Enabler Event Daemon
[*] storwatchd        EMC Solutions Enabler Watchdog Daemon
    storsrmd64        EMC Solutions Enabler SRM Daemon, 64bit
    storstp           EMC Solutions Enabler STP Daemon
    storsrvd          EMC Solutions Enabler SYMAPI Server Daemon
```

Note

The `storrdfd` daemon is mandatory for SRDF.

ViPR Controller configuration requirements for SMI-S providers with VMAX storage

- Review the SMI-S version requirements for VMAX storage systems in the [ViPR Controller Support Matrix](#) before taking any action to install or upgrade the SMI-S provider for use with ViPR Controller.
 - In order to take advantage of the features provided with ViPR Controller 3.0 you must be running the latest version of the SMI-S provider. For specific version requirements see the [ViPR Controller Support Matrix](#).
 - SMI-S provider cannot be shared between ViPR Controller and any other application requiring an SMI-S provider to VMAX, such as EMC ViPR SRM.
 - The host server running Solutions Enabler (SYMAPI Server) and SMI-S provider (ECOM) differs from the server where the VMAX service processors are running.
 - The storage system is discovered in the SMI-S provider.
 - When the storage provider is added to ViPR Controller, all the storage systems managed by the storage provider will be added to ViPR Controller. If you do not want all the storage systems on an SMI-S provider to be managed by ViPR Controller, configure the SMI-S provider to only manage the storage systems that will be added to ViPR Controller, before adding the SMI-S provider to ViPR Controller.
-

Note

Storage systems that will not be used in ViPR Controller, can also be deregistered, or deleted after the storage provider is added to ViPR Controller. For steps to deregister or delete storage from ViPR Controller see the *ViPR Controller User Interface Virtual Data Center Configuration Guide*, which is available from the [ViPR Controller Product Documentation Index](#).

- The remote host, SMI-S provider (Solutions Enabler (SYMAPI Server) and EMC CIM Server (ECOM)) are configured to accept SSL connections.
- The EMC `storsrvd` daemon is installed and running.
- The SYMAPI Server and the ViPR Controller server hosts are configured in the local DNS server and that their names are resolvable by each other, for proper communication between the two. If DNS is not used in the environment, be sure to use the hosts files for name resolution (`/etc/hosts` or `c:/Windows/System32/drivers/etc/hosts`).

- The EMC CIM Server (ECOM) default user login, password expiration option is set to "Password never expires."
- The SMI-S provider host is able to see the gatekeepers (six minimum).

ViPR Controller upgrade requirements for SMI-S provider

The [ViPR Controller Support Matrix](#) has the most recent version requirements for all systems supported, or required by ViPR Controller. For specific version requirements of the SMI-S provider, review the [ViPR Controller Support Matrix](#) before taking any action to upgrade or install the SMI-S provider for use with ViPR Controller.

VMAX storage system

You prepare the VMAX storage system before adding it to ViPR Controller as follows.

- Create a sufficient amount of storage pools for storage provisioning with ViPR Controller (for example, SSD, SAS, NL-SAS).
- Define FAST policies.
Storage Tier and FAST Policy names must be consistent across all VMAX storage systems.
- It is not required to create any LUNs, storage groups, port groups, initiator groups, or masking views.
- If discovering eNAS file systems with VMAX3 storage systems, you must select VNX for File as the storage system type when adding the storage system to ViPR Controller.
- ViPR Controller supports FAST.X which allows you to connect an EMC XtremIO to the backend of a VMAX3. When ViPR Controller discovers the VMAX3, the XtremIO is displayed as a SRP or a SLO tier. All provisioning operations are done through the VMAX3.
- After a VMAX storage system has been added and discovered in ViPR Controller, the storage system must be rediscovered if administrative changes are made on the storage system using the storage system element manager.
- For configuration requirements when working with meta volumes see *ViPR Controller Integration with VMAX and VNX Storage Systems Guide*.

VMAX virtual pool configuration requirements and recommendations

Review the following configuration requirements and recommendations before virtualizing your VMAX system in ViPR Controller.

When VMAX is configured with Storage Tiers and FAST Policies:

- Storage Tier and FAST Policy names must be consistent across all VMAX storage systems.
- Set these options when you build your virtual pool:

Option	Description
RAID Level	Select which RAID levels the volumes in the virtual pool will consist of.

Option	Description
Unique Auto-tiering Policy Names	VMAX only. When you build auto-tiering policies on a VMAX through Unisphere, you can assign names to the policies you build. These names are visible when you enable <code>Unique Auto-tiering Policy Names</code> . If you do not enable this option, the auto-tiering policy names displayed in the Auto-tiering Policy field are those built by ViPR.
Auto-tiering Policy	The Fully Automated Storage Tiering (FAST) policy for this virtual pool. FAST policies are supported on VMAX, VNX for Block, and VNXe. ViPR chooses physical storage pools to which the selected auto-tiering policy has been applied. If you create a volume in this virtual pool, the auto-tiering policy specified in this field is applied to that volume.
Fast Expansion	VMAX or VNX Block only. If you enable Fast Expansion, ViPR creates concatenated meta volumes in this virtual pool. If Fast Expansion is disabled, ViPR creates striped meta volumes.
Host Front End Bandwidth Limit	0 - set this value to 0 (unlimited). This field limits the amount of data that can be consumed by applications on the VMAX volume. Host front end bandwidth limits are measured in MB/S.
Host Front End I/O Limit	0 - set this value to 0 (unlimited). This field limits the amount of data that can be consumed by applications on the VMAX volume. Host front end I/O limits are measured in IOPS.

VMAX3 virtual pool requirements and recommendations

Review the following configuration requirements and recommendations before virtualizing your VMAX3 system in ViPR Controller.

Set these options when you build your virtual pool:

Table 1 VMAX3 virtual pool settings

Field	Description
Provisioning Type	Thin. VMAX3 does not support thick volumes. Note ViPR Controller does not list thin pools on eNAS storage even when a thin LUN is set on the virtual pool. ViPR Controller only lists these thin pools as thick.
Protocols	FC.
System Type	EMC VMAX
Thin Volume Preallocation	0 or 100 . Other values would filter out the VMAX3 SRP pools. 0 - Volumes allocated using this pool are fully-thin. 100 - Volumes allocated using this pool are full-allocated.

Table 1 VMAX3 virtual pool settings (continued)

Field	Description
Unique Auto-tiering Policy Names	Enabled.
Auto-tiering Policy	VMAX3 is delivered with pre-defined Storage Level Objectives, and workflows. You can specify the workflow and SLO you want applied to your volume during provisioning.
Enable Compression	When enabled, only the VMAX3 All Flash storage groups, which support compression will be available to add to the virtual pool. It is not required that compression is enabled on the VMAX3 storage groups, it is only required that compression is supported on the storage groups. When storage from this virtual pool is provisioned to the host, it will apply the compression settings defined on the storage system. For details see Support for compression on VMAX3 All Flash Arrays on page 13 .
Expandable	Enable to include storage pools containing volumes that can be expanded.
Host Front End Bandwidth Limit	0 - set this value to 0 (unlimited). This field limits the amount of data that can be consumed by applications on the VMAX3 volume. Host front end bandwidth limits are measured in MB/S.
Host Front End I/O Limit	0 - set this value to 0 (unlimited). This field limits the amount of data that can be consumed by applications on the VMAX3 volume. Host front end I/O limits are measured in IOPS.

Add aliases to VMAX storage system initiator names

You can use the ViPR Controller CLI or REST API to add aliases to the initiator world wide port names (WWPNs) in masking views for VMAX storage systems.

Configuration requirements and information

- Listing and adding aliases is only supported on VMAX systems running SMI-S 8.2 and higher.
- You can only use the `get Method()` to retrieve the alias name when the initiator is part of an initiator group.
- If an alias is not set on the VMAX storage system, a "/" is returned.
- Once an alias has been assigned, you can rename the alias, but you cannot reset the alias.

ViPR Controller commands

The following ViPR Controller CLI commands have been added to list and add aliases to VMAX storage system initiator names:

- `viprcli initiator aliasget`
- `viprcli initiator aliasset`

Support for compression on VMAX3 All Flash Arrays

You can use ViPR Controller to discover and manage VMAX3 All Flash Arrays, which support compression, and to enable, and disable compression on the storage group.

Configuration requirements and information

Be aware of the following when working with compression enabled storage:

- Compression is only identified by ViPR Controller for compression ready storage groups on VMAX3 All Flash Arrays. Refer to EMC VMAX3 All Flash Array documentation to determine which devices are compression ready on your VMAX3 storage system.
- If you are upgrading VMAX3 All Flash Arrays to support compression, and you want to use ViPR Controller to manage compression on the storage in those arrays, you must upgrade to ViPR Controller 3.5 to enable compression when exporting volumes from ViPR Controller. If you do not upgrade ViPR Controller, you will need to manually compress exported volumes outside of ViPR Controller.
- If you have upgraded to 3.5, or you have upgraded your VMAX3 All Flash Array to support compression, you will need to rediscover the storage system for ViPR Controller to identify that compression is supported on the VMAX3 All Flash Array.
- When ingesting VMAX3 All Flash Array volumes, you should validate that the compression properties of the compression enabled volumes being ingested match the compression properties of the volumes already included in the same virtual pool. ViPR Controller does not validate if the compression property on the volumes being ingested matches the compression properties of the volumes already included in the virtual pool.
If you do ingest VMAX3 All Flash Array volumes into a virtual pool that does not have the same compression properties on the volumes, you can use the **Catalog > Block Storage Services > Change Volume Virtual Pool > Change Auto-tiering Policy, Host IO Limits, or Compression** option to move the volumes into the correct virtual pool.
- Enabling and disabling compression on virtual storage pools can be performed from the ViPR Controller UI, CLI or REST API.

ViPR Controller UI

The following ViPR Controller UI pages, and options provide the functionality to use the feature:

ViPR Controller UI Pages	Description
Physical > Create or Edit Block Virtual Pools > Hardware > Enable Compression	When enabled, only the VMAX3 All Flash storage groups, which support compression will be available to add to the virtual pool. It is not required that compression is enabled on the VMAX3 storage groups, it is only required that compression is supported on the storage groups. When storage from this virtual pool is provisioned to the host, it will apply the compression settings defined on the storage system.
Catalog > Block Storage Services > Change Volume Virtual Pool > Change Auto-tiering Policy, Host IO Limits, or Compression	Allows you to move volumes to a virtual pool where compression is enabled, or where compression is enabled, and the compression ratio set on the storage pools in the virtual pool

ViPR Controller UI Pages	Description
	matches the ratio set on the volume being moved.
Storage Systems > <storage system name> Storage Pools > Compression Enabled column	Identifies if compression is enabled on the VMAX3 storage pool.
Virtual Array > <virtual array name> Storage Pools > Compression Enabled column	Identifies if compression is enabled on the VMAX3 storage pool.
Resources > Volumes > <volume name> > More Details > Compression Ratio	Displays the compression ratio set on the volume.

ViPR Controller CLI

The `-enablecompression` option with the ViPR Controller CLI `viprcli vpool create` and `viprcli vpool update` commands is provided for this feature.

```
viprcli vpool create [-enablecompression <enable_compression>]
```

CHAPTER 3

ViPR Controller Configuration Requirements and Information for VNX for Block storage systems

This chapter includes the following information.

- [VNX for Block configuration requirements and information before creating your virtual data center](#) 16
- [SMI-S provider configuration requirements for VNX for Block](#)..... 16
- [VNX for Block storage system](#) 17
- [EMC VNX for Block configuration requirements and recommendations](#) 18
- [EMC VNX for Block virtual pool requirements and recommendations](#) 18
- [EMC VNXe for Block export recommendations](#)..... 19

VNX for Block configuration requirements and information before creating your virtual data center

This chapter provides the VNX for Block storage system configuration requirements and information required to add the storage systems to the ViPR Controller physical assets, and to configure the storage systems in the ViPR Controller virtual assets.

The requirements and information should be reviewed prior to adding the storage systems to ViPR Controller.

SMI-S provider configuration requirements for VNX for Block

ViPR Controller management of VNX for Block systems is performed through the EMC SMI-S provider. SMI-S provider and VNX for Block must meet certain configuration requirements before you can add this storage system into ViPR Controller.

Gather the required information

You need specific information to validate that the SMI-S provider is correctly configured for ViPR Controller and to add storage systems to ViPR Controller.

- SMI-S provider host address
- SMI-S provider credentials (default is admin/#1Password)
- SMI-S provider port (default is 5989)

Configuration requirements

Set SMI-S provider variable

It is recommended, as a best practice, to set the Windows or UNIX, operating system variables for the SMI-S provider as follows.

symcli_wait_on_db	1	When set to 1, SYMCLI will wait to obtain a lock on the VNX for Block configuration database when locked by another user. By default, a busy database will return an error.
-------------------	---	---

ViPR Controller configuration requirements for SMI-S providers with VNX for Block storage systems

- SMI-S provider cannot be shared between ViPR Controller and any other application requiring an SMI-S provider to VNX for Block, such as EMC ViPR SRM.
- The host server running Solutions Enabler (SYMAPI Server) and SMI-S provider (ECOM) differs from the server where the VNX for Block storage processors are running.
- The storage system is discovered in the SMI-S provider.
- When the storage provider is added to ViPR Controller, all the storage systems managed by the storage provider will be added to ViPR Controller. If you do not want all the storage systems on an SMI-S provider to be managed by ViPR Controller, configure the SMI-S provider to only manage the storage systems that will be added to ViPR Controller, before adding the SMI-S provider to ViPR Controller.

Note

Storage systems that will not be used in ViPR Controller, can also be deregistered, or deleted after the storage provider is added to ViPR Controller. For steps to deregister or delete storage from ViPR Controller see the *ViPR Controller User Interface Virtual Data Center Configuration Guide*, which is available from the [ViPR Controller Product Documentation Index](#).

- The remote host, SMI-S provider (Solutions Enabler (SYMAPI Server) and EMC CIM Server (ECOM)) are configured to accept SSL connections.
- The EMC storsrvd daemon is installed and running.
- The SYMAPI Server and the ViPR Controller server hosts are configured in the local DNS server and that their names are resolvable by each other, for proper communication between the two. If DNS is not used in the environment, be sure to use the hosts files for name resolution (`/etc/hosts` or `c:/Windows/System32/drivers/etc/hosts`).
- The EMC CIM Server (ECOM) default user login, password expiration option is set to "Password never expires."
- The SMI-S provider host needs IP connectivity over the IP network with connections to both VNX for Block storage processors.

VNX for Block storage system

You prepare the VNX for Block storage system before adding it to ViPR Controller as follows.

Configuration requirements

- Create a sufficient amount of storage pools or RAID groups for storage provisioning with ViPR Controller.
- If volume full copies are required, install SAN Copy enabler software on the storage system.
- If volume continuous-native copies are required, create clone private LUNs on the array.
- Fibre Channel networks for VNX for Block storage systems require an SP-A and SP-B port pair in each network, otherwise virtual pools cannot be created for the VNX for Block storage system.
- For configuration requirements when working with meta volumes see *ViPR Controller Integration with VMAX and VNX Storage Systems Guide*.

Configuration requirements for ViPR Controller to collect HDS port metrics

You must enable performance data logging in EMC Unisphere so that VNX for Block sends the required metrics to ViPR Controller before you can set up metrics-based port selection for VNX for Block. For steps to enable performance data logging in EMC Unisphere see: [Prerequisite configuration settings for VNX for Block on page 18](#).

Enable performance data logging for VNX for Block

You must enable performance data logging in EMC Unisphere so that VNX for Block sends the required metrics to ViPR Controller before you can set up metrics-based port selection for VNX for Block .

Procedure

1. Log into the EMC Unisphere.
2. Select **System** > **Statistics for Block**. Statistics for Block can be found in the **Monitoring and Alerts** section.
3. Click **Performance Data Logging**.

The **Data Logging** dialog is displayed.

4. If data logging is not already started:

Note

Do not change the default times for **Real Time Interval** and **Archive Interval**.

- a. Click **Start** to start data logging.
 - b. Click **Apply**.
5. Click **OK**.

EMC VNX for Block configuration requirements and recommendations

ViPR Controller management of VNX for Block systems is performed through the EMC SMI-S provider. SMI-S provider and VNX for Block must meet certain configuration requirements before you can add this storage system into ViPR Controller.

EMC VNX for Block virtual pool requirements and recommendations

Review the following configuration consideration before adding VNX for Block storage to the ViPR Controller virtual pools.

- Fibre Channel networks for VNX for Block storage systems require an SP-A and SP-B port pair in each network, otherwise virtual pools cannot be created for the VNX for Block storage system.
- Prior to ViPR Controller version 2.2, if no auto-tiering policy was set on the virtual pool created from VNX for Block storage, ViPR Controller creates volumes from the virtual pools with auto-tiering enabled. Starting with ViPR Controller version 2.2, if no policy is set on the virtual pool created for VNX for Block storage, ViPR Controller will create volumes from the virtual pool with the "start high then auto-tier" enabled on the new volumes created in the same virtual pool.

EMC VNXe for Block export recommendations

It is recommended when exporting a VNXe for Block volume to a host using ViPR Controller that the host is configured with Fibre Channel only or iSCSI connectivity to the storage.

CHAPTER 4

ViPR Controller Support for FAST Policies

This chapter contains the following topics:

- [ViPR Controller support for fully automated storage tiering for a volume](#)..... 22
- [Change FAST policies on an unexported block volume](#)25
- [Change the FAST policy for an exported volume](#)..... 25
- [Duplicate a virtual pool](#)..... 30
- [Add a FAST policy to a volume](#)..... 31
- [Change the FAST policy for a volume](#)..... 32
- [Remove the FAST policy from a volume](#)..... 33

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 23](#).

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 2 FAST settings in virtual pools

Field	Description
Unique Auto-tiering Policy Names	<p>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.</p> <p>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:</p> <p>SYMMETRIX+000196701972+FASTPOLICY+Green</p>
Auto-tiering Policy	<p>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.</p> <p>If you create a volume in this virtual pool, ViPR Controller applies the auto-tiering policy specified in this field to that volume.</p>

Notes on unique policy names

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

On a VMAX array, you build unique FAST policy names with Unisphere. If you enable the `Unique Auto-tiering Policy Names` check box, ViPR Controller 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 Controller can include more than one VMAX in a virtual pool. This situation presents a complication for the ViPR Controller 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 Controller user interface displays only one instance of the name, and ViPR Controller 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`.

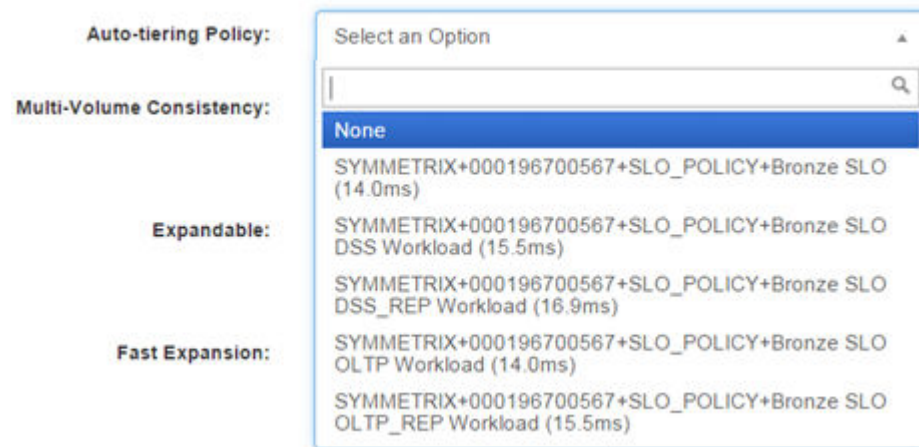
Unique auto-tiering policy names are required for many **Change Virtual Pool** service operations, such as changing a virtual volume from VPLEX Local to VPLEX Distributed.

Service Level Objectives (SLO) on VMAX3

ViPR Controller supports Service Level Objectives on VMAX3 arrays.

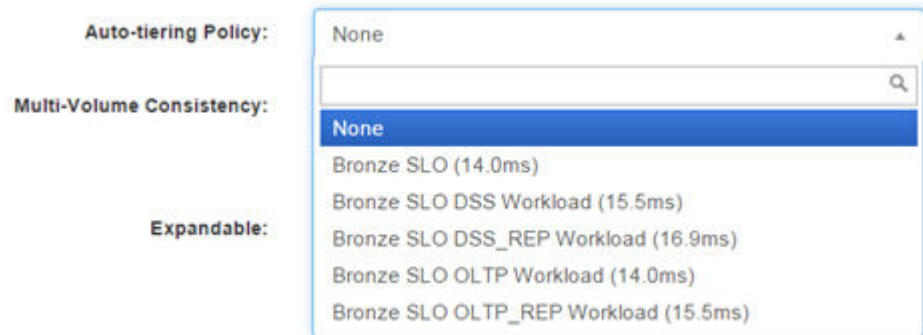
Service Level Objectives are similar to VMAX FAST policies. They are pre-defined at the factory, and are displayed in ViPR through the Auto-tiering Policy field. the following figure shows the Auto-tiering Policy field in the Hardware panel of the virtual pool.

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 storage systems 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 **Start High then Autotier** policy, which is the recommended option on VNX.

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 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 30](#).

Choose the appropriate procedure for your environment:

- [Add a FAST policy to a volume on page 31](#)
- [Change a FAST policy of a volume on page 32](#)
- [Remove a FAST policy from a volume on page 33](#)

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

The screenshot displays the details for a volume named 'MixTierVol3'. The volume information includes:

- WWN:** 60000970000195701351533030413436
- Size:** 1.00 GB Provisioned / 1.00 GB Requested
- Virtual Array:** VMAX351
- Virtual Pool:** MixTierVpool

There is a 'More Details' link and a 'Delete Volume' button in the 'Actions' section.

Below the volume details, the 'Exports' section is expanded, showing a 'singlehost1 Host Export Group'. A blue arrow points to this section. The exports are listed in a table:

Initiator	Target	SAN Zone	HLU
20:00:00:00:AA:BB:CC:F0	50:00:09:73:00:15:1D:25	SDS_singlehost1_0000AABBCCF0_1351_FA10E1	0
20:00:00:00:AA:BB:CC:F1	50:00:09:73:00:15:1D:19	SDS_singlehost1_0000AABBCCF1_1351_FA7E1	0

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 27](#).

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

Figure 4 Volume with no exports



Bob_Volume2
Volume

WWN: 60000970000195701573533031313530
Size: 3.00 GB Provisioned / 3.00 GB Requested
Virtual Array: vArray1
Virtual Pool: 1573_vmax
[More Details](#)

▼ Exports
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 25](#).

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

Once you determine that your volume was exported, you know that your volume resides in a storage group on your VMAX. To change the FAST policy, you must compile a list of all volumes in the storage group. This list is required when you run the Change Virtual Pool service.





Before you begin

- You must have a volume that was created by ViPR Controller.
- The volume must have exports.

Procedure

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

The Thin Volumes list opens.

Volume Dashboard		
All Volumes		
General Volumes ...	Volume Type	Number of Volumes
▶ Regular Volume		Total: 65
▼ Virtual Volume		Total: 547
	BCV+TDEV	21
	RDF1+TDEV	3
	RDF2+TDEV	29
	TDEV	494

- 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**.

Advanced Filter Dialog

Volume Type
 Volume Identifier
 Volume ID
 Volume Range -
 Volume Identifier Name

Volume Availability
 Replication
 Related Objects
 Federated Tiered Storage
 Virtual Provisioning

The volume list displays your volume.

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

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

- Click **Storage Groups**.

Unisphere displays the Storage Groups to which your volume belongs.

000198700412 > Storage > Volumes > TDEV > 246B > Storage Groups

Storage Groups

Name	Parent	Child	Child SGs	FAST Policy	Capacity (GB)
lglw7142_412_CSG			1	N/A	17
lglw7142_412_SG_NonFast			0	N/A	17

8. Double-click the parent storage group.

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

Related Objects

Contains :

- [Volumes - 6](#)
- [Child Storage Group - 1](#)

Associated With :

- [Masking Views - 1](#)

9. Click **Volumes** in the **Related Objects** list.

Unisphere displays the complete list of storage groups to which the volume belongs. You can use this list of volumes to run **Change Virtual Pool** to change a FAST policy.

Figure 5 Storage Groups List

EMC Unisphere for VMAX V1.6.1.8

Home System **Storage** Hosts Data Protection

000198700412 > Storage > Volumes > TDEV > 246B > Storage Groups > Iglw7142_412_CSG > Volumes

Volume

Name	Type	Emulation	Allocated %	Capacity (GB)	Status
2442:CarlTestExportRP*	TDEV	FBA	0 %	2	Ready
2445:CarlTestExportRP*	TDEV	FBA	0 %	3	Ready
2455:CarlTestExport3	TDEV	FBA	0 %	7	Ready
2459:rpexportvol	TDEV	FBA	0 %	1	Ready
2467:BBBCRRVol2	TDEV	FBA	0 %	1	Ready
246B:Bob_Vol1	TDEV	FBA	0 %	3	Ready

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 27](#).

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. Make sure that your source and target virtual pools 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 see which physical storage pool contains your volume, see [Get the physical storage pool for your volume on page 30](#).

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 cannot 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 30](#). In the target virtual pool, set 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 as shown in the following table.

Table 3 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 30](#) 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 4 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 4 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 30](#). 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 5 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 5

ViPR Controller Support for Meta Volumes on VMAX Arrays

This chapter contains the following topics:

- [ViPR Controller support for meta volumes on VMAX](#) 36
- [Concatenated vs. striped meta volumes on VMAX arrays](#) 36
- [ViPR Controller striped volume creation in a VMAX thin pool](#).....37
- [ViPR Controller concatenated volume creation on VMAX](#)..... 38
- [ViPR Controller striped volume creation in a VMAX thick pool](#)..... 39
- [ViPR Controller volume expansion on VMAX](#)..... 40

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

VMAX supports both striped and concatenated meta volumes.

System Type:	<input type="text" value="EMC VMAX"/>
RAID Level(s):	<input type="checkbox"/> RAID1 <input type="checkbox"/> RAID5 <input type="checkbox"/> RAID6 <input type="checkbox"/> RAID10
Thin Volume Preallocation:	<input type="text"/>
Unique Auto-tiering Policy Names:	<input type="checkbox"/> Check to show unique policy names in Auto-tiering Policy.
Auto-tiering Policy:	<input type="text" value="None"/>
Multi-Volume Consistency:	<input type="checkbox"/> If selected, resources provisioned from this pool will support the use of consistency groups
Expandable:	<input checked="" type="checkbox"/> If selected, resources provisioned from this pool will support expansion.
Fast Expansion:	<input checked="" type="checkbox"/> If selected, expansion will be performed more quickly but potentially decreases performance.

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.

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:

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

Example 1

Suppose 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 VMAX returns a maximum volume size 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 Controller. 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 6

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](#)..... 44
- [ViPR Controller provisioning on VNX: regular vs. meta volumes](#).....44
- [ViPR Controller provisioning on VNX: Determine the number of meta members in a volume](#).....45
- [Expand a volume on a VNX array](#)..... 45

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 Controller 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 VNX, ViPR Controller completes the following processes:

- ViPR Controller chooses one physical storage pool where it will create the volume. ViPR Controller volumes do not span across physical storage pools.
- 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.
- 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.
- 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 7

ViPR Controller Support for TimeFinder Operations on VMAX arrays

This chapter contains the following information.

- [ViPR Controller Support for TimeFinder Operations on VMAX Arrays](#)..... 48
- [TimeFinder Clone operations](#)..... 48
- [TimeFinder Snap \(VDEV\) operations](#)..... 50
- [TimeFinder VP Snap operations](#)..... 51
- [TimeFinder Mirror operations](#).....52
- [TimeFinder SnapVX operations](#)..... 54

ViPR Controller Support for TimeFinder Operations on VMAX Arrays

ViPR Controller uses snapshot technology to perform TimeFinder operations on VMAX storage systems.

The following sections list the TimeFinder operations which are supported, and not supported in ViPR Controller and lists the ViPR Controller services used to perform the supported operations.

- [TimeFinder Clone on page 48](#)
- [TimeFinder Snap \(VDEV\) on page 50](#)
- [TimeFinder VP Snap on page 51](#)
- [TimeFinder Mirror on page 52](#)
- [TimeFinder SnapVX on page 54](#)

TimeFinder Clone operations

The following sections list the TimeFinder Clone operations which are supported, and not supported in ViPR Controller and lists the ViPR Controller services used to perform the supported operations.

TimeFinder Clone supported operations

The following TimeFinder Clone operations are supported by ViPR Controller on VMAX3 and VMAX2 storage systems.

Table 6 TimeFinder Clone operations supported by ViPR Controller

TimeFinder Clone operation	Description	ViPR Controller UI	ViPR Controller REST API
Create Differential Clone (precopy)	Creates a differential clone in precopy mode.	Catalog>Block Protection Services>Create Full Copy (performs both create and activate operations)	POST /block/volumes/{id}/protection/full-copies
	Creates a differential clone in precopy mode for multiple volumes in a consistency group.		POST /block/consistency-groups/{id}/protection/full-copies
Activate Differential Clone (precopy)	Activates a differential clone in precopy mode.		POST /block/full-copies/{id}/activate
	Activates a differential clone in	POST /block/consistency-groups/	

Table 6 TimeFinder Clone operations supported by ViPR Controller (continued)

TimeFinder Clone operation	Description	ViPR Controller UI	ViPR Controller REST API
	precopy mode for multiple volumes in a consistency group.		{id}/protection/full-copies/{fcid}/activate
Terminate	Severs the relationship with the source and target devices. Detached clone is considered a standard volume.	Catalog>Block Protection Services>Detach Full Copies	POST /block/full-copies/{id}/detach
			POST /block/consistency-groups/{id}/protection/full-copies/{fcid}/detach
Delete Clone	Deletes the clone. Severs the relationship with source and target devices.	Catalog>Block Protection Services>Remove Full Copies	POST /block/volumes/{id}/deactivate
			POST /block/full-copies/{id}/detach
			POST /block/consistency-groups/{id}/protection/full-copies/{fcid}/detach
			POST /block/consistency-groups/{id}/protection/full-copies/{fcid}/deactivate
Full Restore	Full restore can use the target as the source for a new session with a new target.	Catalog>Block Protection Services>Restore from Full Copies	POST /block/full-copies/{id}/restore
Resynchronize	Performs recreate and establish. Incremental copy of all subsequent changes made to the source device to the target device.	Catalog>Block Protection Services>Resynchronize Full Copies	POST /block/full-copies/{id}/resynchronize

TimeFinder Clone operations not supported in ViPR Controller

The following TimeFinder Clone operations are not supported by ViPR Controller:

- Copy Mode
- Clone to larger device
- Clone thick to thin
- Clone thin to thick

TimeFinder Snap (VDEV) operations

The following sections list the TimeFinder Snap (VDEV) operations which are supported, and not supported in ViPR Controller and lists the ViPR Controller services used to perform the supported operations.

TimeFinder Snap (VDEV) supported operations

The following TimeFinder Snap (VDEV) operations are supported by ViPR Controller on VMAX2 storage systems.

Table 7 TimeFinder Snap (VDEV) operations supported by ViPR Controller

TimeFinder Snap (VDEV) operation	Description	ViPR Controller UI	ViPR Controller REST API
Create and Activate Differential Snapshot with Copy on First Write (Thick Source Only)	Creates and activates snap copy session. Target VDEV becomes accessible to the host.	Catalog>Block Protection Services>Create Block Snapshot (for a volume or consistency group)	POST /block/snapshots/{id}/activate
			POST /block/consistency-groups/{id}/protection/snapshots
			POST /block/consistency-groups/{id}/protection/snapshots/{sid}/activate
Terminate	Severs the relationship with source and target devices. Deletes the target device.	Catalog>Block Protection Services>Remove Block Snapshot (of a volume or consistency group)	POST /block/snapshots/{id}/deactivate
			POST /block/consistency-groups/{id}/protection/snapshots/{sid}/deactivate
Incremental Restore	Incremental restore to the source device. Only the differences between source and target devices in SAVE pool will be copied back to the source.	Catalog>Block Protection Services>Restore Block Snapshot (to a volume or consistency group)	POST /block/snapshots/{id}/restore
			POST /block/consistency-groups/{id}/protection/

Table 7 TimeFinder Snap (VDEV) operations supported by ViPR Controller (continued)

TimeFinder Snap (VDEV) operation	Description	ViPR Controller UI	ViPR Controller REST API
			snapshots/{sid}/restore
Create Differential Clone	Create and activates a differential clone of a snapshot in pre-copy mode.	UI operation not available.	POST /block/snapshots/{id}/protection/full-copies
Resynchronize	Performs recreate and establish. Incremental copy of all subsequent changes made to the source device to the target device	UI operation not available.	POST /block/snapshots/{id}/resynchronize
Export	Presents snapshot of a volume to another host.	Catalog>Block Protection Services>Export a Snapshot to a host	POST /block/exports

TimeFinder SNAP (VDEV) unsupported operations

The following TimeFinder SNAP (VDEV) operations are not supported by ViPR Controller:

- Thin Source Volume
- Asynchronous Copy on First Write
- Selecting a target SAVE pool
- Cannot create inactive Snap

TimeFinder VP Snap operations

The following TimeFinder VP Snap operations are supported by ViPR Controller on VMAX2 storage systems.

Table 8 TimeFinder VP Snap operations supported by ViPR Controller

TimeFinder VP Operation	Description	ViPR Controller UI	ViPR Controller REST API
Create and Activate Snapshot (Thin source only)	Creates and activates snap copy session Target is bound to the pool of the source volume.	Catalog>Block Protection Services>Create Block Snapshot (for a volume or consistency group)	POST /block/snapshots/{id}/activate
			POST /block/consistency-groups/{id}/protection/snapshots
			POST /block/consistency-groups/{id}/protection/

Table 8 TimeFinder VP Snap operations supported by ViPR Controller (continued)

TimeFinder VP Operation	Description	ViPR Controller UI	ViPR Controller REST API
			snapshots/{sid}/activate
Terminate	Deletes target device. Target device is removed from any shared allocations that were part of th session, and any non-shared allocations for tat device are deallocated.	Catalog>Block Protection Services>Remove Block Snapshot (of a volume or consistency group)	POST /block/snapshots/{id}/deactivate
			POST /block/consistency-groups/{id}/protection/snapshots/{sid}/deactivate
Incremental Restore	Incremental restore to the source device	Catalog>Block Protection Services>Resotre Block Snapshot (to a volume or consistency group)	POST /block/snapshots/{id}/restore
			POST /block/consistency-groups/{id}/protection/snapshots/{sid}/restore
Create Differential Clone	Creates and activates a differential clone of snapshot in pre-copy mode.	Catalog>Block Protection Services>Create Snapshot Full Copy	POST /block/snapshots/{id}/protection/full-copies
Resynchronize	Performs recreate, and establish. Incremental copies of all subsequent changes made to the source device to the target device.	UI operation not available.	POST /block/snapshots/{id}/resynchronize
Export	Presents snapshot of a volume to another host.	Catalog>Block Protection Services>Export Snapshot (block volume) to a Host	POST /block/exports

TimeFinder Mirror operations

The following sections list the TimeFinder Mirror operations which are supported, and not supported in ViPR Controller and lists the ViPR Controller services used to perform the supported operations.

Supported TimeFinder Mirror operations

The following TimeFinder Mirror operations are supported by ViPR Controller on VMAX3 and VMAX2 storage systems.

Table 9 TimeFinder Mirror operations supported by ViPR Controller

TimeFinder Mirror operations	Description	ViPR Controller UI	ViPR Controller REST API
Create Mirror	Create relationship of source to target.	Catalog>Block Protection Services>Create Continuous Copy	POST /block/volumes/{id}/protection/continuous-copies/start
Terminate	Deletes mirror.	Catalog>Block Protection Services>Remove Continuous Copy	POST /block/volumes/{id}/protection/continuous-copies/deactivate
Stop	Dissolves pair. Promotes mirror as regular volume.	Resources>Block Snapshots>Actions	POST /block/volumes/{id}/protection/continuous-copies/stop
Pause	Fracture the mirror.	Resources>Block Snapshots>Actions	POST /block/volumes/{id}/protection/continuous-copies/pause
Resume	Incremental establish	Resources>Block Snapshots>Actions	POST /block/volumes/{id}/protection/continuous-copies/resume

Unsupported TimeFinder Mirror operations

The following TimeFinder Mirror operations are not supported by ViPR Controller.

- Mirror Protected Restore
- Mirror Protected Establish
- Mirror Reverse Split
- Mirror Concurrent BCV

TimeFinder SnapVX operations

The following sections list the TimeFinder SnapVX operations which are supported, and not supported in ViPR Controller and lists the ViPR Controller services used to perform the supported operations.

Supported TimeFinder SnapVX operations

The following TimeFinder SnapVX operations are supported by ViPR Controller on VMAX3 storage systems, as well as following storage systems, and configurations when VMAX3 is used for the backend:

- VPLEX Local
- VPLEX Metro
- VPLEX + RecoverPoint

TimeFinder SnapVX operations	Description	ViPR Controller UI	ViPR Controller REST API
Create	Create SnapVX snapshot session for the volume or consistency group, and define whether to link to one or multiple targets in copy or no copy mode.	Catalog>Block Protection Services>Create Block Snapshot (for a volume or consistency group)	POST /block/volumes/{id}/protection/snapshot-sessions
			POST /block/consistency-groups/{id}/protection/snapshot-sessions
			POST /block/snapshots/{id}/protection/snapshot-sessions
Deactivate	Delete the snapshot session. You cannot delete a snapshot session, which is linked to any targets.	Catalog>Block Protection Services>Remove Snapshot Session (of a volume or consistency group) Resources>Snap Sessions>Delete	POST /block/snapshot-session/{id}/deactivate
			POST /block/consistency-groups/{id}/protection/snapshot-sessions/{sid}/deactivate
Link	Link the snapshot session to the target volume. You can use an existing target, or create a new target to link to the snapshot session.	Catalog>Block Protection Services>Link Block Snapshot (of a volume or consistency group)	POST /block//snapshot-sessions/{id}/link-targets
			POST /block/consistency-groups/{id}/protection/snapshot-sessions/{sid}/link-targets
Unlink	Unlink the target volume from the snapshot session and also delete the target volume.	Resources>Snap Sessions>Snap session details>Unlink with delete	POST /block//snapshot-sessions/{id}/unlink-targets

TimeFinder SnapVX operations	Description	ViPR Controller UI	ViPR Controller REST API
		Catalog>Block Protection Services>Remove Snapshot Session (Also deletes the snapshot session) (for a volume or consistency group)	POST /block/consistency-groups/{id}/protection/snapshot-sessions/{sid}/unlink-targets
	Unlink the target volume from the snapshot session, while allowing you to continue to use ViPR Controller to manage the target volume as an individual volume.	Resources>Snap Sessions>Snap session details>Unlink without delete (for a volume or consistency group)	
Relink	Relink the target volume with the snapshot session. You can relink the target to the same snapshot session or a different snapshot session.	Catalog>Block Protection Services>Link Block Snapshot (for a volume or consistency group)	POST /block//snapshot-sessions/{id}/relink-targets
		Resources>Snap Sessions>Snap session details>Relink	POST /block/consistency-groups/{id}/protection/snapshot-sessions/{sid}/relink-targets
Restore	Restore from the snapshot session — to restore the snapshot session data to the source volume.	Catalog>Block Protection Services>Restore Block Snapshot in Type, select Snapshot Session	POST /block/snapshot-sessions/{id}/restore
			POST /block/consistency-groups/{id}/protection/snapshot-sessions/{sid}/restore
	Restore from linked target — to restore the linked target data to the to the source volume.	Catalog>Block Protection Services>Restore Block Snapshot(to a volume or consistency group), in Type, select Local or Remote.	POST /block/snapshots/{id}/restore
			POST /block/consistency-groups/{id}/protection/snapshots/{sid}/restore

Unsupported TimeFinder SnapVX operations

The following TimeFinder SnapVX operations are not supported by ViPR Controller.

- Create Differential Clone, BCVs
- Time-to-Live (TTL)
- Generation Numbers

CHAPTER 8

ViPR Controller Support for SRDF Remote Replication

This chapter contains the following topics:

- [ViPR Controller support for Symmetrix Remote Data Facility](#)..... 58
- [ViPR Controller support for SRDF/A and SRDF/S operations](#)..... 62
- [ViPR Controller support for SRDF-Metro operations](#)..... 73

ViPR Controller support for Symmetrix Remote Data Facility

ViPR Controller enables you to use the Symmetrix Remote Data Facility (SRDF) to replicate volumes automatically to a remote data center.

ViPR Controller supports the following SRDF modes.

VMAX or VMAX3 storage system mode	ViPR Controller mode
SRDF synchronous or SRDF/S	Synchronous
SRDF asynchronous or SRDF/A	Asynchronous
SRDF Metro	Active
	<p>Note</p> <p>Active mode is only available for VMAX3 storage systems enabled with a SRDF/Metro license.</p>

ViPR Controller operations for SRDF automate these processes:

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

ViPR Controller and SRDF: limitations

ViPR Controller does not support certain SRDF configurations.

ViPR Controller does not support the following:

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

Support summary: SRDF operations

Review the following sections to determine the SRDF operations that are supported and unsupported by ViPR Controller.

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:

- [SRDF operations supported for SRDF/S and SRDF/A replication on page 64](#)
- [SRDF operations supported and unsupported for SRDF Metro replication on page 74](#)

Table 10 Common SRDF operations

SRDF operation	Description	Supported through ViPR Controller?			Notes
		UI	API	CLI	
SRDF Pairs operations					
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	
Deletepair	Deletes dynamic SRDF pairing in the specified device group.	Yes	Yes	Yes	
Suspend	Suspends I/O traffic on the SRDF links for the remotely mirrored pairs in the group.	No	Yes	Yes	Support on entire consistency group.
SRDF Pair, Link operations					Any SRDF link operations are applied to all volumes in the RDF group.
Split	Splits an SRDF pair. This stops mirroring for the SRDF pairs in a device group.	No	Yes	Yes	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.
Resume	Resumes I/O traffic on the SRDF links for the remotely-mirrored pairs in the group.	No	Yes	Yes	Support on entire consistency group.
Failover and Failback operations					Failover and Failback functions are not supported for SRDF Metro.
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	Yes	Yes	Yes	Not supported for SRDF Metro. SRDF/S and SRDF/A support on entire consistency group.

Table 10 Common SRDF operations (continued)

SRDF operation	Description	Supported through ViPR Controller?			Notes
		UI	API	CLI	
	write enables the devices on the target side to their local hosts.				
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: <ol style="list-style-type: none"> 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	Not supported for SRDF Metro. SRDF/S and SRDF/A support on entire consistency group.
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	Not supported for SRDF Metro. 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 operations					
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 operations					
Create Mirror	Create a continuous copy of a volume	Yes	Yes	Yes	
Delete Mirror	Delete a continuous copy of a volume.	Yes	Yes	Yes	

Table 10 Common SRDF operations (continued)

SRDF operation	Description	Supported through ViPR Controller?			Notes
		UI	API	CLI	
	<p>Note</p> <p>Perform the pause operation before deleting a mirror.</p>				

RDF groups

When using ViPR Controller to perform operations on RDF groups:

- ViPR Controller project contains all the volumes in the RDF group. When you perform an operation on a device in an RDF group, the operation is performed on all volumes in the project.
- You can only perform operations on all volumes in an RDF group, and not on individual volumes in an RDF group.

R1/R2 with R2 gold copies

If an SRDF/S or SRDF/A R1/R2 consistency group has an existing mirror or BCV relationship in ViPR Controller, the following occurs when provisioning the new R1/R2 pair:

- Creates R1/R2 pair.
- Adds R1/ R2 pair to the existing CG.
- Creates mirrors or BCVs to the R1/ R2 pair.
- Adds mirrors or BCVs to the existing mirror CG.

The added Gold Copies are in Synchronized State. To make the CG consistent, invoke Consistent Split above the Gold Copy CG.

SRDF operations not provided by ViPR Controller

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
- Expand in the following configurations:
 - Expanding R1 and R2 volumes with snapshots
 - Expanding an SRDF volume in a VMAX to VMAX3 configuration where the R1 device is a meta volume on a VMAX storage system.
 - Although ViPR Controller does not support the native expansion of volumes in an SRDF relationship, it does support this workflow to expand VMAX3 volumes: SRDF links broken > volume natively expanded > SRDF links re-established

Note

You can expand the SRDF source and target volumes when the source and targets are both on VMAX3 storage systems, however, the expand operation is disruptive.

- SRDF target volumes (When the source volume is expanded, the target volume is automatically expanded as well.)

SRDF operations not supported by ViPR Controller

ViPR Controller does not support any of the following SRDF operations

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

ViPR Controller support for SRDF/A and SRDF/S operations

ViPR Controller supports various SRDF/A and SRDF/S 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: [SRDF operations supported for SRDF/S and SRDF/A replication on page 64](#).

Prerequisites for setting up SRDF/A and SRDF/S 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:

- The source and target VMAX arrays 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.

SRDF/A and SRDF/S support summary: virtual pool changes and array features

ViPR Controller offers various support for changing virtual pools for SRDF/A or SRDF/S-protected volumes and array functionality, such as FAST for SRDF.

Change virtual pools for SRDF-protected volumes

The following table lists support for virtual pool changes.

Table 11 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/A)	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 12 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	

SRDF operations supported for SRDF/S and SRDF/A replication

Review this section to determine the valid SRDF operations that ViPR Controller can perform on VMAX storage systems that are protected by SRDF/S and SRDF/A remote replication.

Unless noted, the SRDF operations can be performed on both volumes with and without consistency groups.

Table 13 Supported operations for SRDF replication

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
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	No
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

Table 13 Supported operations for SRDF replication (continued)

Operation	VMAX3 to VMAX	VMAX3 to VMAX3	VMAX to VMAX3	VMAX to VMAX
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	No	No	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

Additional notes for SRDF/S and SRDF/A operations

Restore: When using ViPR Controller to restore a consistency group snapshot for the R2 device, the SRDF link between the R1, and R2 is split. After attempting to restore, the link remains in a split state. You must perform one of the following operations to the link in either direction: failback, restore (again), establish, or resume.

Support for SRDF operations between VMAX meta volumes, and VMAX3 non-meta volumes

You can use ViPR controller to create and manage SRDF relationships between VMAX and VMAX3 storage systems when the R1 device is a meta device.

You can use ViPR Controller to work with SRDF configurations with R1 meta devices in the following configurations:

- Creation and management of SRDF relationships where a VMAX meta volume is the source, and a VMAX3 thin device is the target.
- Creation and management of SRDF relationships where a VMAX meta volume is the target, and a VMAX3 thin device is the source.
- Using the **Change Virtual Pool**, > **Add SRDF protection** option on existing SRDF devices to swap the target to a:
 - VMAX3 thin device, where a VMAX meta is the source.
 - VMAX meta volume, where a VMAX3 thin device is the source.

Note

Swap may not work if the VMAX meta is comprised of 2 times more cylinders than the VMAX3 device.

Examples of ViPR Controller operations for SRDF/S and SRDF/A volumes and CGs

This section provides examples of the ViPR Controller operations you can use to manage your SRDF/S and SRDF/A-protected volumes and consistency groups.

- [Setup SRDF/A or SRDF/S protection between two sites with of ViPR Controller on page 66](#)
- [Use ViPR Controller to add SRDF/S or SRDF/A protection to a volume in a consistency group on page 69](#)
- [Ingest volumes with SRDF/A or SRDF/S protection on page 69](#)
- [Failover a block volume with SRDF/S or SRDF/A protection on page 72](#)

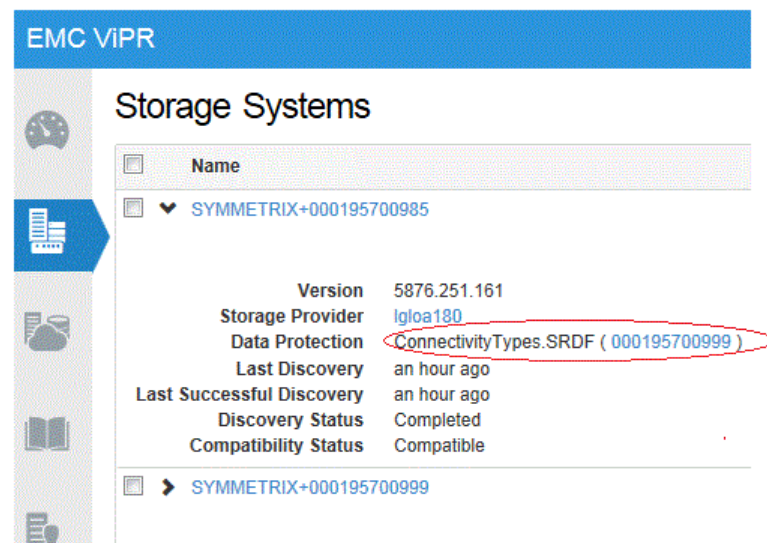
Example: Setup SRDF/A or SRDF/S protection between two sites with of ViPR Controller

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).

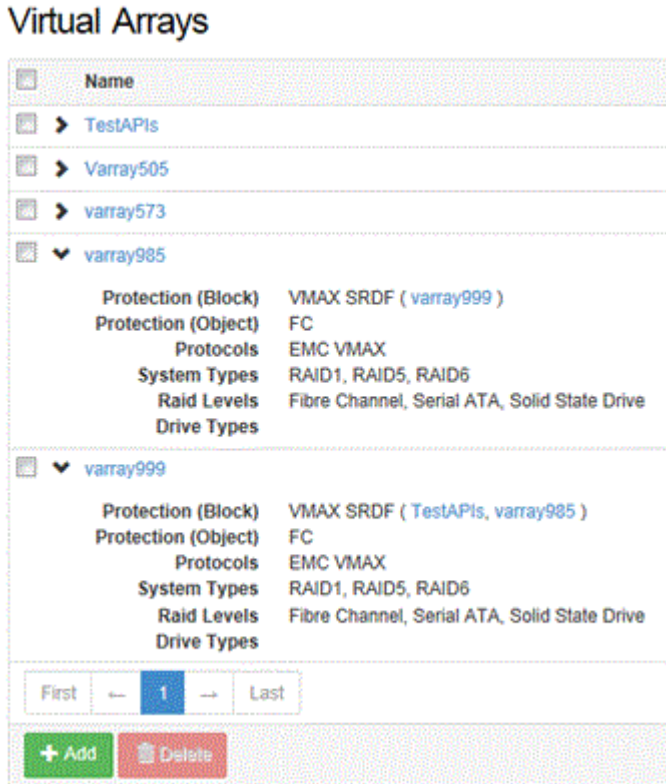
Figure 7 SRDF Connectivity Type



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 > Virtual Arrays**.

3. Create the target virtual pool. This virtual pool represents the target storage for SRDF disaster recovery. Select **Virtual > 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**.

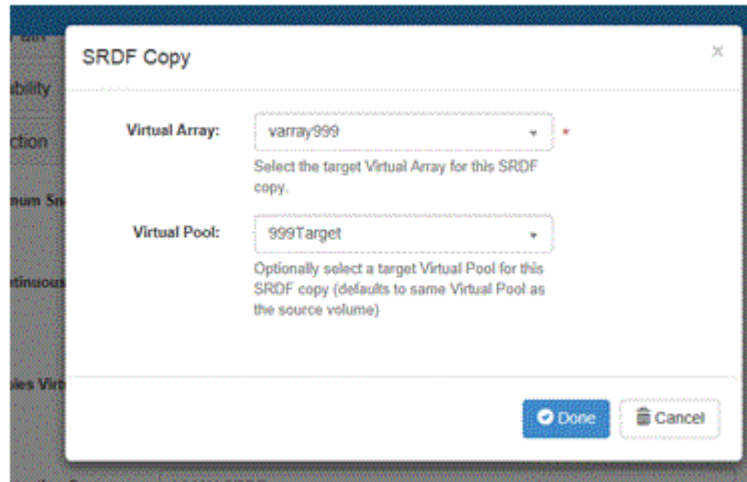
Note

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 **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 (SRDF/S)** or **Asynchronous (SRDF/A)**.
- 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. Select **Tenant > 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 **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**.

Example: Use ViPR Controller to add SRDF/S or SRDF/A 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**.

Example: Ingest volumes with SRDF/A or SRDF/S protection

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

Before you begin

When ingesting volumes in an SRDF relationship:

- Both the source volume (R1) and the target volume (R2) are ingested using a project whose name matches its RDF group.
- The source virtual pool must contain physical storage pools on the source storage array.
- The target virtual pool must contain physical storage pools on the target storage array.
- You perform two ingest operations because the source and target volumes are ingested using different virtual pools.

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.

Note

Ingested SDRF pairs must be in a consistent state when adding R1 and R2 devices. The operation fails if the SRDF pair is in a synchronized, failover, split, suspended, invalid, or partitioned state.

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*.

Ingest SRDF/A or SRDF/S-protected volumes

To ingest an SRDF-protected volume, do the following:

1. Check the name of the RDF group for the SRDF pair you want to ingest. The ViPR Controller `project` you create for the ingest operation must have the same name as

the RDF group. To check the RDF group name, you can use an element manager such as SMC, or use the following SYMCLI command:

```
# symcfg -sid <id> list -rdfg all
```

2. Ensure that you have set up a virtual array with a virtual pool that has SRDF protection configured. This virtual pool is used to ingest the source volume. You set the source virtual pool with the following SRDF settings, which you can find at the **Virtual > Block Virtual Pools > Data Protection**.

Table 14 SRDF data protection settings

Data Protection Field	Data Protection Setting
Protection System	VMAX SRDF . Only use this setting in the virtual pool during ingestion of the source volume.
SRDF Copy Mode	Synchronous or asynchronous mode.
SRDF Copies	Set the virtual array and virtual pool to host the target volume.

The following shows the virtual pool Data Protection panel with the appropriate selections.

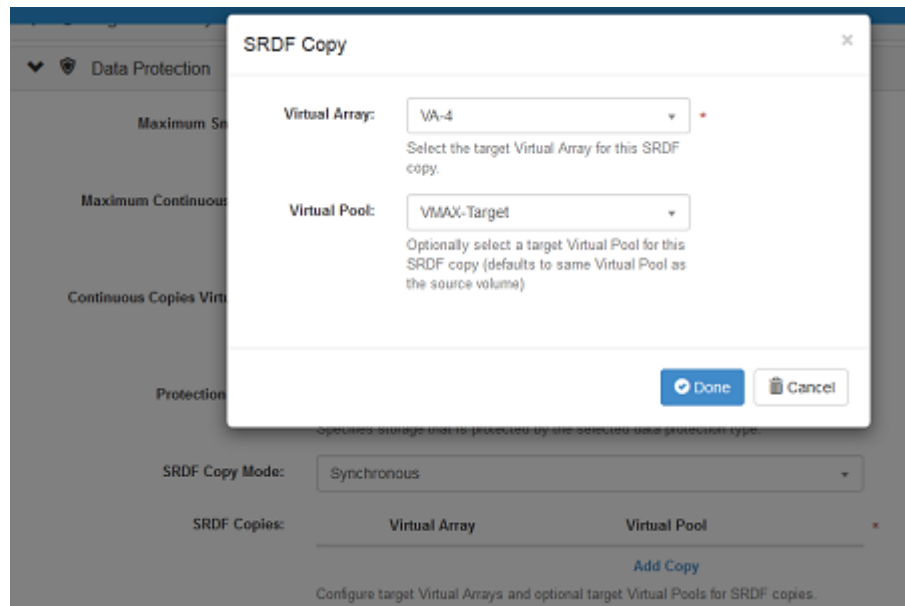
Figure 10 SRDF protection on source virtual pool

The screenshot displays the 'Data Protection' configuration panel. It includes the following settings:

- Maximum Snapshots:** 0 (Maximum number of local snapshots allowed for resources from this Virtual Pool)
- Maximum Continuous Copies:** 0 (Maximum number of native continuous copies allowed for resources from this Virtual Pool)
- Continuous Copies Virtual Pool:** None (Optionally select a different Virtual Pool to use for native continuous copies (applicable only if maximum copies > 0))
- Protection System:** VMAX SRDF (Specifies storage that is protected by the selected data protection type.)
- SRDF Copy Mode:** Synchronous
- SRDF Copies:** A table with columns for 'Virtual Array' and 'Virtual Pool'. An 'Add Copy' button is located below the table.

Configure target Virtual Arrays and optional target Virtual Pools for SRDF copies.

When you select **Add Copy**, specify the target virtual array and target virtual pool. Only virtual arrays and their associated pools that can act as the target for the source VMAX appear in this screen.

Figure 11 SRDF protection: specify target virtual pool

3. Ensure that you set up a virtual array with a virtual pool for ingesting the target volume. The virtual pool must not be SRDF protected.
4. Run the discovery process and specify both the source and target arrays.
 - a. Select **Catalog > View Catalog > Block Storage Services > Discover Unmanaged Volumes**.
 - b. Select the both the source and target arrays to discover the unmanaged SRDF-protected volumes.
 - c. Select **Order**.
5. After successful discovery on the source and target arrays, run either of the following the ingestion services on both the source and target arrays:
 - a. Select **Catalog > View Catalog > Block Storage Services** and select either:
 - **Ingest UnExported Unmanaged Volumes**
 - **Ingest Exported Unmanaged Volumes**
 For a VMAX3 replica volume, repeat step 2 to ingest this volume

For further details, and general information about discovery, and ingestion of unmanaged volumes refer to the *ViPR Controller Ingest Services for Existing Environments*, which is available from the [ViPR Controller Product Documentation Index](#).

Example: Failover a block volume with SRDF/S or SRDF/A protection

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 rediscvery of the underlying storage arrays before performing any actions on these resources in ViPR Controller.

Procedure

1. Select the **Catalog > Block Protection Services > Failover block volume** service.
2. Select the project, volume, and failover target.
3. Click **Order**.
4. After the failover completes, return to the ViPR Controller 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**.

ViPR Controller support for SRDF-Metro operations

ViPR Controller supports SRDF Metro for VMAX3 storage systems. SRDF Metro is established on the block virtual pool by setting the SRDF copy mode to **Active**. The **Active** mode is then used by ViPR Controller to select only the storage pools that are SRDF Metro enabled to add to the block virtual pool.

Requirements and information for setting up SRDF-Metro for ViPR Controller

Your SRDF-Metro configuration must meet the following configuration requirements to be supported by ViPR Controller.

For SMI-S version requirements refer to the [ViPR Controller Support Matrix](#).

- ViPR Controller only supports SRDF Metro between two VMAX3 storage systems.
- VMAX3 storage systems must be enabled with an SRDF Metro licenses.
- ViPR Controller does not support ingestion of SRDF Metro devices.
- You do not need to discover the “witness,” storage system in ViPR Controller with the SRDF Metro-enabled storage systems.
- SRDF Metro operations are supported with volumes in a consistency group.
- ViPR Controller does not support Swap and Failover operations. When a new pair needs to be created or added to the same ViPR Controller project (SRDF Group), you will need to suspend the existing pairs associated with the project.
- When a new pair needs to be added to a non-empty ViPR Controller project (SRDF Group), ViPR Controller will need to suspend all the pairs belonging to the SRDF Group before proceeding with the required task.
- When an existing pair needs to be removed from a ViPR Controller project (SRDF Group), ViPR Controller will need to suspend all the pairs belonging to the SRDF Group before proceeding with the required task.

SRDF-Metro support summary: changing virtual pools and array features

ViPR Controller offers various support for changing virtual pools for SRDF-Metro protected volumes and array functionality, such as FAST for SRDF.

Change virtual pools for SRDF Metro-protected volumes

Table 15 Virtual pool changes

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

Support for SRDF Metro-protected volumes and FAST

FAST with SRDF is supported by ViPR Controller. When creating the SRDF-protected virtual pool:

- The source and target volumes should 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.

SRDF operations supported and unsupported for SRDF Metro replication

Review this section to determine the valid SRDF operations that ViPR Controller can perform on VMAX3 storage systems that are protected by SRDF Metro remote replication.

Supported SRDF operations

Unless noted, the SRDF operations can be performed on both volumes with and without consistency groups.

SRDF Metro operations are only supported in VMAX3 to VMAX3 configurations.

- Create SRDF Volume
- Split SRDF link
- Establish SRDF link
- Restore from R2 to R1
- SRDF stop
- Delete SRDF Volumes
- Change volume from non-SRDF virtual pool to an SRDF virtual pool
- Expand SRDF Metro volumes
- Create local Mirror from SRDF R1 Volume
- Delete local Mirror of SRDF R1 Volume
- Create Snapshot from SRDF R1 Volume

- Restore Snapshot to SRDF R1 Volume
- Delete Snapshot of SRDF R1 Volume
- Create Clone from SRDF R1 Volume
- Restore Clone to SRDF R1 Volume
- Resync Clone from SRDF R1 Volume
- Delete Clone of SRDF R1 Volume
- Create local Mirror from SRDF R2 Volume
- Delete local Mirror of SRDF R2 Volume
- Create Snapshot from SRDF R2 Volume
- Delete Snapshot of SRDF R2 Volume
- Create Clone from SRDF R2 Volume
- Restore Clone to SRDF R2 Volume
- Resync Clone from SRDF R2 Volume
- Delete Clone of SRDF R2 Volume

Unsupported SRDF Metro operations

The following SRDF Metro operations are not supported by ViPR Controller

- Resync from R1 to R2
- Resync Snapshot from SRDF R1 Volume
- Resync Snapshot from SRDF R2 Volume
- Restore Snapshot to SRDF R2 Volume

CHAPTER 9

ViPR Controller Ingest Support for VMAX Storage Systems

This chapter includes the following sections.

- [Ingesting VMAX volumes into a consistency group](#)..... 78

Ingesting VMAX volumes into a consistency group

The **Ingest VMAX Block Volumes into Consistency Groups** service imports the source VMAX volumes, including snapshots, continuous copies, and full copies, into a ViPR Controller consistency group. These volumes cannot belong to other consistency groups. Use this service for native or VPLEX-protected volumes on VMAX only. Do not use for RecoverPoint -protected volumes.

This allows you to use the ViPR Controller consistency group to take snapshots and clones of your virtual volumes at the consistency group level. All of the virtual volumes in the consistency group must come from the same storage array.

Ingestion of SRDF Metro volumes is not supported.

Note

If you already have consistency groups for backend volumes, clones and snaps, and would like to continue using those existing manually created consistency groups, you will need to manage those consistency groups outside of ViPR Controller. However, it is recommended that you create and start using the backend consistency groups created by ViPR Controller once the backend volumes, clones and snapshots are ingested in to ViPR Controller.

Procedure

1. Select **Service Catalog** > **Block Storage Services** > **Ingest VMAX Block Volumes into Consistency Groups**.
2. Select the **Project** to which the consistency group belongs.
3. Select the **Consistency Group**.
4. Select the source **Volumes** to add to the consistency group.