IBM XIV Storage Replication Adapter
Version 2.3.0

User Guide

GA32-1067-06

Note
Before using this document and the product it supports, read the information in "Notices" on page 59.

Edition notice

Publication number: GA32-1067-06. This edition applies to version 2.3.0 of the IBM XIV Storage Replication Adapter and to all subsequent releases and modifications until otherwise indicated in a newer publication.

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About this guide

This guide describes how to prepare for, install, configure, and use the IBM® XIV® Storage Replication Adapter.

Who should use this guide

This guide is intended for system administrators who are familiar with the VMware vCenter, Site Recovery Manager, and vSphere platforms, and with the relevant IBM storage systems.

Conventions used in this guide

These notices are used in this guide to highlight key information.

Note: These notices provide important tips, guidance, or advice.

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Attention: These notices indicate possible damage to programs, devices, or data. An attention notice appears before the instruction or situation in which damage can occur.

Related information and publications

You can find additional information and publications related to the IBM XIV Storage Replication Adapter on the following information sources.

- IBM Knowledge Center
- IBM XIV Storage System on IBM Knowledge Center
- IBM Spectrum Accelerate™ on IBM Knowledge Center
- IBM FlashSystem® A9000 on IBM Knowledge Center
- IBM FlashSystem A9000R on IBM Knowledge Center
- VMware vCenter Site Recovery Manager Documentation (www.vmware.com/support/pubs)
- VMware Technical Resources (www.vmware.com/technical-resources)
- VMware knowledgebase (kb.vmware.com)

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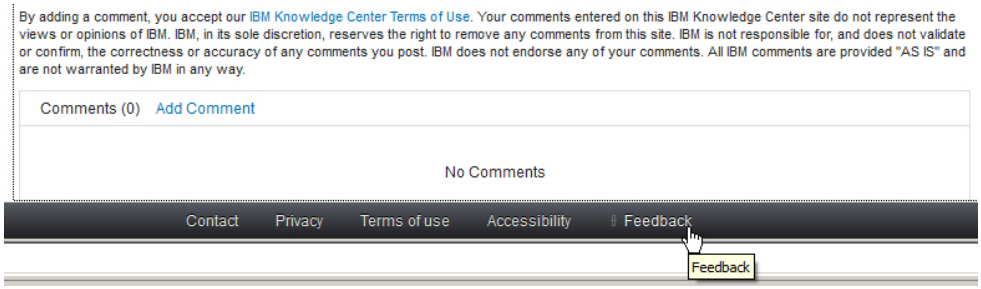

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Chapter 1. Introduction

The IBM XIV Storage Replication Adapter (SRA) is a software add-on that integrates with the VMware vCenter Site Recovery Manager (SRM) platform and enables site-to-site failovers together with supported IBM storage systems.

The IBM XIV SRA extends the VMware vCenter Site Recovery Manager capabilities by allowing it to employ the replication and mirroring features for continuous storage availability at both the protected site and recovery site.

Using the IBM XIV SRA, VMware administrators can automate the failover of a supported storage system at the protected (primary) SRM site to a storage system at a recovery (secondary) SRM site. Immediately upon a failover, the ESX and ESXi servers at the recovery SRM site start using the replicated datastores on the mirrored volumes of the secondary storage system.

When the primary site is back online, failback from the recovery site to the primary site can be performed manually or automatically.

Concept diagram

The following figure illustrates how two supported IBM storage systems are integrated in a typical VMware SRM disaster recovery solution. The IBM XIV SRA is used on the VMware vCenter Site Recovery Manager server at both the protected and recovery sites.

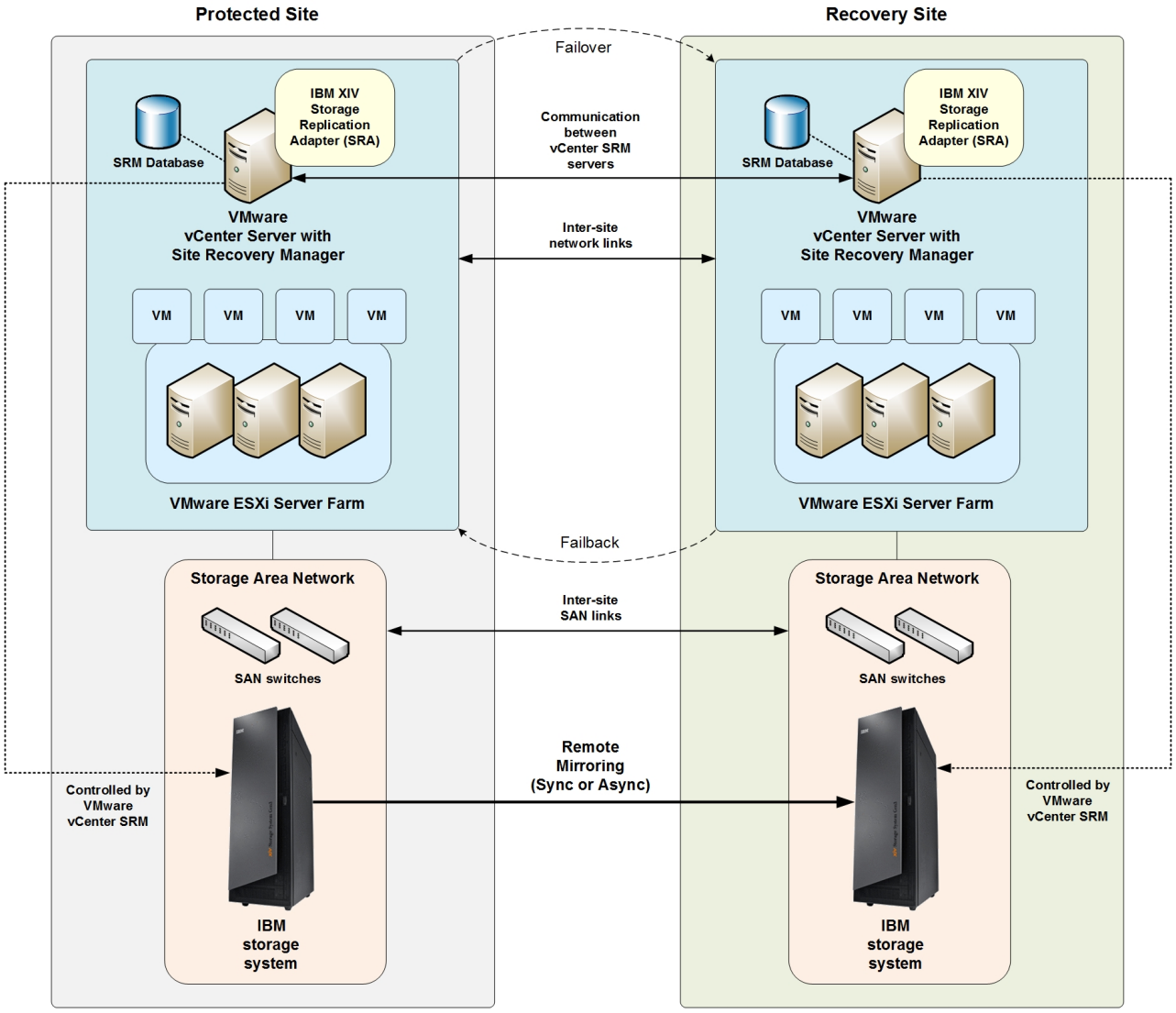

Figure 1. IBM storage systems in a typical protection and recovery deployment

Volume mapping principles

At both the protected and recovery sites, the IBM XIV SRA aims to best achieve the following configuration goals on the supported IBM storage system, if possible:

- Keep the volume LUN numbers upon failover, and reuse the same ones upon failback.
- Map volumes with the same LUN IDs across all the specific ESXi hosts that are requested for the failover.
- In more scenarios, map volumes to a cluster that contains all the specific ESXi hosts that are requested for the failover, rather than mapping to individual hosts.

Note: The above configuration goals are attained on a best-effort basis, depending on the specific configuration scenario at the protected and recovery sites.

The following figure illustrates the volume mapping principles (attained on a best-effort basis):

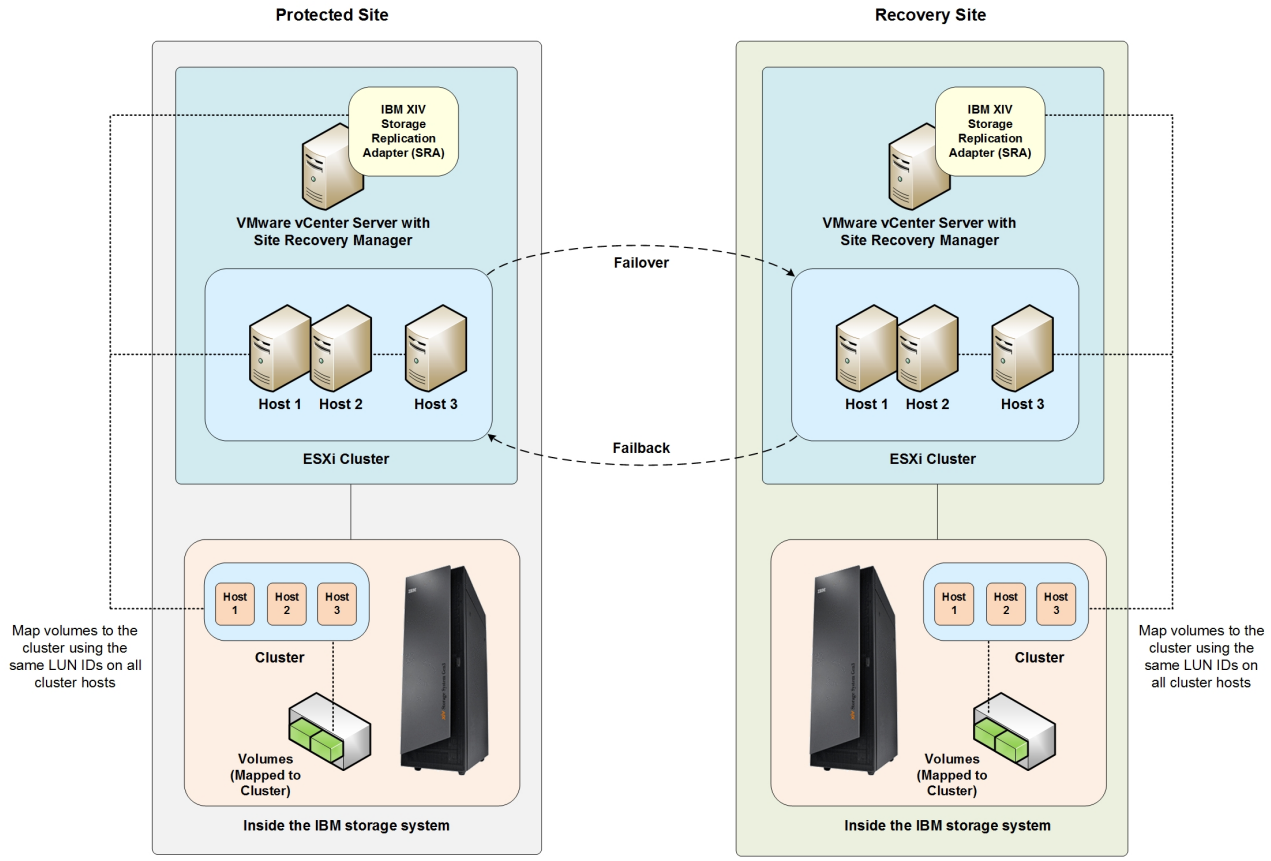

Figure 2. Best-effort volume mapping principles

For in-depth understanding of how the different IBM XIV SRA operations are carried out, see "Initiating SRA operations" on page 47.

Compatibility and requirements

For the complete and up-to-date information about the compatibility and requirements of the IBM XIV Storage Replication Adapter, refer to the latest release notes.

You can find the latest release notes on the IBM Knowledge Center.

Note: Refer to the relevant VMware documentation for information about how to install the compatible versions of vCenter Server and vSphere Client. You should also refer to the latest installation and configuration instructions for ESXi servers.

Important: To learn about the requirements for using VMware vCenter Site Recovery Manager (SRM) at your sites, refer to the Administration Guide that was issued for the SRM version that you are using. The guide is available at the VMware vCenter Site Recovery Manager Documentation website (www.vmware.com/support/pubs/srm_pubs.html).

Before you proceed

Before you proceed to the Preparation chapter, you must have access to a workstation on which your preferred storage management software is locally installed or accessible via a remote connection.

You can manage the connected storage system using the GUI (graphical user interface) or CLI (command-line interface). Use the XIV GUI to manage the XIV and Spectrum Accelerate storage systems. However, for the FlashSystem A9000 and A9000R, the Hyper-Scale Manager user interface (UI) is used.

Chapter 2. Preparation

Preparation is required depending on your specific site configuration.

Prior to installing and using the IBM XIV Storage Replication Adapter (SRA), the following verification tasks are required:

- Verifying the mirroring configuration
- Verifying the VMware vCenter SRM installation

To learn about how to prepare your sites from scratch, refer to "Setting up site-to-site mirroring from scratch" on page 8.

Verifying the mirroring configuration

All storage systems, volumes, and ESXi hosts at both the protected (primary) and recovery (secondary) sites must be properly connected to their remote counterparts and configured for site mirroring.

Prior to installing and using the IBM XIV SRA, make sure that:

- Your local storage system at the protected site has mirroring connectivity with the target storage system at the recovery site.
- The name of each storage system is unique in both the protected and recovery sites.
- The **Target Name** of any remote storage system is identical to the predefined System Name of that same remote storage system, as illustrated below for the XIV, Spectrum Accelerate and FlashSystem A9000/9000R systems.

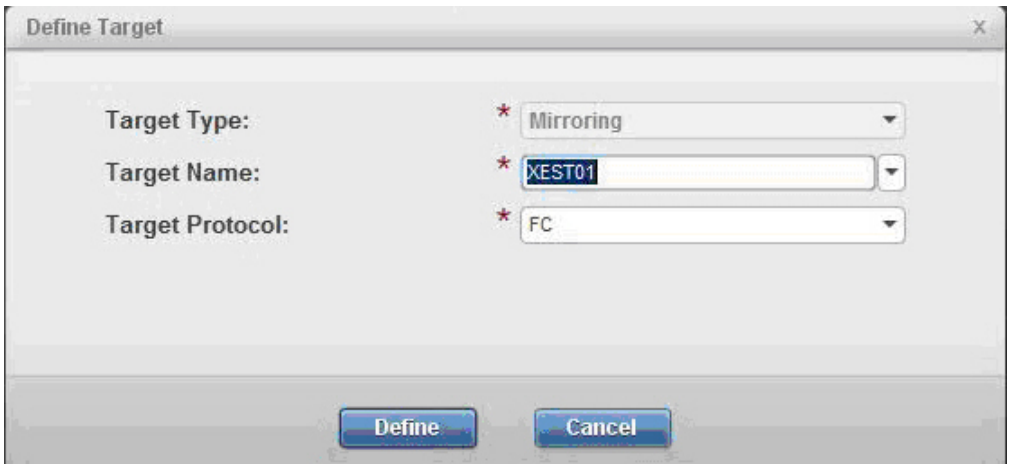

Figure 3. Define Target dialog box for XIV and Spectrum Accelerate – Target Name is "XEST01"

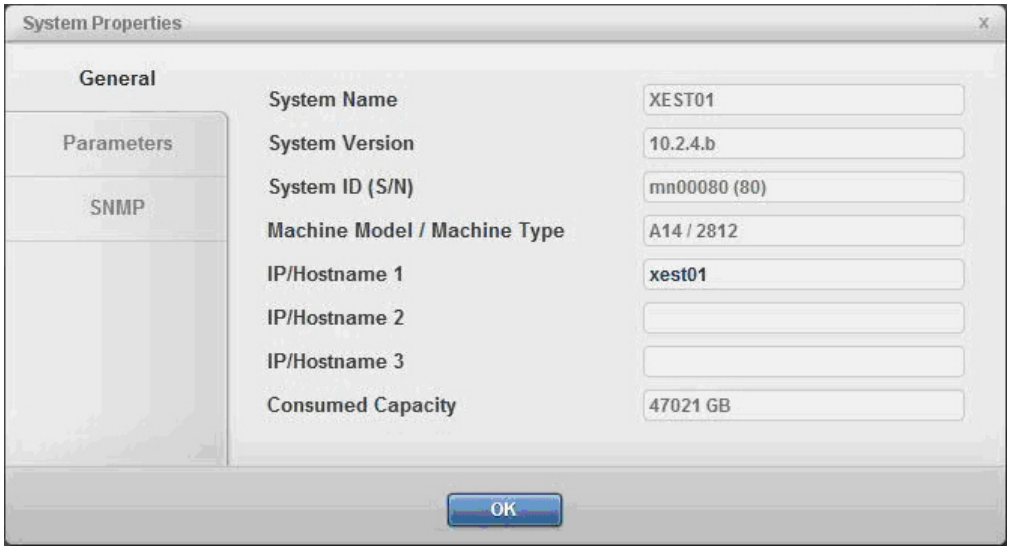

Figure 4. Properties information for XIV and Spectrum Accelerate– System Name is "XEST01"

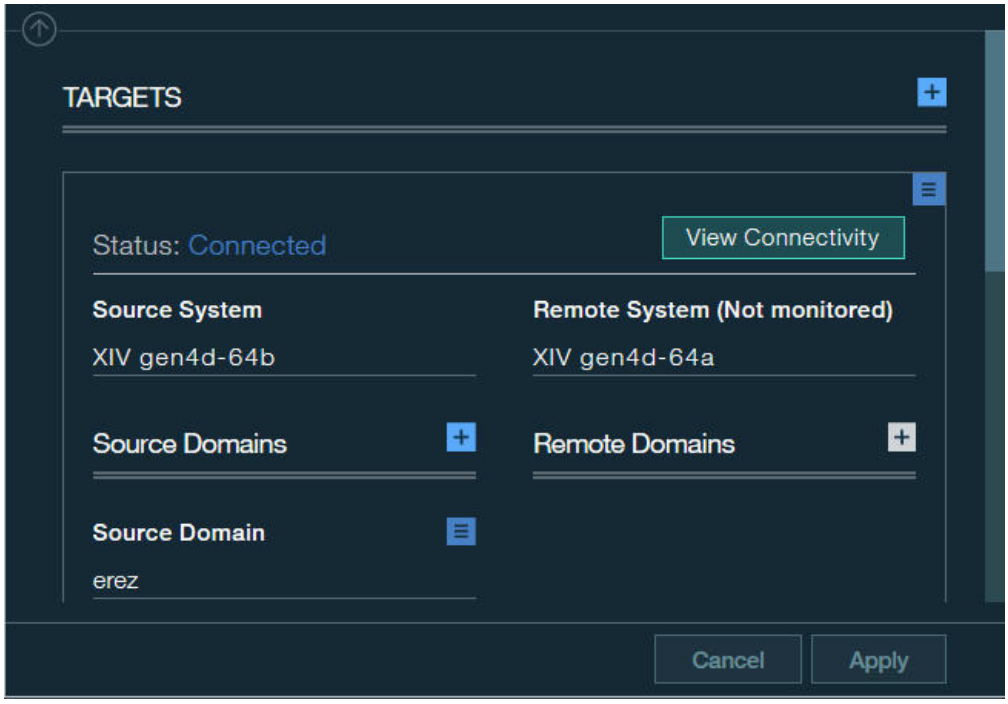

Figure 5. Targets form for FlashSystem A9000/9000R – Remote System name is "XIV gen4d-64a"

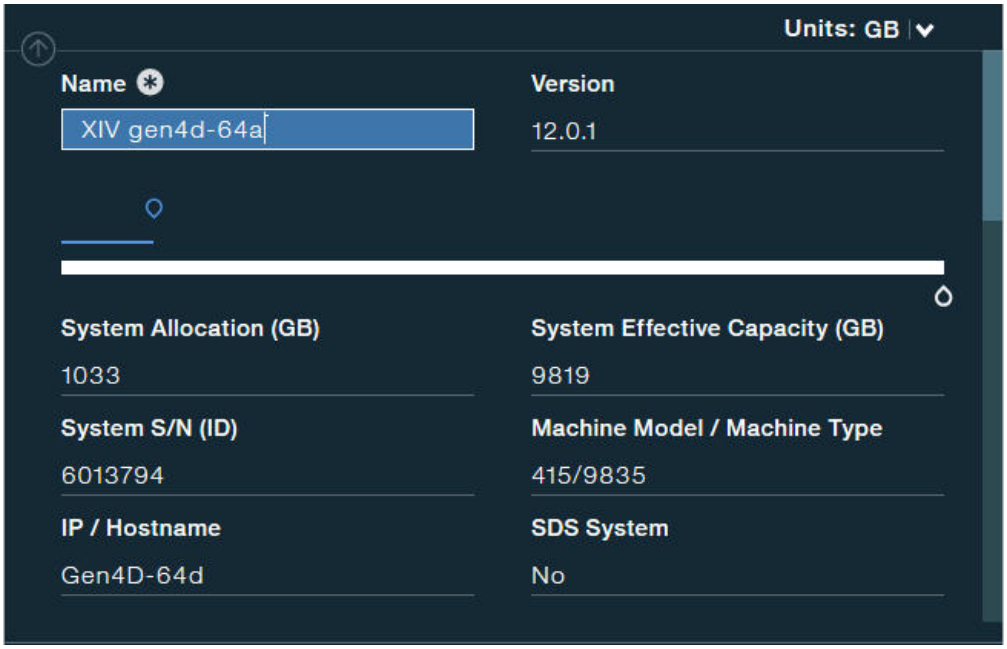

Figure 6. Properties information for FlashSystem A9000/9000R – System name is "XIV gen4d-64a"

- The storage pools that contain the replicated volumes at both the protected and recovery sites have sufficient size for creating the snapshots of all replicated volumes concurrently. For IBM XIV and Spectrum Accelerate storage systems, allocate a minimum of 17 GB for each volume, with additional 17 GB as spare space.
- Remote mirroring is defined for all volumes that you intend to protect as part of your Disaster Recovery Plan (DRP).
- Your protected (primary) volumes are mapped to the protected ESXi hosts.
- The recovery (secondary) volumes remain unmapped.
- Your recovery (secondary) ESXi hosts are defined as storage system hosts at the recovery site.
- Your recovery ESXi host ports are FC-zoned with the storage system at the recovery site, and are visible by that storage system.

Attention: Confirm with your storage administrator that all the requirements above are met.

Note: To learn how to set up mirroring in a "start from scratch" scenario, refer to “Setting up site-to-site mirroring from scratch” on page 8.

Verifying the VMware vCenter SRM installation

Before installing the IBM Storage Replication Adapter, make sure that VMware vCenter Site Recovery Manager is already installed and accessible at the protected (primary) site, as well as at the recovery (secondary) site.

On the vSphere client application, go to the Home page and check that the **Site Recovery** icon is displayed under **Solutions and Applications**.

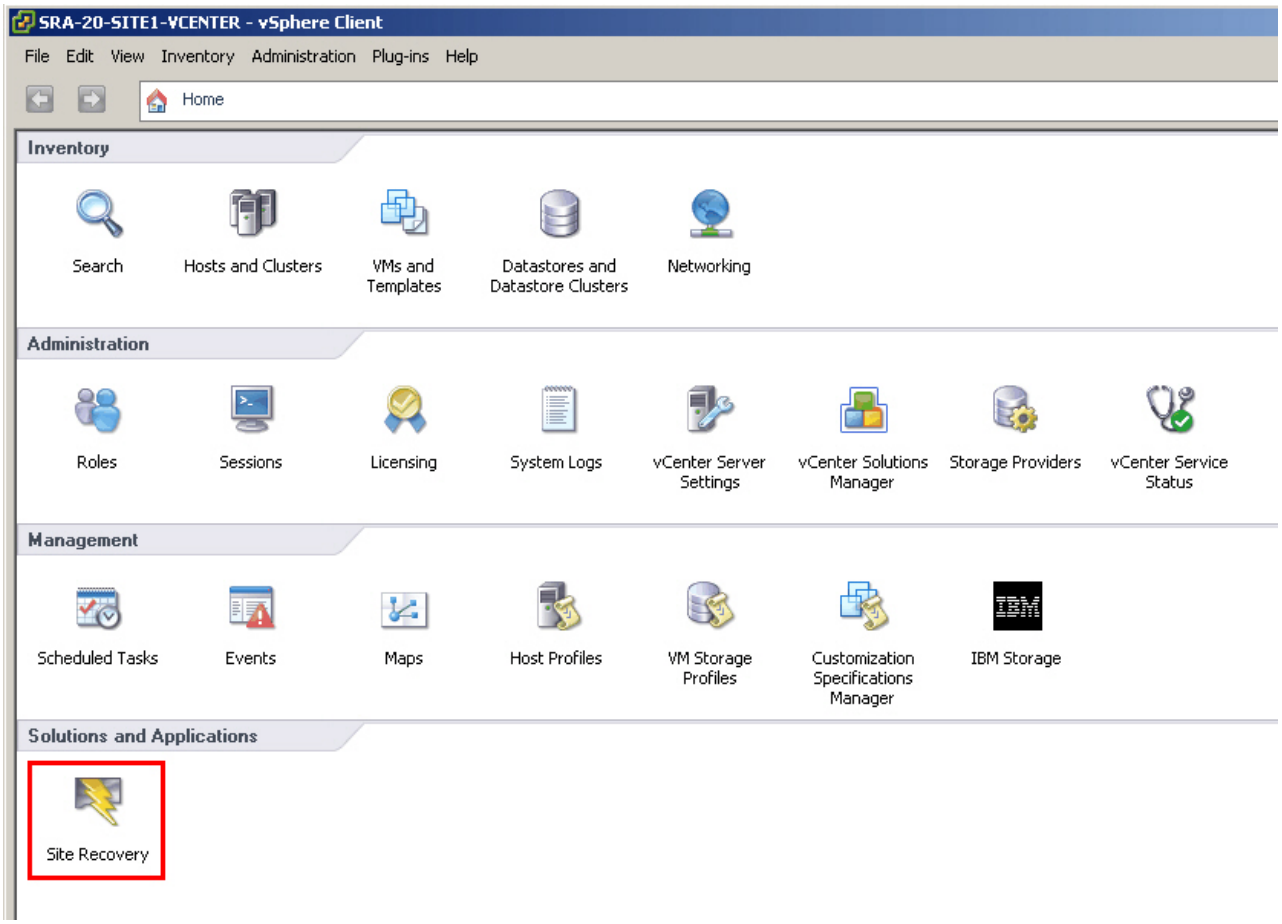

Figure 7. VMware vSphere Client – Site Recovery Manager is installed

Setting up site-to-site mirroring from scratch

This section covers the specific scenario when no previous setup for mirroring has been preformed at your sites.

The specific scenario of setting up mirroring from scratch includes the following configuration stages:

Note:
- If your sites are already partially configured for mirroring, perform only the stages or steps that are relevant to your specific case.
- The following sections provide setup examples from version 3.0.x of the XIV GUI and version 5.0 of the Hyper-Scale Manager UI. If you are using an older or a newer management package version, refer to its online help or documentation.

Stage 1: Establish mirroring connection

Your first task is to determine which of your storage systems should be used as the protected (primary) system, and which should be used as the recovery (secondary) system.

Use either the XIV GUI or the IBM Hyper-Scale Manager UI to define a mirroring connection with the secondary storage system, as explained in the following sections:

- "Establishing mirroring connection from the XIV GUI"
- "Establishing mirroring connection from the IBM Hyper-Scale Manager UI" on page 13

Establishing mirroring connection from the XIV GUI

This section applies if you want to use the XIV GUI for establishing mirroring connection for XIV and Spectrum Accelerate storage systems.

About this task

Complete the following procedure to define a mirroring connection with the secondary storage system.

Important: The target storage system at the remote site must already be up and running, as well as added to the XIV GUI before you can set the mirroring connection to it. In addition, all iSCSI or FC connections to the remote storage system must be operational as well. Confirm with your storage administrator that the remote storage system is ready for establishing the mirroring connection.

Procedure

1. On the XIV management GUI, go to **Remote** > **Mirroring Connectivity**
2. Right-click the storage system that you want to use as the primary system, and then click **Create Target**. The Define Target dialog box appears.

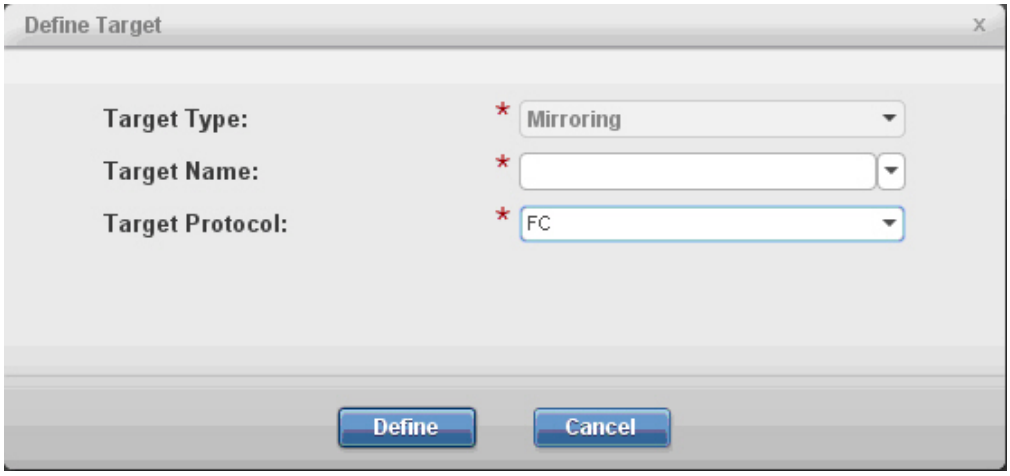

Figure 8. XIV Management GUI – Define Target dialog box

3. From the **Target Name** drop-down list, select the name of the storage system that should be used as the target system.
4. From the **Target Protocol** drop-down list, select the connection type (FC or iSCSI) to the selected target system.
5. Click **Define**. The interface panels of the two storage systems are displayed.
6. Click **Show Auto Detected Connections**, located above the two interface panels.

Figure 9. Show Auto Detected Connections button

The auto-detected physical connections (iSCSI or FC) between the two storage systems are displayed graphically as green arrow lines between the interface connections of both storage systems.

Important: Fibre Channel (FC) connections can be auto-detected only through proper FC zoning. Confirm with your storage administrator that FC zoning has been properly set in advance.

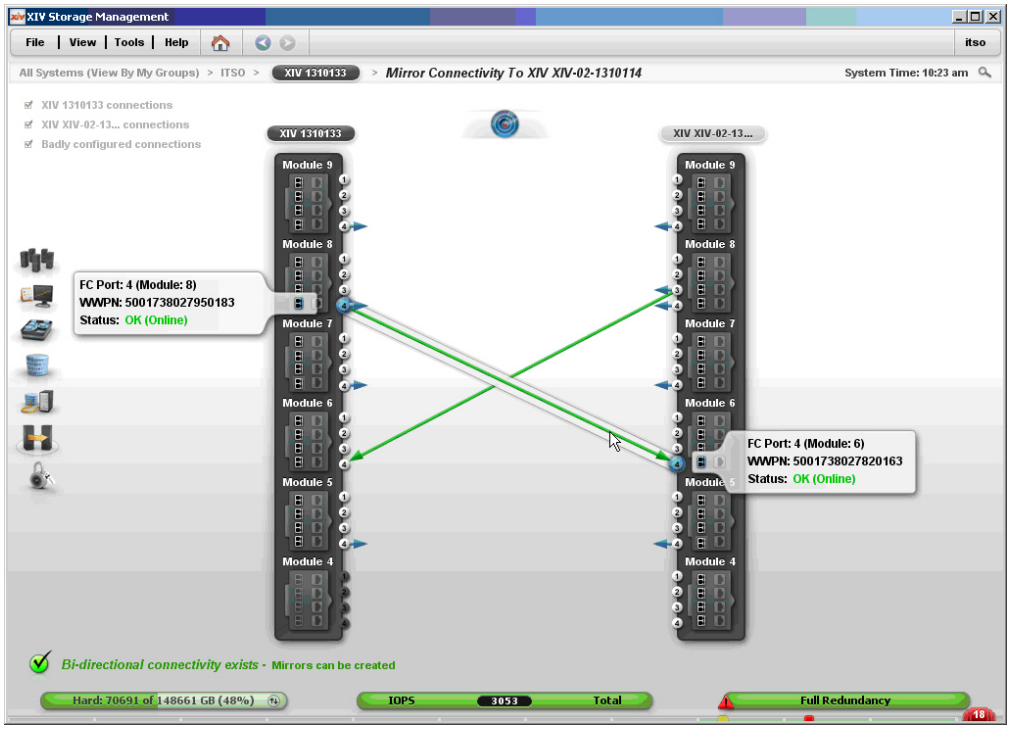

Figure 10. XIV Management GUI – Detected connections

7. Click **Approve** to use the graphically displayed connections.

Figure 11. XIV Management GUI – Approve button

Note: You can also define new connections manually by clicking a port on the primary system and then by dragging a blue arrowed line to the corresponding port on the target system (see Figure 12 on page 12). Placing the arrow head on the target port initiates the connection.

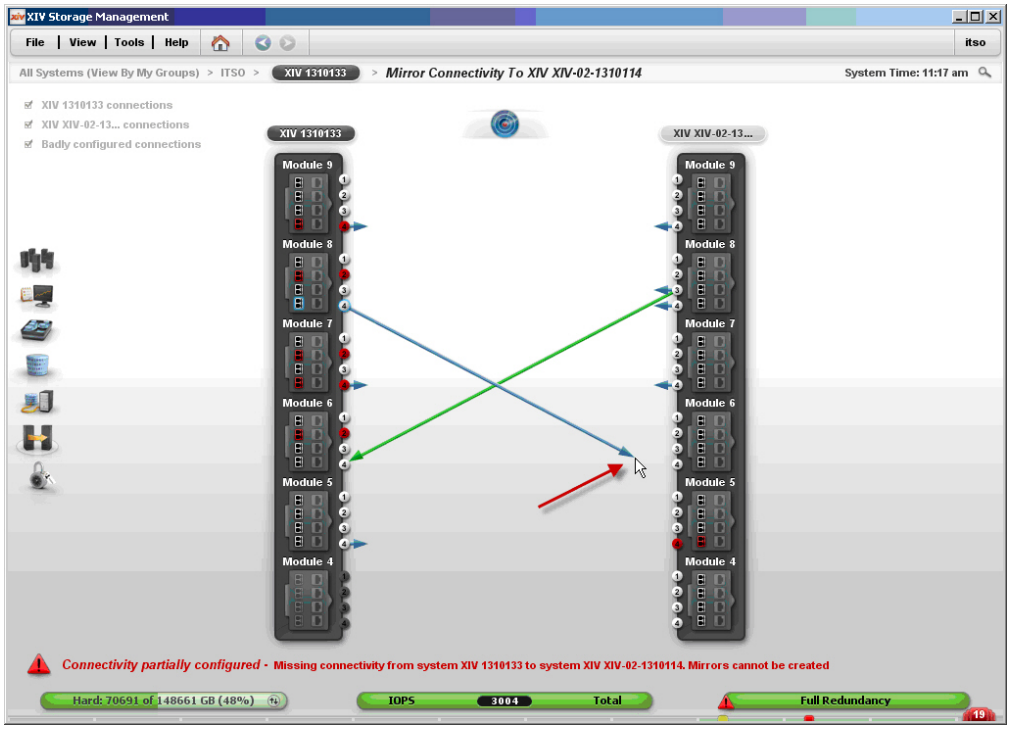

Figure 12. XIV Management GUI – Detected connections

8. Right-click the arrowed line of a connection that you want to enable, and then click **Activate** on the pop-up menu.

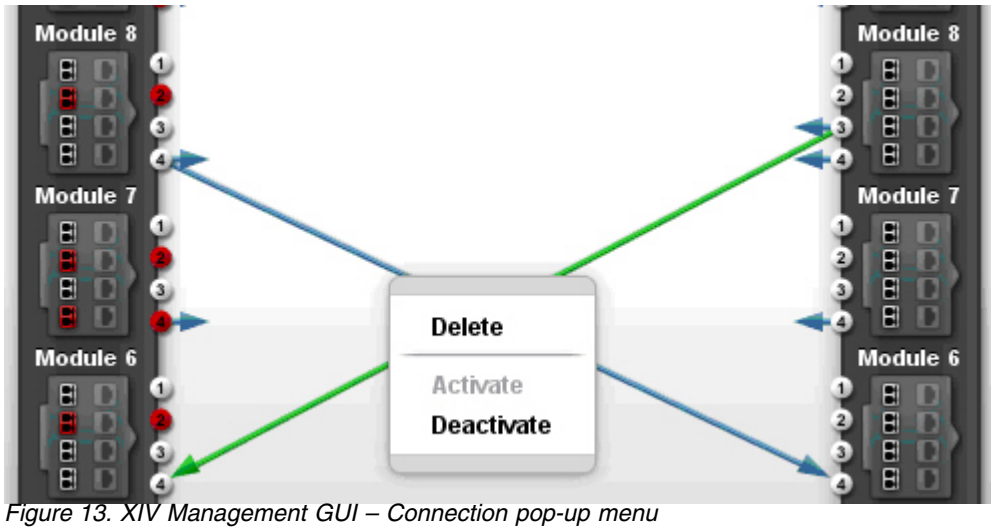

Figure 13. XIV Management GUI – Connection pop-up menu

Important:

- Make sure that a bi-directional connection is established with the target storage system.
- If you are using the XIV CLI (XCLI), establish a bi-directional connection manually. For more information, refer to the XCLI documentation.

Establishing mirroring connection from the IBM Hyper-Scale Manager UI

This section applies if you want to use the IBM Hyper-Scale Manager UI for establishing mirroring connection for FlashSystem A9000/A9000R storage systems.

About this task

Complete the following procedure to define a mirroring connection with the secondary storage system, using the IBM Hyper-Scale Manager UI.

Important: The target storage system at the remote site must already be up and running, as well as added to the IBM Hyper-Scale Manager UI before you can set the mirroring connection to it. In addition, all iSCSI or FC connections to the remote storage system must be operational as well. Confirm with your storage administrator that the remote storage system is ready for establishing the mirroring connection.

Procedure

1. Select **System and Domains Views** > **System Connectivity**.
2. From the Hub, click on **Targets**. The list of targets is displayed in the **System Connectivity** form. If there are no targets connected to this system, the display will be empty.
3. From the top of the **System Connectivity** form, click on the plus (+) sign to add a target. The System Connectivity form is displayed.

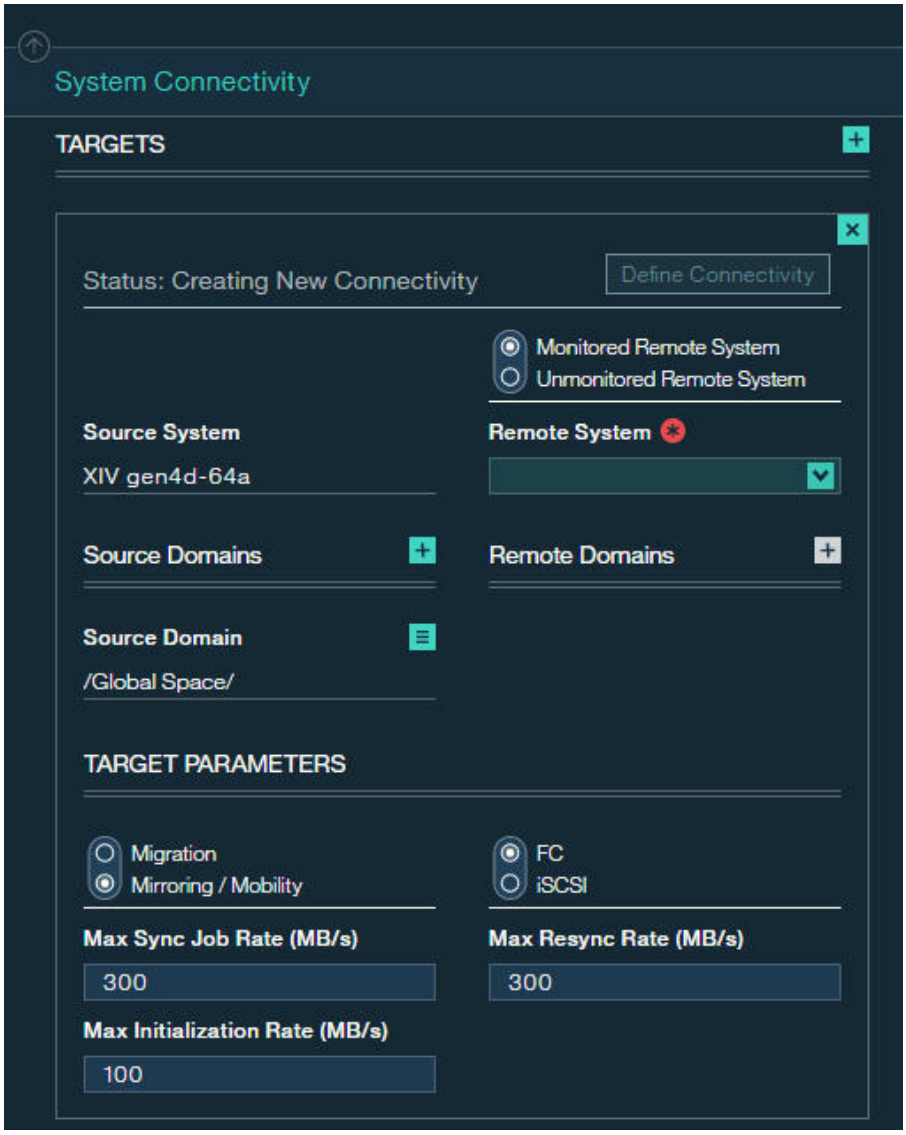

Figure 14. System Connectivity form

4. Add a remote system that is either monitored by management server or unmonitored and define all of its parameters, including **Mirroring/Mobility**. Click **Apply**.
5. Click **Define Connectivity** to view the Connectivity Patch Panel displaying the defined ports on the source and target systems. A dotted line between the source and target systems shows that the connectivity is not yet defined.
6. Click **Auto Connect**. The system sees all of the ports on the target and connects the ports. You can switch between the source and target views on the Connectivity Patch Panel to see the ports and the port status defined on both.
7. To see a graphical image of the Connectivity Patch Panel and the connections between the ports of the source and target systems, click on **Connectivity Details**.

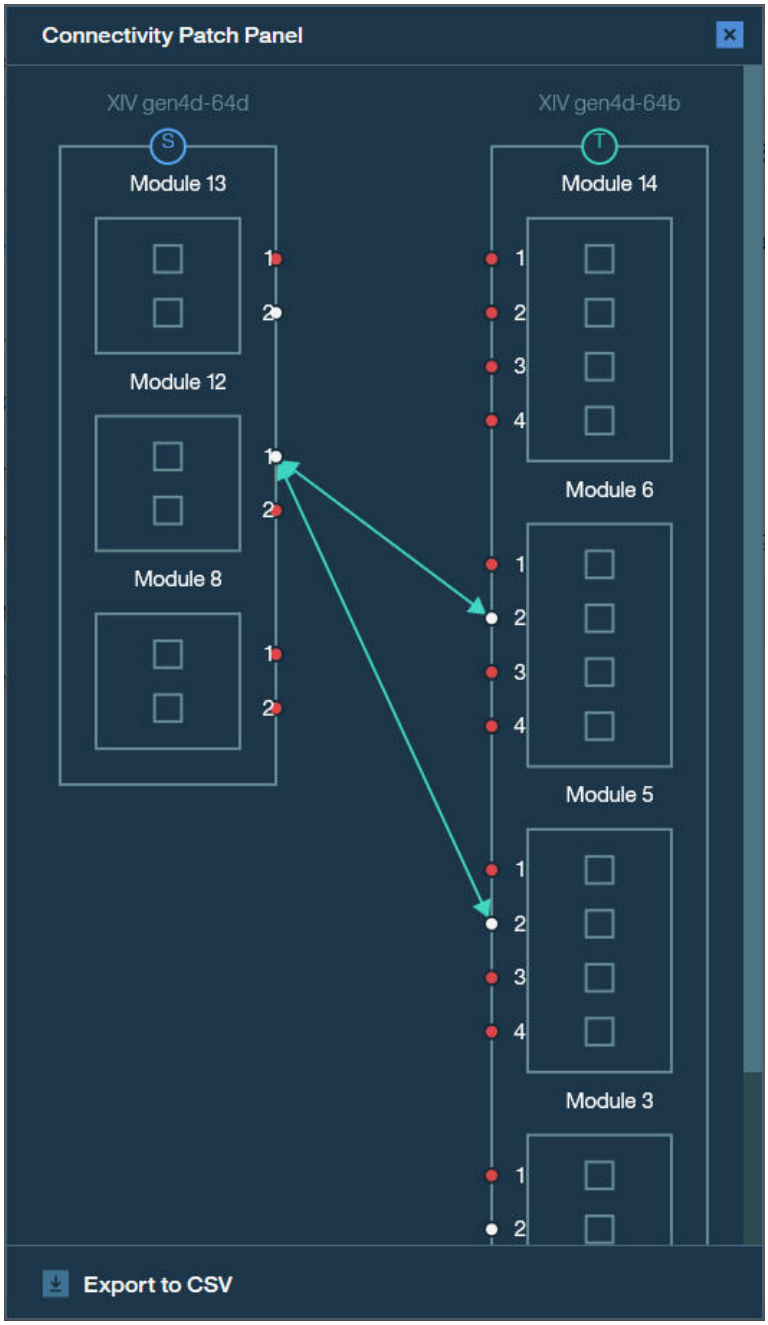

Figure 15. Connectivity Patch Panel

The auto-detected physical connections (iSCSI or FC) between the two storage systems are displayed graphically as green arrow lines between the interface connections of both storage systems.

- Make sure that a bi-directional connection is established with the target storage system.
- Fibre Channel (FC) connections can be auto-detected only through proper FC zoning. Confirm with your storage administrator that FC zoning has been properly set in advance.

8. Click **Approve** to use the graphically displayed connections.

Stage 2: Create a storage pool for the protected volumes

In this preparation stage you create a storage pool for the protected volumes.

After the mirroring between the storage systems is set, use either the XIV GUI or the IBM Hyper-Scale Manager UI to create a storage pool for the protected volumes on the primary storage system.

- "Creating a storage pool for the protected volumes from the XIV GUI"
- "Creating a storage pool for the protected volumes from the IBM Hyper-Scale Manager UI" on page 17

Creating a storage pool for the protected volumes from the XIV GUI

This section applies if you want to use the XIV GUI for creating a storage pool for the protected volumes on XIV and Spectrum Accelerate storage systems.

About this task

After the mirroring between the storage systems is set, create a storage pool for the protected volumes on the primary storage system.

Procedure

1. On the XIV management GUI, focus on the primary storage system, and then click **Pools** > **Storage Pools**.
2. Click **Add Pool** and then define the pool size and name in the Add Pool dialog box.

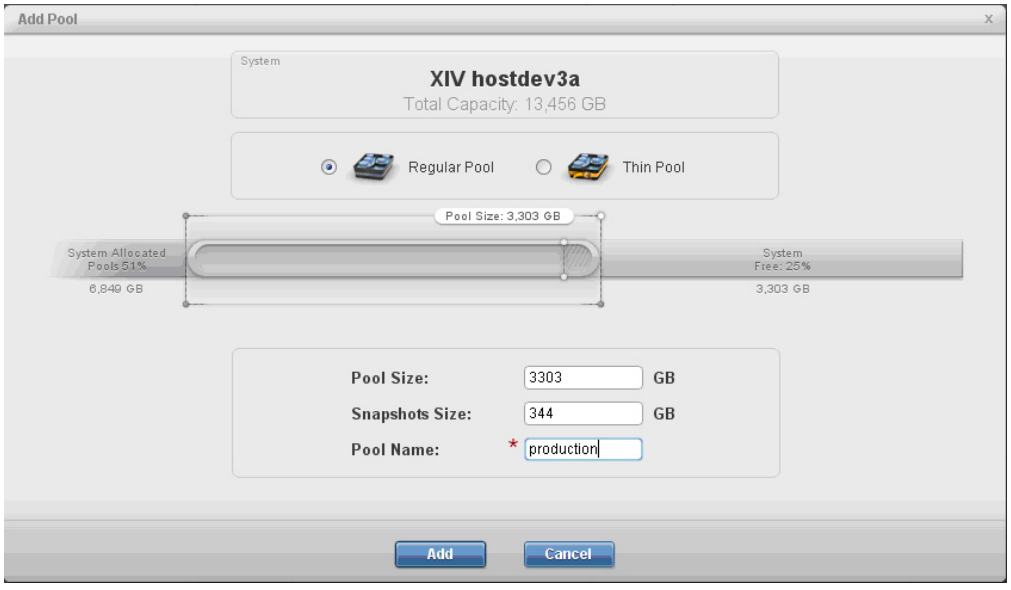

Figure 16. XIV Management GUI – Add Pool dialog box

3. Click **Add**. The storage pool is created.

Creating a storage pool for the protected volumes from the IBM Hyper-Scale Manager UI

This section applies if you want to use the IBM Hyper-Scale Manager UI for creating a storage pool for the protected volumes on FlashSystem A9000/A9000R storage systems.

About this task

After the mirroring between the storage systems is set, create a storage pool for the protected volumes on the primary storage system.

Procedure

1. Select **Pools and Volumes Views** > **Pools**. The list of pools is displayed. If there are no pools in this system, the display will be empty.
2. From the Hub, click on the plus (+) sign to add a new pool. The **Create Pool** form is displayed.

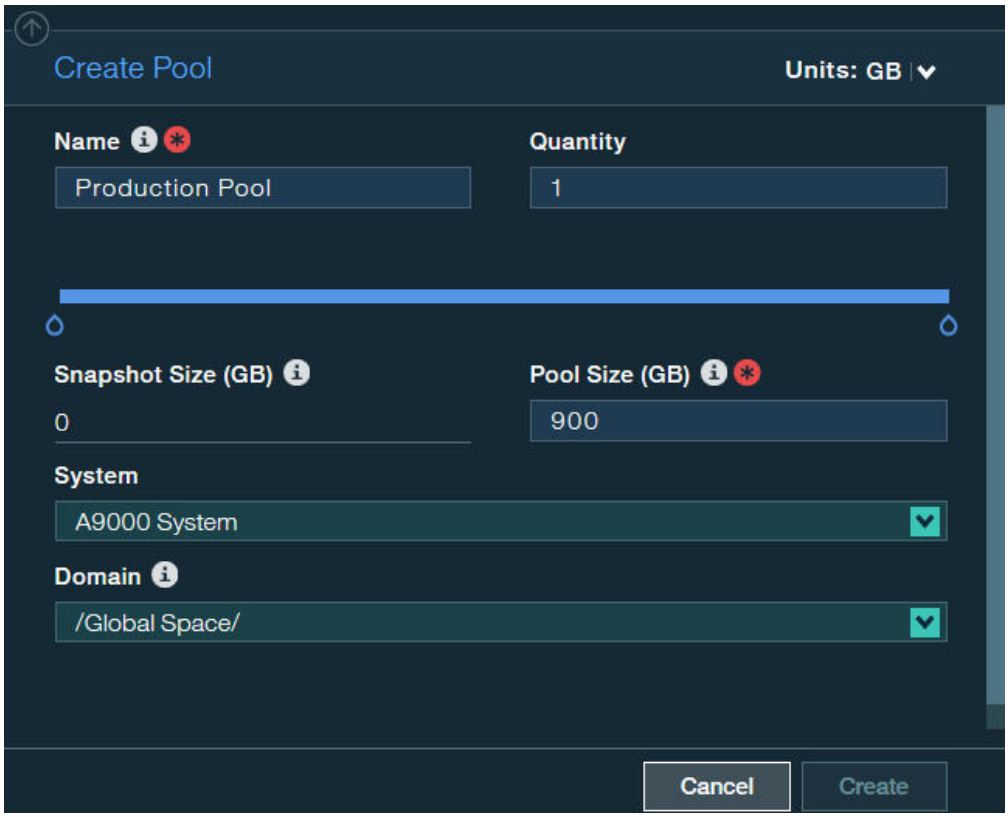

Figure 17. Create Pool form

3. Define the pool name, its size, primary storage system and domain.
4. Click **Create**. The storage pool is created.

Stage 3: Create a storage pool for the recovery volumes

In this preparation stage you create a storage pool for the recovery volumes.

Procedure

Complete the pool creation procedure (see “Stage 2: Create a storage pool for the protected volumes” on page 16) at the recovery (secondary) site as well. When you do so, you may want to give an identical name to the storage pool at the recovery site.

Stage 4: Create protected volumes

In this preparation stage you create protected volumes.

After the storage pool is created, use either the XIV GUI or the IBM Hyper-Scale Manager UI to create the protected volumes on it:

- “Creating protected volumes from the XIV GUI”
- “Creating protected volumes from the IBM Hyper-Scale Manager UI” on page 19

Creating protected volumes from the XIV GUI

This section applies if you want to use the XIV GUI to create protected volumes on XIV and Spectrum Accelerate storage systems.

About this task

After the storage pool is created, create the protected volumes on it.

Procedure

1. On the XIV management GUI, focus on the primary storage system, and then click **Pools** > **Volumes by Pools**.
2. Click **Add Volumes**. The Create Volumes dialog box is displayed.
3. From the **Select Pool** drop-down list, select the pool you created in the previous stage, and then define the number of volumes, as well as the size of volumes that you want to create in this pool.

Important: For XIV and Spectrum Accelerate storage systems, the size of the volume must be 17 GB or more.

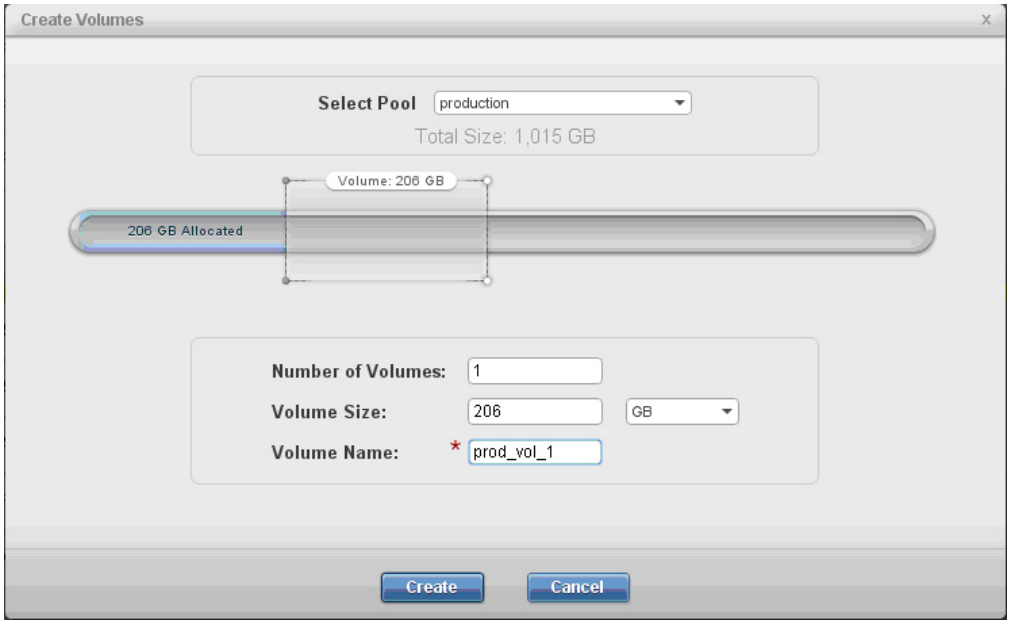

Figure 18. XIV Management GUI – Create Volumes dialog box

4. Click **Create**.

Creating protected volumes from the IBM Hyper-Scale Manager UI

This section applies if you want to use the IBM Hyper-Scale Manager UI to create protected volumes on FlashSystem A9000/A9000R storage systems.

About this task

After the storage pool is created, create the protected volumes on it.

Procedure

1. Select **Pools and Volumes Views** > **Volumes**. The list of volumes is displayed. If there are no volumes in this system, the display will be empty.
2. From the Hub, click on the plus (+) sign to add a new volume. The **Create Volume** form is displayed.

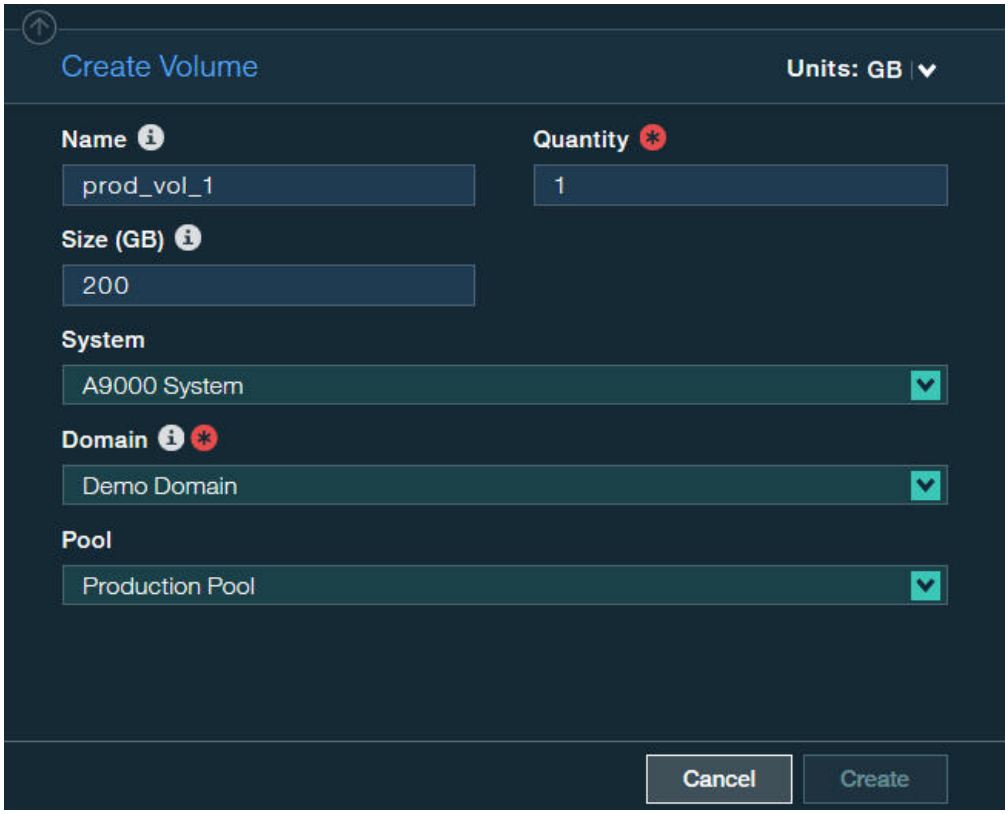

Figure 19. Create Volume form

3. Define the volume name, the number of volumes, volume size, primary storage system, its domain and the pool you created in the previous stage.
4. Click **Create**. The volume is created.

Stage 5: Create recovery volumes

In this preparation stage you create recovery volumes.

Procedure

Complete the volume creation procedure (see: "Stage 4: Create protected volumes" on page 18) at the recovery (secondary) site as well. When you do so, keep in mind:

- You might want to give identical names to the volumes at the recovery site.
- The volumes at the recovery site must have the same size as the volumes at the protected site.

Stage 6: Map protected volumes to protected ESXi hosts

In this preparation stage you map protected volumes to protected ESXi hosts.

After you have created protected volumes, use either the XIV GUI or the IBM Hyper-Scale Manager UI to map the volumes to the primary ESXi hosts that are to be protected by SRM, and then rescan these hosts.

- "Mapping protected volumes to protected ESXi hosts from the XIV GUI" on page 21

- "Mapping protected volumes to protected ESXi hosts from the IBM Hyper-Scale Manager UI" on page 22

Mapping protected volumes to protected ESXi hosts from the XIV GUI

This section applies if you want to use the XIV GUI to map protected volumes on XIV and Spectrum Accelerate storage systems to protected ESXi hosts.

About this task

After you have created protected volumes, map the volumes to the primary ESXi hosts that are to be protected by SRM, and then rescan these hosts.

Procedure

1. On the XIV management GUI, focus on the primary storage system, and then go to **Hosts and Clusters** > **Volumes by Hosts**. The ESXi hosts that are already mapped to the storage system are displayed.
2. Double-click a host to which you want to map volumes. The list of currently mapped volumes (mapped to the host) is displayed on the right.
3. From the volumes list on the left, select the volume or volumes that you want to map to the host, and then click **Map**.

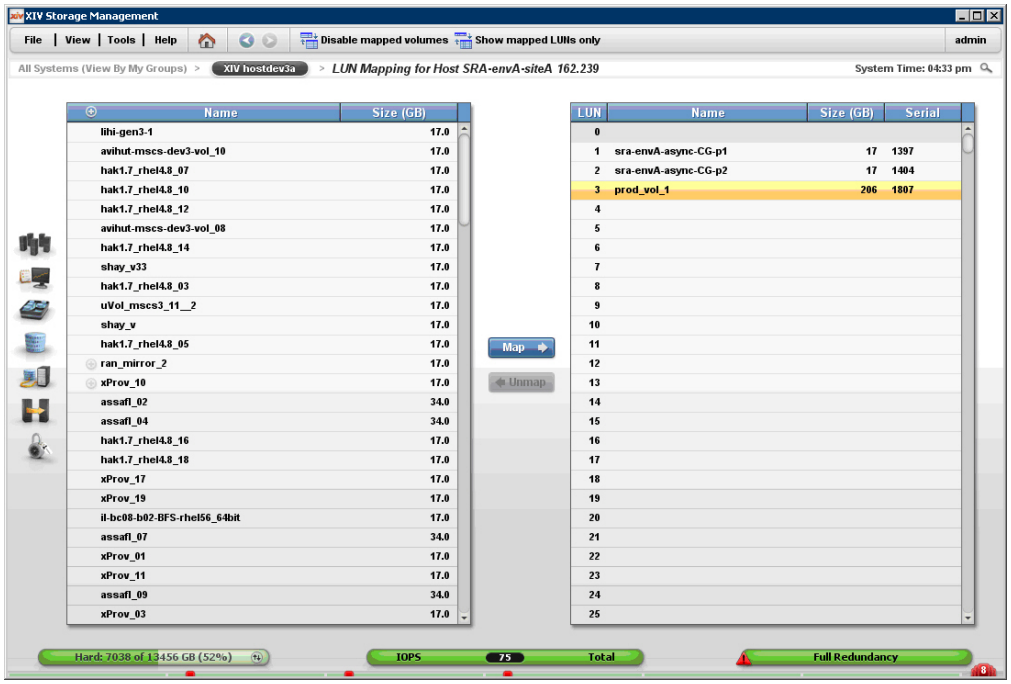

Figure 20. XIV Management GUI – LUN Mapping for Host panel

4. Click **Back** to go back to the main GUI window, and verify that the volumes are mapped.

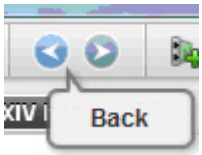

Figure 21. Back button

Mapping protected volumes to protected ESXi hosts from the IBM Hyper-Scale Manager UI

This section applies if you want to use the IBM Hyper-Scale Manager UI to map protected volumes on FlashSystem A9000/A9000R storage systems to protected ESXi hosts.

About this task

After you have created protected volumes, map the volumes to the primary ESXi hosts that are to be protected by SRM, and then rescan these hosts.

Procedure

1. Select **Pools and Volumes Views** > **Volumes**. The list of volumes is displayed.
2. Select one or more protected volumes to which you want to map a host. The **Volume** mini-dashboard is displayed.

Figure 22. Volume mini-dashboard

3. From the **Volume** mini-dashboard, click the **Mapping** relation icon to display the empty **Volume Mapping** form with the **ADD** icon.
4. In the **Volume Mapping** form, click **ADD** icon to map the volume to an existing host.

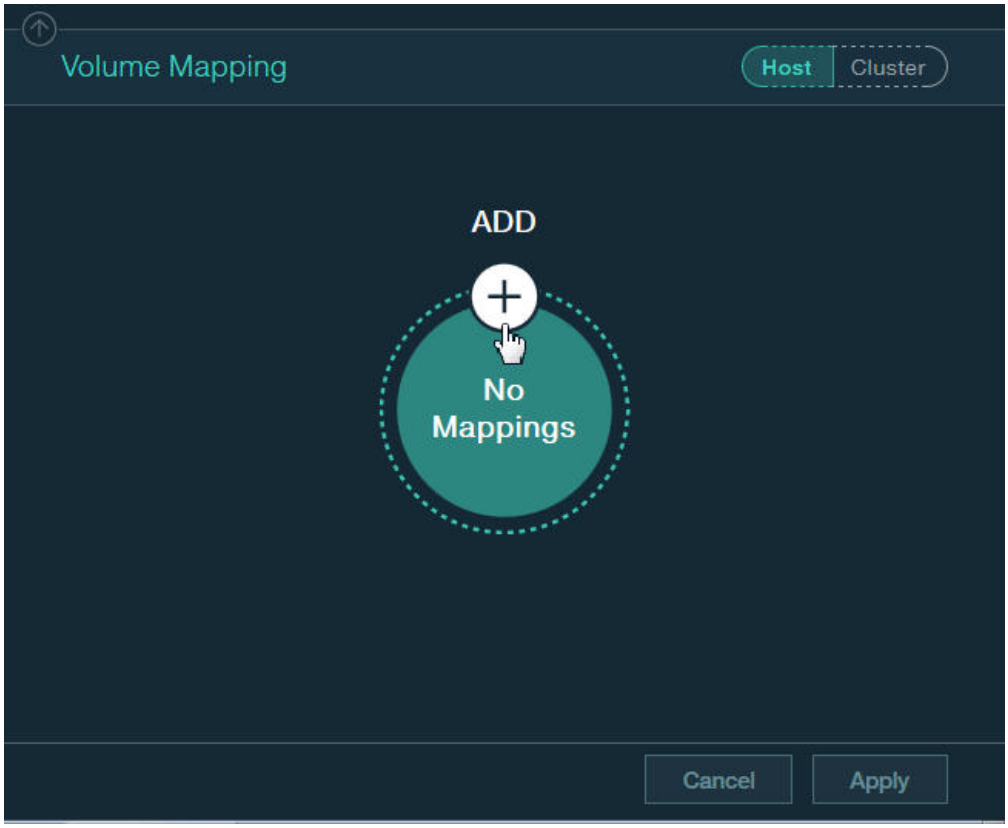

Figure 23. Adding new volume mapping to host

The **Host** and **LUN** drop-down lists are displayed in **Volume Mapping** form.

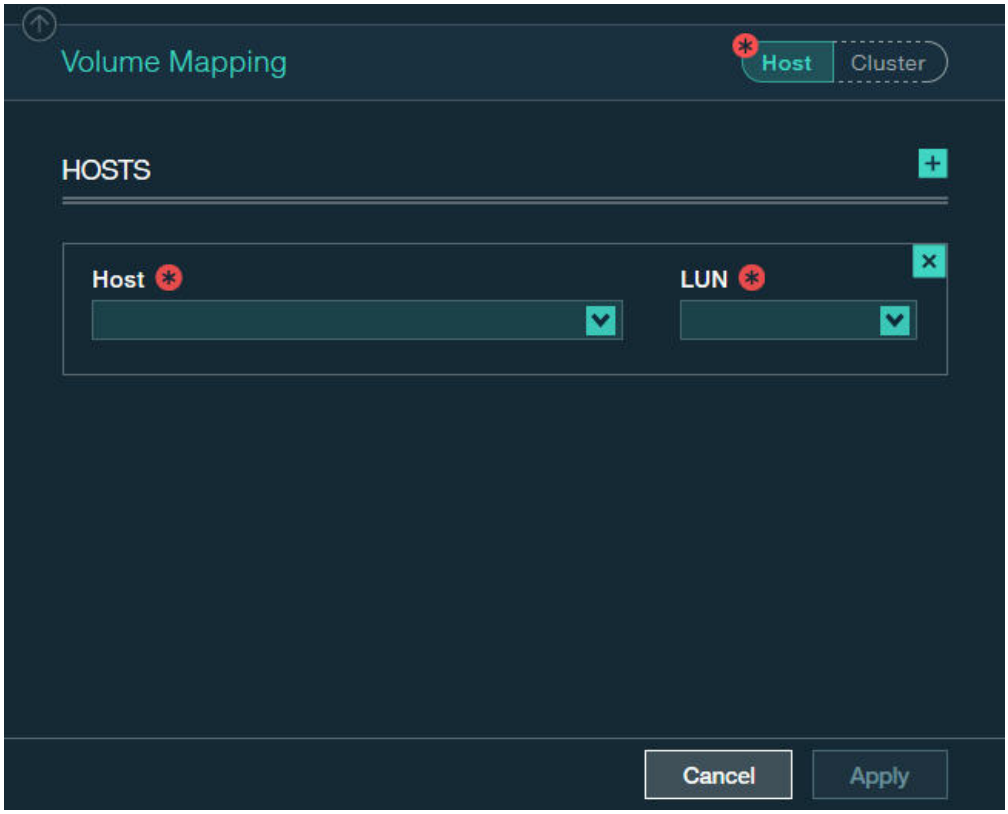

Figure 24. Adding new volume mapping for a host

5. In the **Volume Mapping** form, select a host and a LUN to be mapped, using the respective drop-down lists.
6. Click the plus sign in the right-hand corner if you want to continue the host mapping.
7. Click **Apply** to finish the mapping.

Stage 7: Define recovery ESXi hosts

In this preparation stage you define recovery ESXi hosts.

After mapping the protected volumes to the protected ESXi hosts, use either the XIV GUI or the IBM Hyper-Scale Manager UI to define your recovery (secondary) ESXi hosts at the recovery site.

- "Defining recovery ESXi hosts from the XIV GUI"
- "Defining recovery ESXi hosts from the IBM Hyper-Scale Manager UI" on page 26

Defining recovery ESXi hosts from the XIV GUI

This section applies if you want to use the XIV GUI to define recovery ESXi hosts for XIV and Spectrum Accelerate storage systems.

About this task

After mapping the protected volumes to the protected ESXi hosts, you can start defining your recovery (secondary) ESXi hosts as hosts at the recovery site.

Important: The recovery ESXi hosts should be connected over iSCSI or FC to the recovery storage system. For FC, proper zoning must be predefined.

Procedure

1. On the XIV management GUI, focus on the secondary storage system (at the recovery site), and then go to **Hosts and Clusters** > **Hosts and Clusters**.
2. Click **Add Host**. The Add Host dialog box appears.

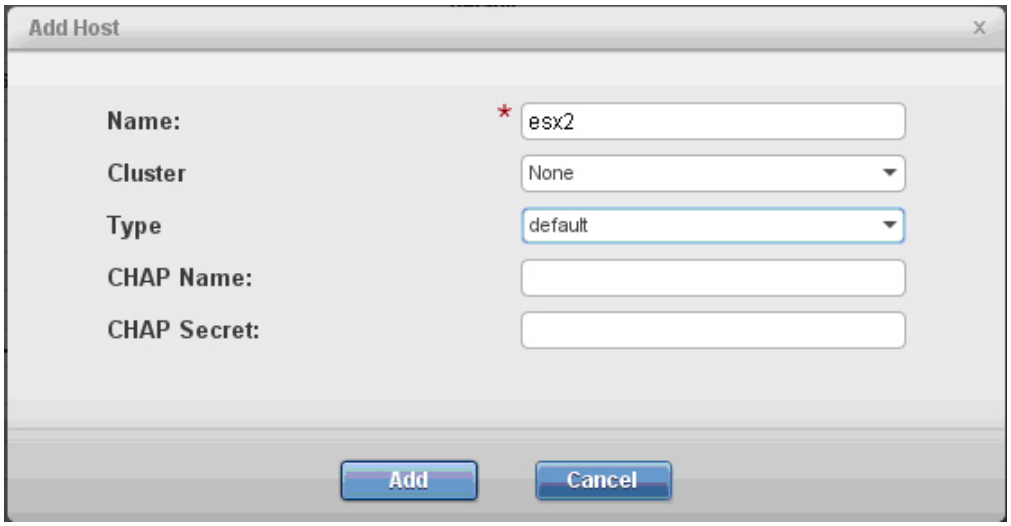

Figure 25. XIV Management GUI – Add Host dialog box

3. Enter the name and details of the recovery host, and then click **Add**. The host is added to the list of hosts.
4. On the list of hosts, right-click the name of the host you have added, and then click **Add Port**.
5. Enter the communication port details, and then click **Add**.

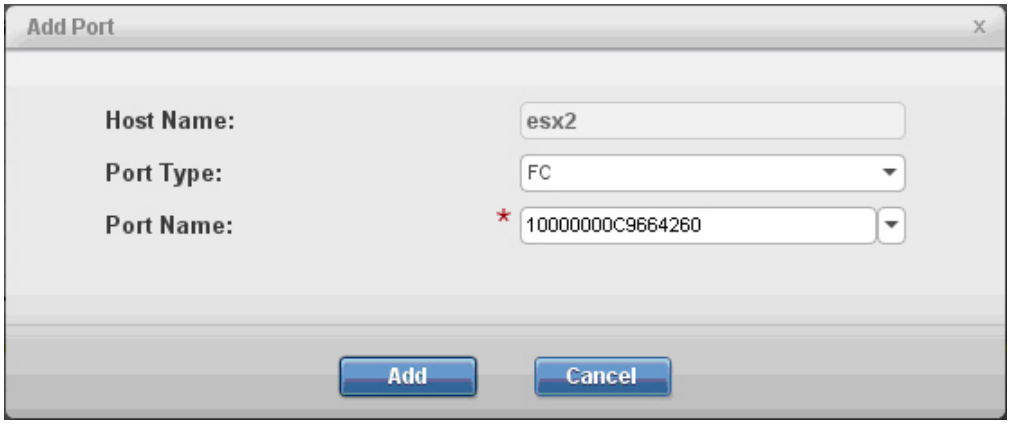

Figure 26. XIV Management GUI – Add Port dialog box

Note: Step 5 repeats for multipathed Fibre Channel (FC) connections.

6. Repeat steps 2 –5 for each recovery host at the recovery site.

Note: The procedure above is for a single host. If some hosts are part of a cluster, go to **Hosts and Clusters** > **Hosts and Clusters**, hold down the SHIFT key and select these hosts. Then, right-click the selection and click **Create a Cluster with Selected Hosts** on the pop-up menu.

Defining recovery ESXi hosts from the IBM Hyper-Scale Manager UI

This section applies if you want to use the IBM Hyper-Scale Manager UI to define recovery ESXi hosts for FlashSystem A9000/A9000R storage systems.

About this task

After mapping the protected volumes to the protected ESXi hosts, you can start defining your recovery (secondary) ESXi hosts at the recovery site.

Important: The recovery ESXi hosts should be connected over iSCSI or FC to the recovery storage system. For FC, proper zoning must be predefined.

Procedure

1. Click the **New** icon on the toolbar at the top and then select **Host**.

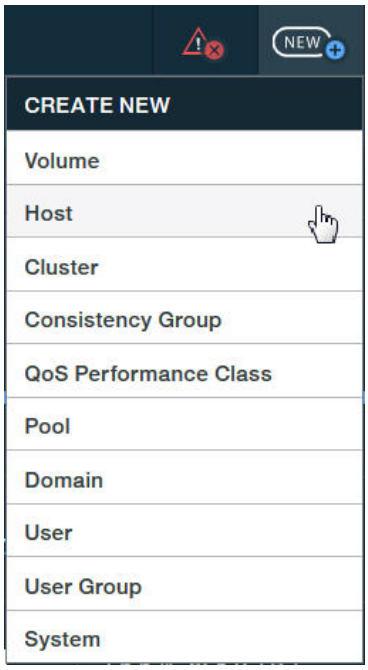

Figure 27. New Host option

The **Add Host** form is displayed.

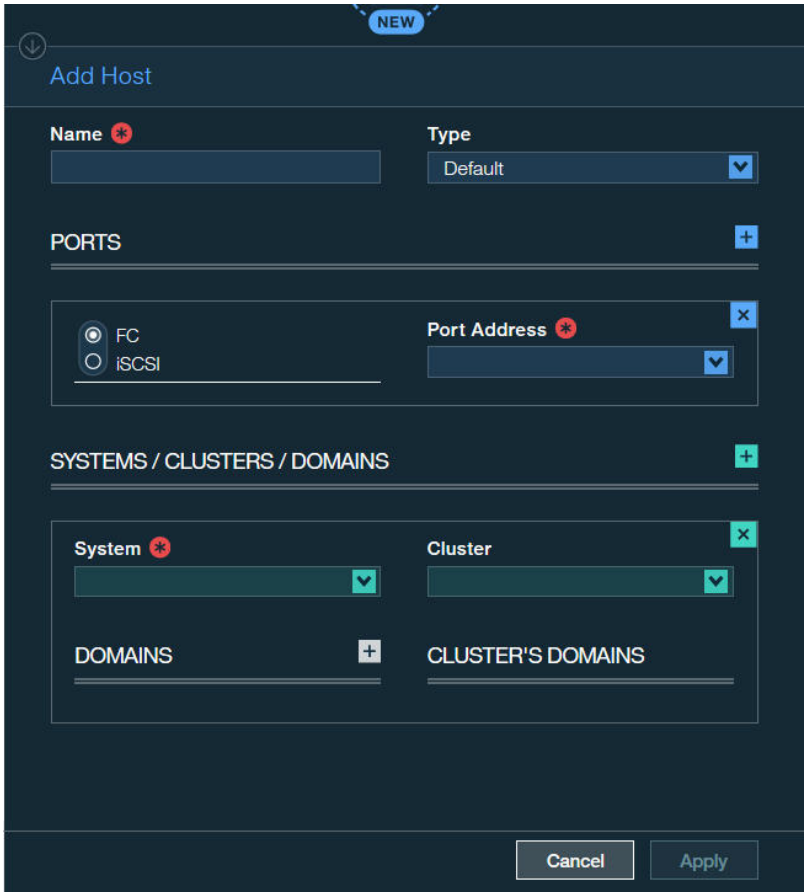

Figure 28. Add Host form

2. Enter the following host details:
   - **Name** – Define name of the host.
   - **Type** – Select the host type from the drop down list.
   - **PORTS** – Select **FC** or **iSCSI** to define the port type. Depending on the selected port type, set the port address as follows:
     - For an FC port – Select the World Wide Port Name (WWPN) of the port from the drop down list.
     - For an iSCSI port – Enter the iSCSI Qualified Name (IQN) of the port.
   - **System** – Select the secondary storage system to which you want to attach the host.
   - **Cluster** – If the host is a member of a cluster, select the cluster name from the drop down list. Otherwise, leave this option blank.
   - **Domain** – Select the storage system domain or domains in which this host should be defined.
   - **Cluster's Domain** – Select the cluster domain or domains in which this host should be defined.
3. Click **Apply**. The host definition is added to the storage system.
4. Repeat steps 1–3 for each recovery host at the recovery site.

Note: The procedure above is for a single host. If some hosts are part of a cluster, go to **Hosts and Clusters Views** > **Hosts**, hold down the SHIFT key and select these hosts. Then, from the Hub and click **Actions** > **Clusters** > **Add/Remove Cluster** to add the hosts to the cluster.

Stage 8: Define mirroring for volumes

In this preparation stage you define mirroring for volumes.

After the recovery hosts are defined as storage system hosts at the recovery site, use either the XIV GUI or the IBM Hyper-Scale Manager UI to create the volume mirroring.

- "Defining mirroring for volumes from the XIV GUI"
- "Defining mirroring for volumes from the IBM Hyper-Scale Manager UI" on page 29

Defining mirroring for volumes from the XIV GUI

This section applies if you want to use the XIV GUI to define mirroring for volumes on XIV and Spectrum Accelerate storage systems.

About this task

After the recovery hosts are defined as storage system hosts at the recovery site, you can start defining the volume mirroring. The mirroring direction is from the protected site to the recovery site, and can be either synchronous (Sync) or asynchronous (Async). If you choose asynchronous mirroring, set the required Recovery Point Objective (RPO).

Procedure

1. On the XIV management GUI, focus on the primary storage system, and the go to **Pools** > **Volumes by Pools**. The list of available storage pools is displayed.
2. Select the storage pool on which protected volumes exist, and then open the volume tree of that pool.

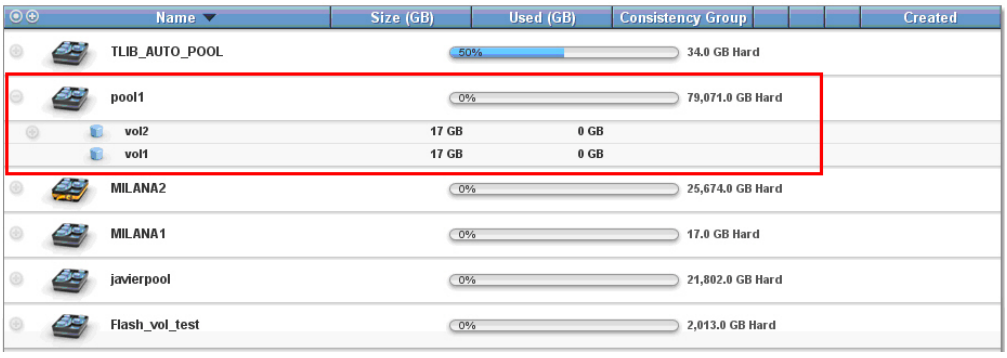

Figure 29. XIV Management GUI – Volumes of a storage pool

3. Double-click a volume to be mirrored, and then click **Create Mirror**. The Create Mirror dialog box appears.

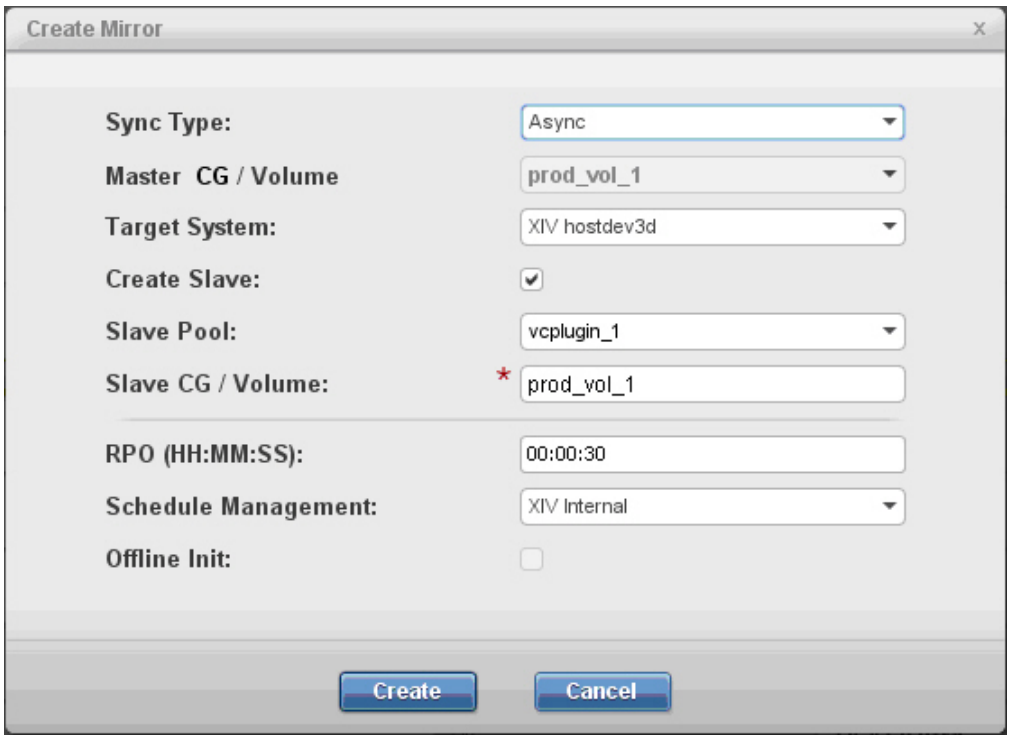

Figure 30. XIV Management GUI – Create Mirror dialog box – for a volume

4. Select the mirroring type (Sync or Async) and enter the relevant mirroring details.
5. Click **Create**. The mirroring is set for the volume.
6. Repeat steps 3 on page 28 – 5 for every volume that requires mirroring.
7. Go to **Remote** > **Mirroring Connectivity**, right-click a newly created volume mirror and then click **Activate**. Repeat this action for all mirrored volumes.

Important: Make sure that the volume mirroring connection is activated for each mirrored volume.

Defining mirroring for volumes from the IBM Hyper-Scale Manager UI

In this preparation stage you define mirroring for volumes on FlashSystem A9000/A9000R storage systems.

About this task

After the recovery hosts are defined as storage system hosts at the recovery site, you can start defining the volume mirroring. The mirroring direction is from the protected site to the recovery site.

Procedure

1. Select **Pools and Volumes Views** > **Volumes**. The list of volumes is displayed.
2. Select one or more volumes to be mirrored. The **Volume** mini-dashboard is displayed.

Figure 31. Volume mini-dashboard

3. From the **Volume** mini-dashboard, click the **Mirror** relation icon to display the empty **Volume Mirroring** form with the **ADD** icon.
4. In the **Mirroring** form, click **ADD** icon to create mirroring.
   The full **Mirroring** form is displayed.

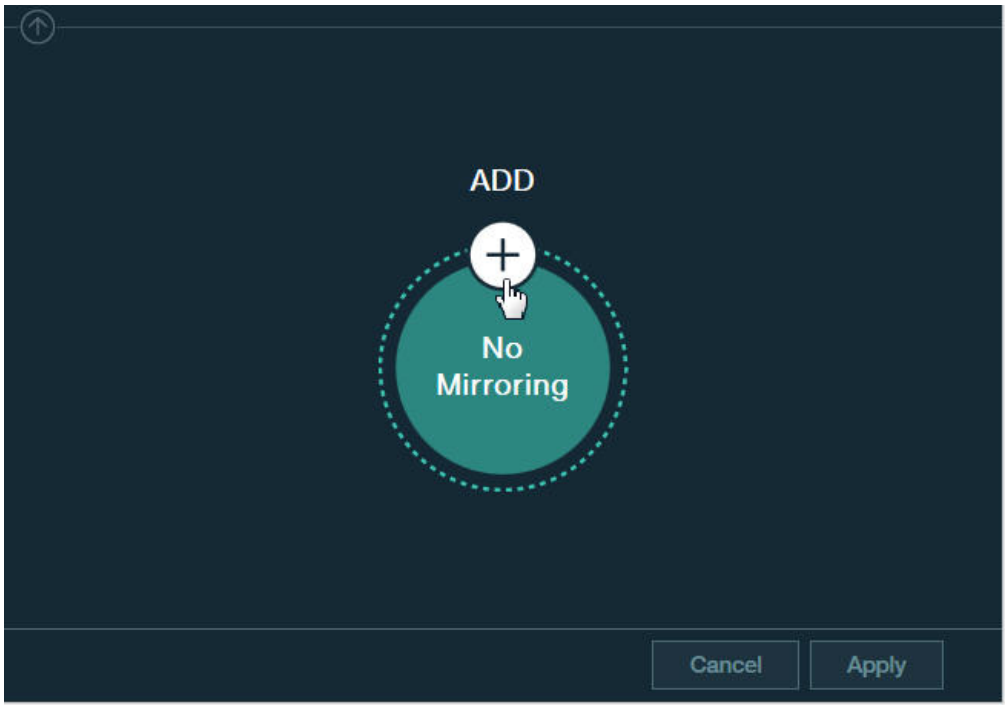

Figure 32. Adding volume mirroring

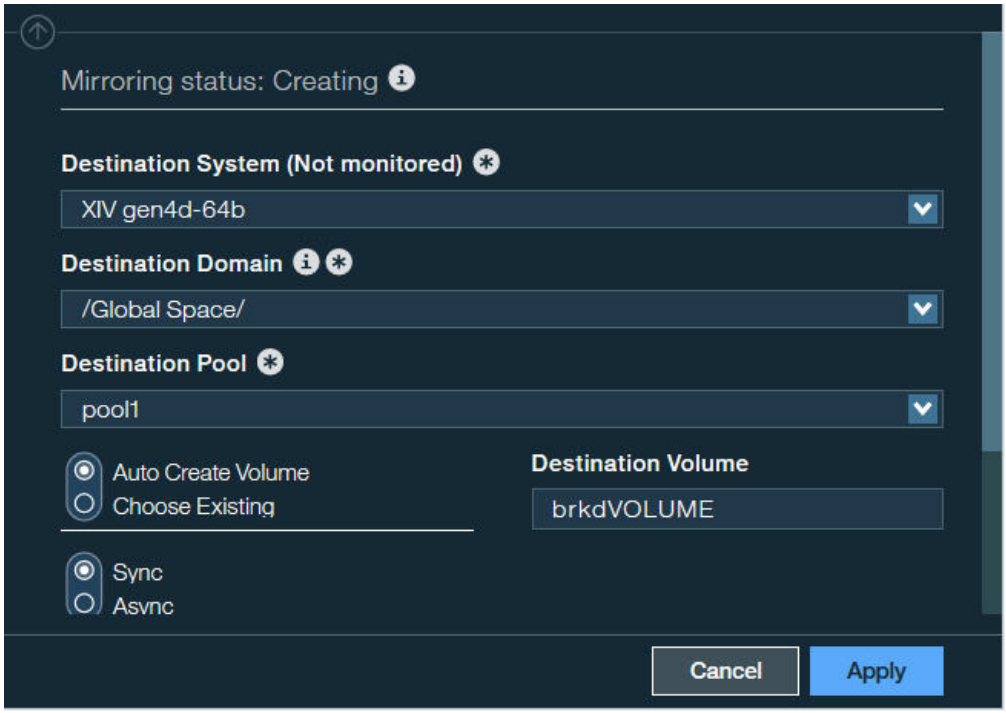

Figure 33. Mirroring form

5. In the **Mirroring** form, select the destination system, domain, pool, and other relevant mirroring details.
6. Click **Apply** to finish the mirroring configuration.

Stage 9: Define consistency groups (optional)

If your volumes require replication in consistency with each other (for example, when a datastore consists of more than one volume), create a consistency group for these volumes.

Use either the XIV GUI or the IBM Hyper-Scale Manager UI to create a consistency group, as explained in the following sections:

- "Defining consistency groups from the XIV GUI (optional)"
- "Defining consistency groups from the IBM Hyper-Scale Manager UI (optional)" on page 34

Defining consistency groups from the XIV GUI (optional)

This section applies if you want to use the XIV GUI to create a consistency group for the volumes that require replication in consistency with each other.

About this task

Create one consistency group for the primary XIV or Spectrum Accelerate storage system, and one for the secondary XIV or Spectrum Accelerate storage system.

Procedure

1. On the XIV management GUI, focus on the primary storage system, and the go to **Volumes** > **Consistency Groups**. The list displays all existing consistency groups and a group of unassigned volumes.

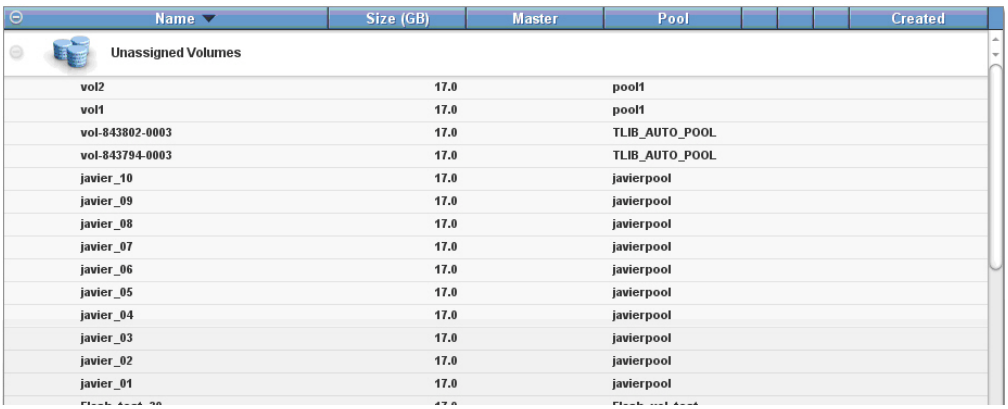

Figure 34. XIV Management GUI – List of unassigned volumes

2. Click **Create Consistency Group**. The Create Consistency Group dialog box appears.
3. Enter the consistency group's name and select the storage pool on which it should be created. Then, click **Create**.
   The Create Mirror dialog box appears.

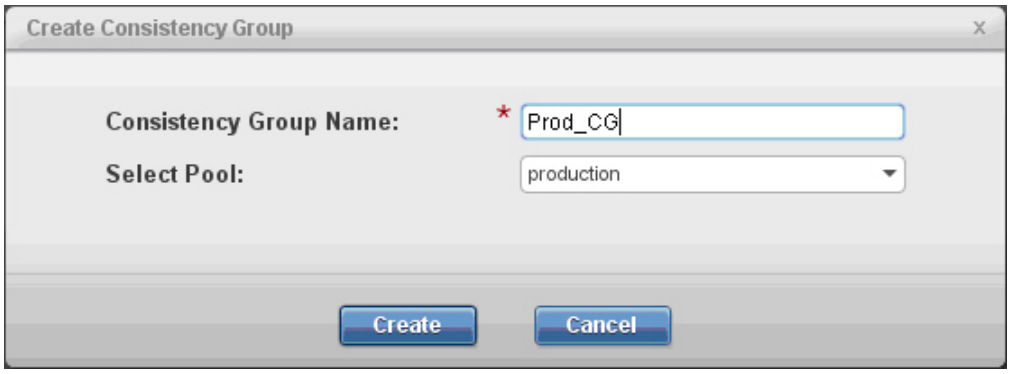

Figure 35. XIV Management GUI – Create Consistency Group dialog box

4. Define mirroring for the consistency group (CG) you have created. The mirroring should be of the same type and characteristics of the mirrored volumes that you intend to add to the group. Then, click **Create**.

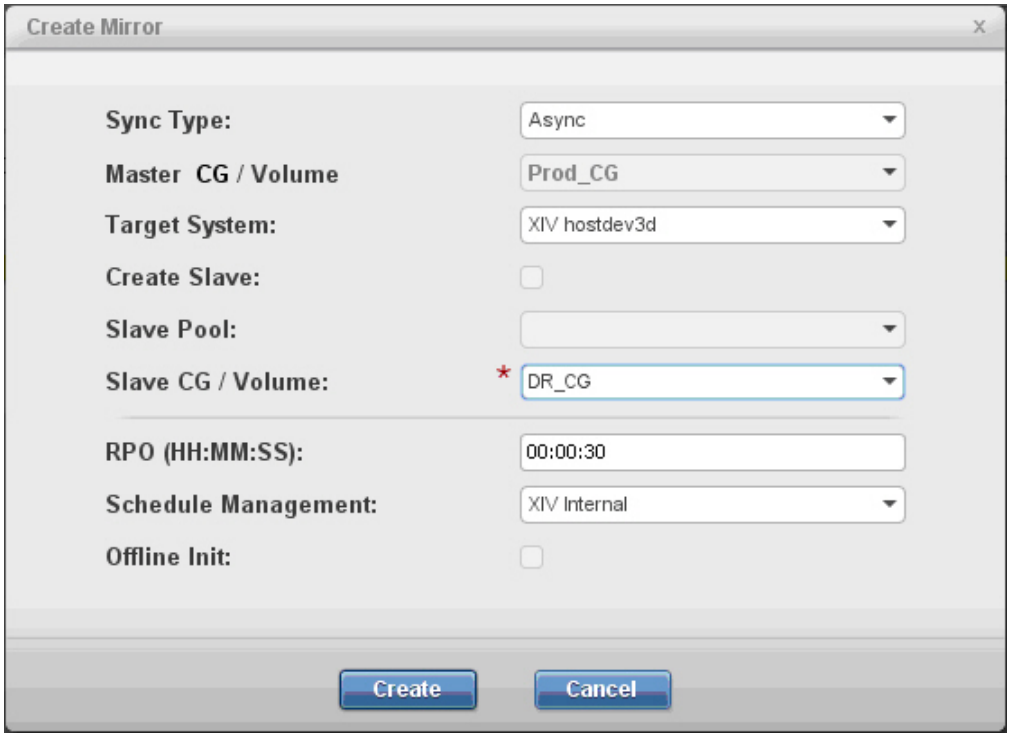

Figure 36. XIV Management GUI – Create Mirror dialog box – for a CG

5. Go to **Remote** > **Mirroring** and add the relevant mirrored volumes to the consistency group.
   The mirrored volumes are now part of the mirrored consistency group.

Figure 37. XIV Management GUI – Add Mirrored Volumes to CG dialog box

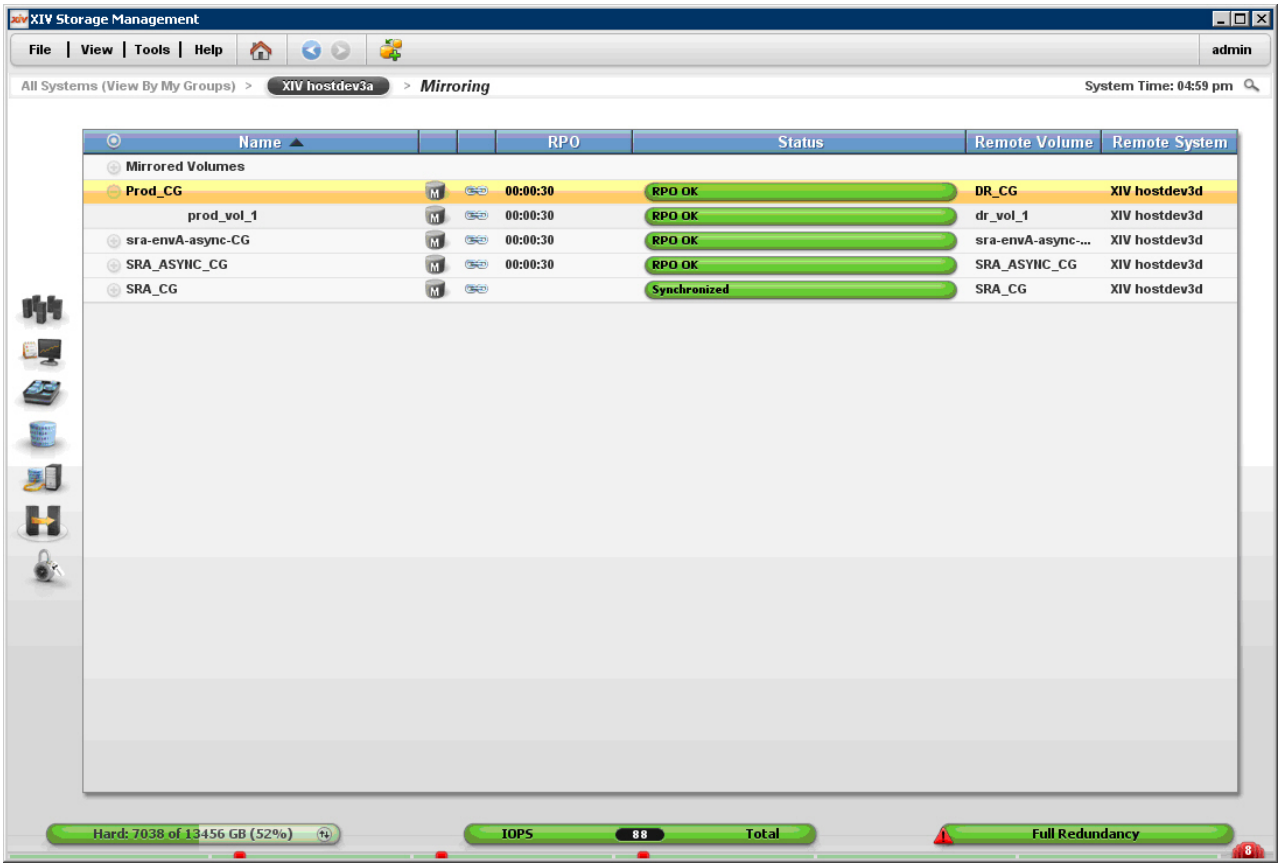

Figure 38. XIV Management GUI – Mirrored volumes in a consistency group

Defining consistency groups from the IBM Hyper-Scale Manager UI (optional)

This section applies if you want to use the IBM Hyper-Scale Manager UI to create a consistency group for the volumes that require replication in consistency with each other.

About this task

Define a mirrored consistency group on FlashSystem A9000/A9000R storage systems, which will contain previously created mirrored volumes.

Procedure

1. Click the **New** icon on the toolbar at the top and then select **Consistency Group**.

Figure 39. New Consistency Group option

The **Create Consistency Group** form is displayed.

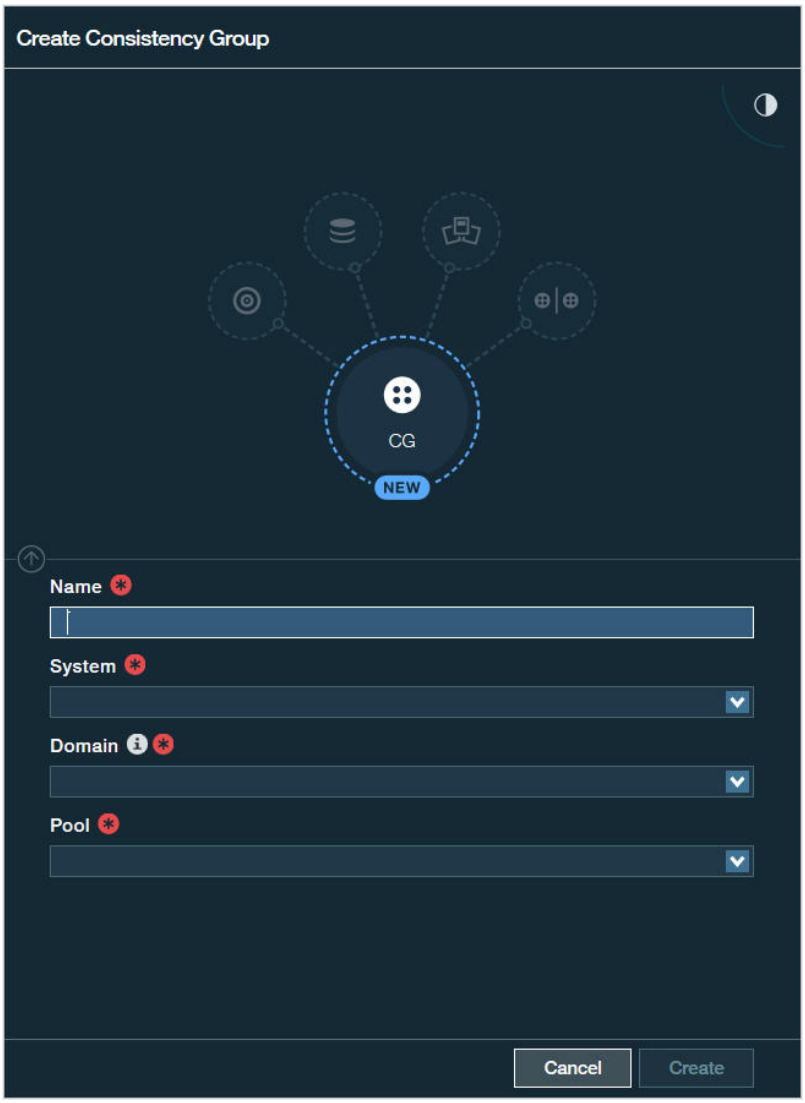

Figure 40. Create Consistency Group form

2. Enter the consistency group's name, storage system, domain and select the storage pool on which it should be created. Then, click **Create**.
3. Define mirroring for the consistency group (CG) you have created. The mirroring should be of the same type and characteristics of the mirrored volumes that you intend to add to the group. Then, click **Apply**.

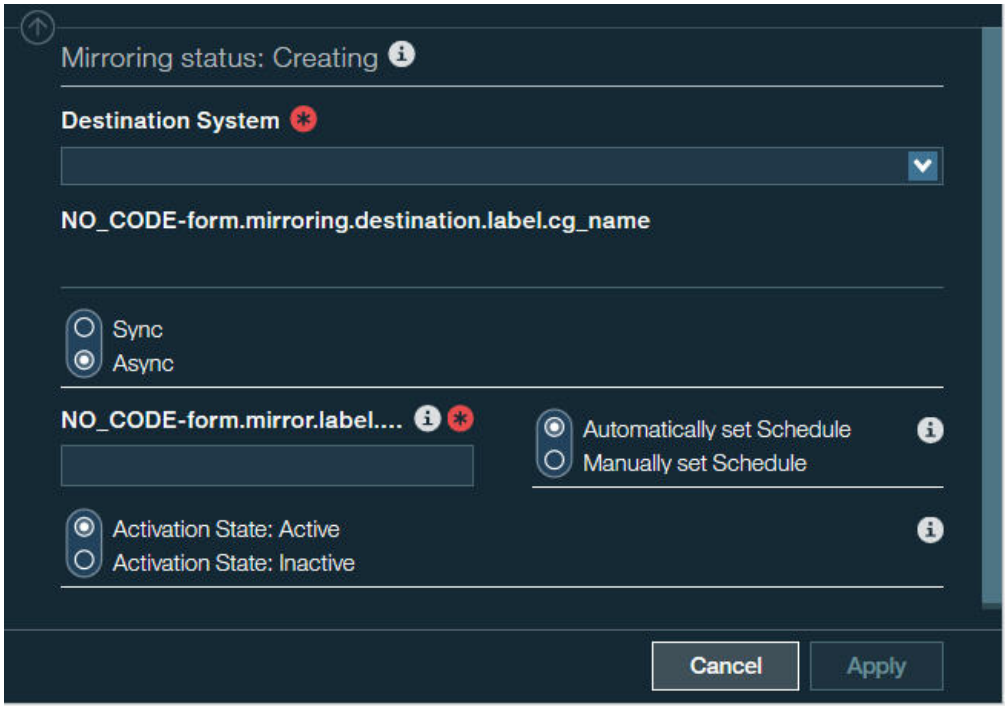

Figure 41. Create Mirror form – for a CG

4. Select **Pools and Volumes Views** > **Volumes**. The list of volumes is displayed.
5. Select one or more mirrored volumes which you want to add to the mirrored consistency group.
6. From the Hub, select **Actions** > **Consistency Group** > **Move to a Group**.

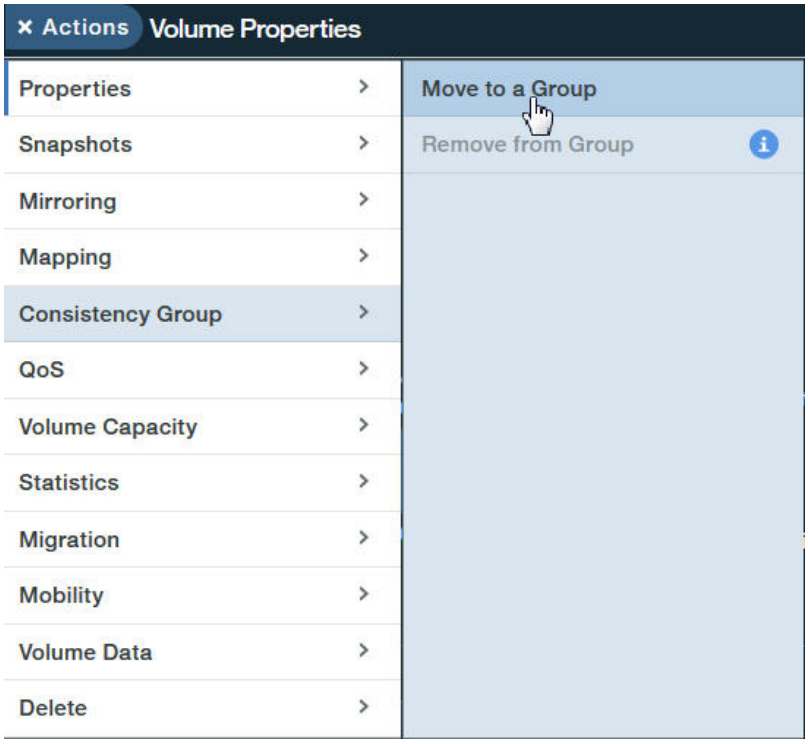

Figure 42. Move Mirrored Volumes to a CG option

The mirrored volumes are now part of the mirrored consistency group.

Chapter 3. Installation

After the required preparation has been performed, you can start the IBM XIV SRA installation.

This chapter describes:

Running the SRA installation wizard

This section describes how to run the IBM XIV Storage Replication Adapter installation wizard.

About this task

Complete the following procedure on the VMware vCenter SRM server to install the IBM XIV SRA.

Note: You can upgrade from version 2.1.0, 2.1.1, or 2.1.1.1 to version 2.3.0 by performing this installation procedure, without having to uninstall the existing version.

Procedure

1. Run the installation package file: .
   `IBM_XIV_Storage_Replication_Adapter-2.3.0-build-x64.exe`
2. From the language selection dialog box, select the language that you want to use in the installation wizard, and then click **OK**.

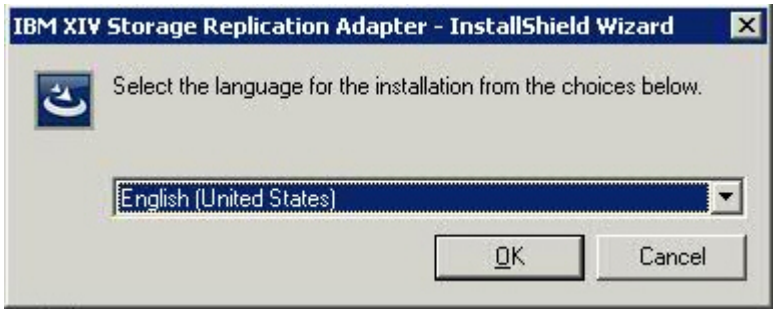

Figure 43. Language selection dialog box

   The installation wizard of IBM XIV Storage Replication Adapter starts.
3. Click **Next**. The License Agreement panel is displayed.
4. Read the IBM License Agreement and then select **I accept the terms in the license agreement**.
5. Click **Next**. The Ready to Install the Program panel is displayed.

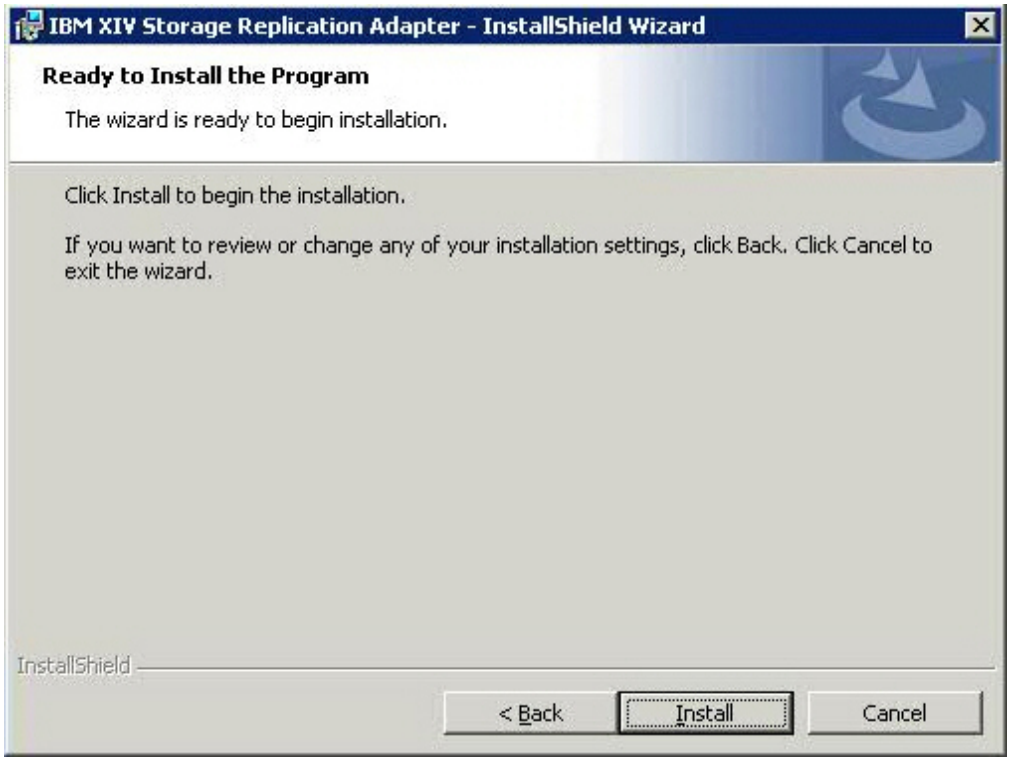

Figure 44. Ready to Install the Program panel

6. Click **Install** to begin the installation.

Note: The IBM XIV SRA files are installed in the SRM installation directory (default: `C:\Program Files\VMware\VMware vCenter Site Recovery Manager`), under the subfolder: `\storage\sra\IBM XIV`

After the installation is complete, the Completed panel is displayed.

7. If you want to display the user guide or release notes for the installed version, keep the appropriate check box selected. Otherwise, clear the check box of the document that you do not want to display. Then, click **Finish**.

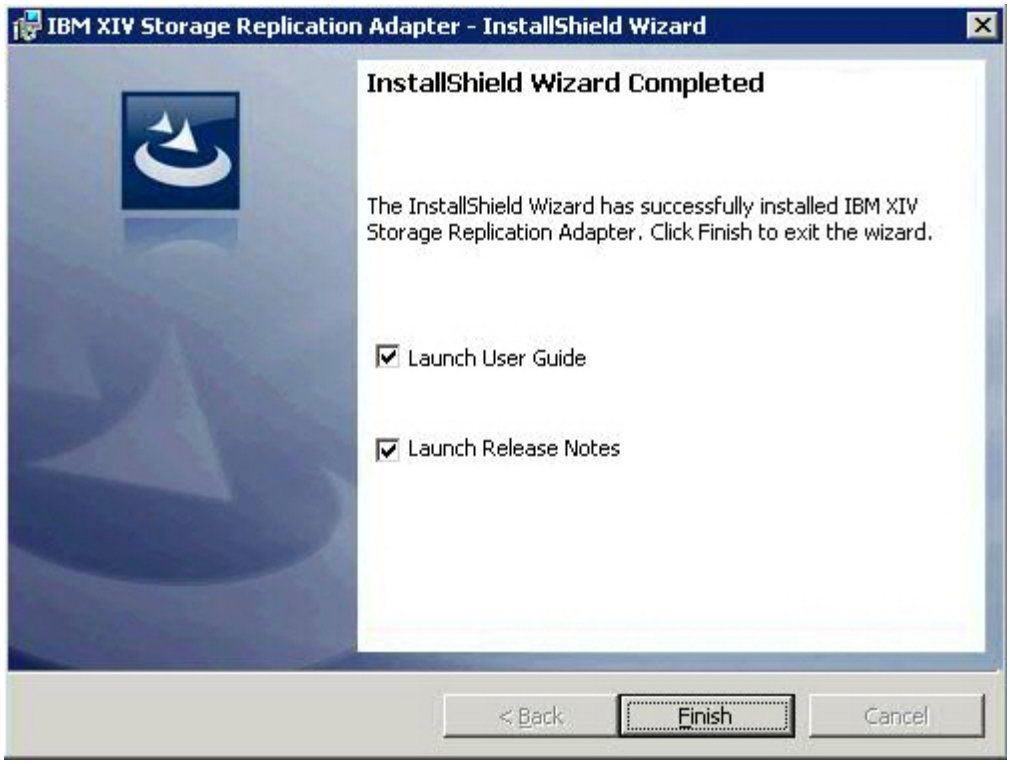

Figure 45. User Guide and Release Notes® check boxes selected

Verifying the SRA installation

After the installation, you can verify that the IBM XIV SRA is properly installed.

Procedure

1. On the vSphere client application, go to **Site Recovery** > **Array Managers**.
2. Click the top hierarchy of a listed array, and then click the **SRAs** tab.

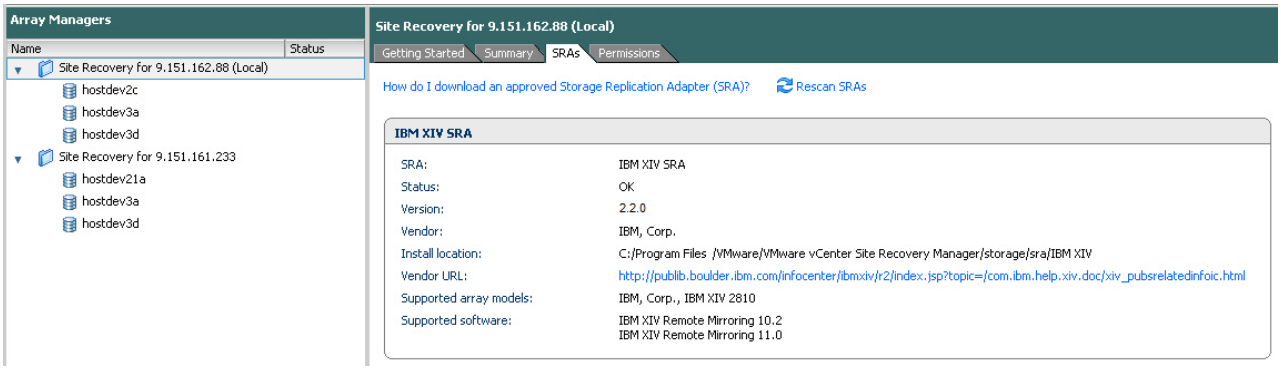

Figure 46. Array Managers – SRAs tab

3. Click **Rescan SRAs** and then verify that the correct IBM XIV SRA version details are displayed.

Removing the SRA software

If you want to remove the IBM XIV SRA from the SRM server, perform the Windows Server software removal procedure.

Procedure

1. From the Control Panel, click **Programs** > **Programs and Features**, and select IBM XIV Storage Replication Adapter from the list of installed programs.
2. Click **Uninstall**. The uninstallation wizard guides you through the uninstallation steps.

Chapter 4. Usage

This chapter describes the usage of the IBM XIV SRA together with VMware SRM for performing dependable Disaster Recovery Planning (DRP) and protecting VMware sites that utilize supported IBM storage resources.

This includes:

Adding a storage system as an Array Manager

After the IBM XIV SRA is installed, you can start adding IBM storage systems (referred to as *array managers*) to your protected and recovery sites, as described in the following procedure.

Procedure

1. On the **Site Recovery** panel, select a site to which you want to add a storage system, select the **Array Based Replication** tab and click the + sign to launch the **Add Array Manager** wizard.
   The SRM Add Array Manager wizard appears.

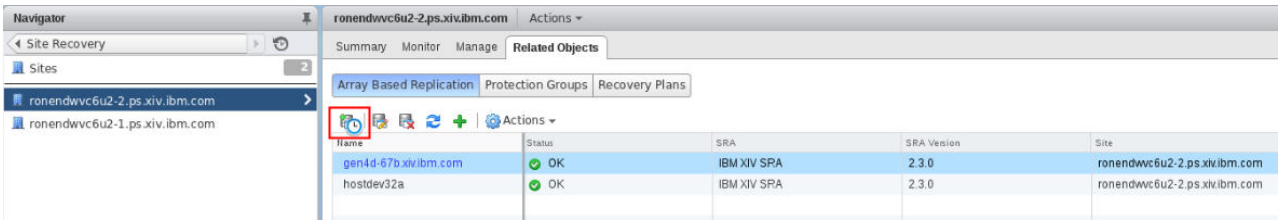

Figure 47. Sites panel

2. In the **Options** dialog box of the Add Array Manager wizard, select an option of adding a single array manager or two managers, one for each site. Then, click **Next**.

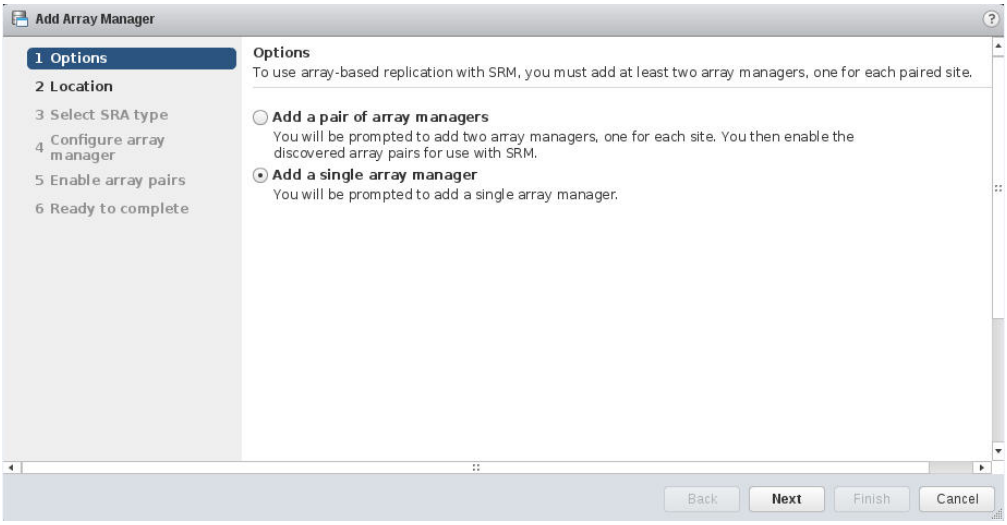

Figure 48. Add Array Manager – Options

The **Location** panel is displayed .

3. In the **Location** panel, select a protected or recovery site. If you chose to add a pair of managers in the previous step, you would be prompted to select the pair of sites. Then, click **Next**.
   The **Select SRA Type** panel is displayed. The wizard automatically detects the

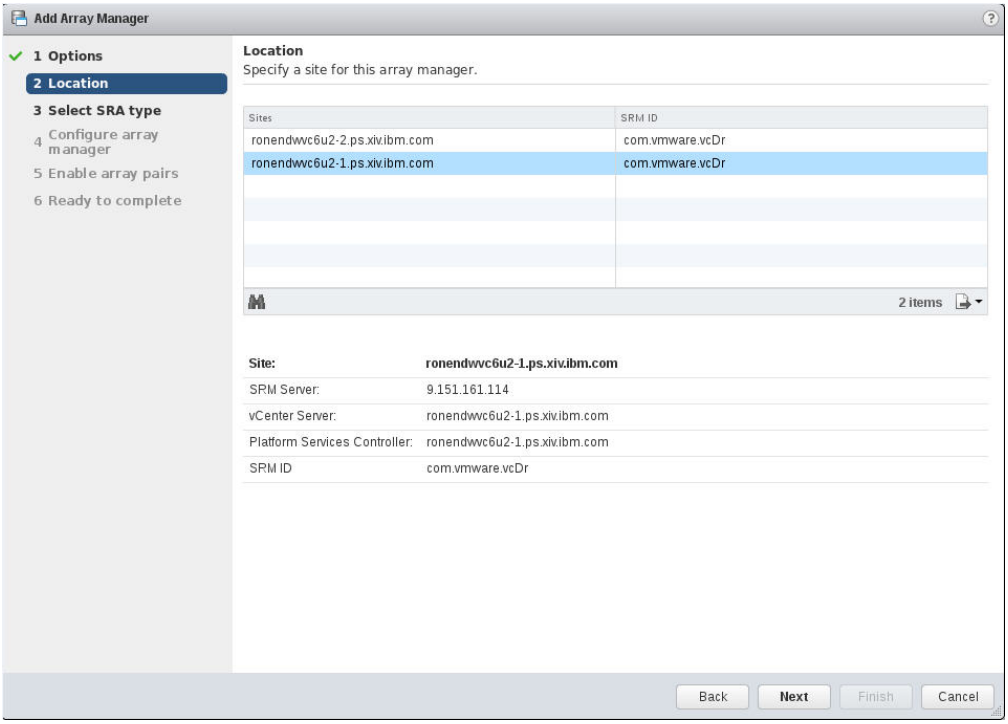

Figure 49. Add Array Manager – Location

type of Storage Replication Adapters (SRAs) installed on the site and status of SRA.

4. In the **Select SRA Type** panel, verify the displayed SRA information. Then, click **Next**.

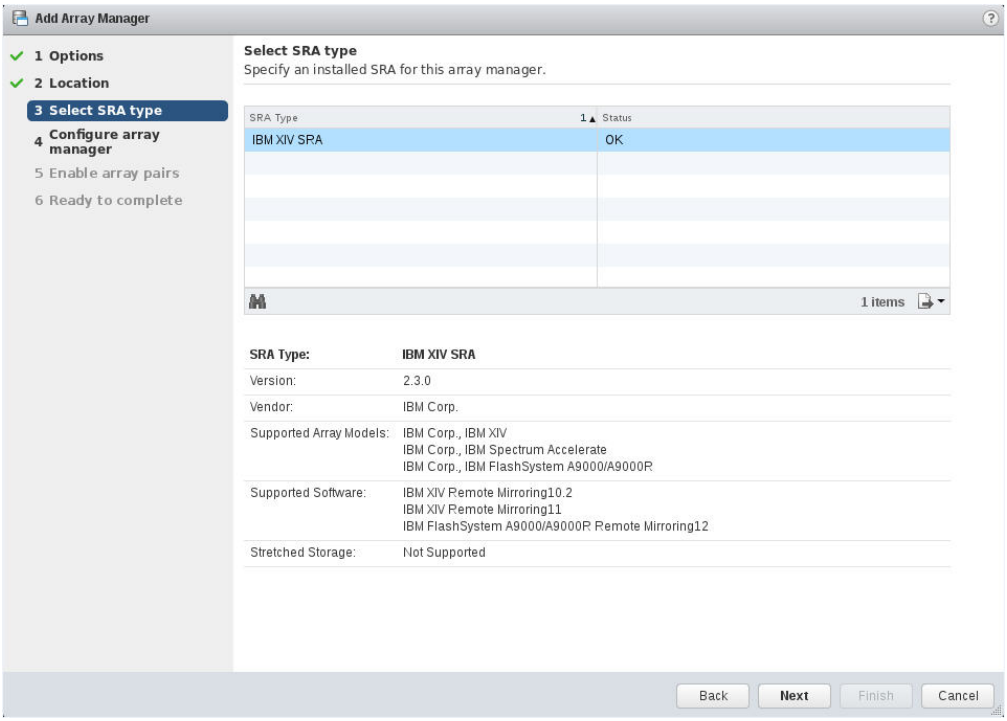

Figure 50. Add Array Manager – Select SRA type

The **Configure Array Manager** panel is displayed.

5. In the **Configure Array Manager** panel, enter the following connection parameters for the storage system that you want to add. Click **Next**, when done.
   - **`Display Name`** – A name for the storage system (array manager).
   - **`First management IP address / hostname`** – Primary IP address or hostname of the storage system that you want to add.
   - **`Second management IP address / hostname`** – Alternative IP address or hostname of the storage system that you want to add.
   - **`Third management IP address / hostname`** – Another alternative IP address or hostname of the storage system that you want to add.

Important:
- You must fill in all three text fields.
- If you have only two addresses, you can use the primary address in the First text field, and use the second address in the Second and Third text fields.
- If you have only one address, enter it in all three text fields.

   - **`Username`** – User name for accessing the specified storage system.
   - **`Password`** – Password for accessing the specified storage system.

Important: You must use login credentials of a storage administrator.

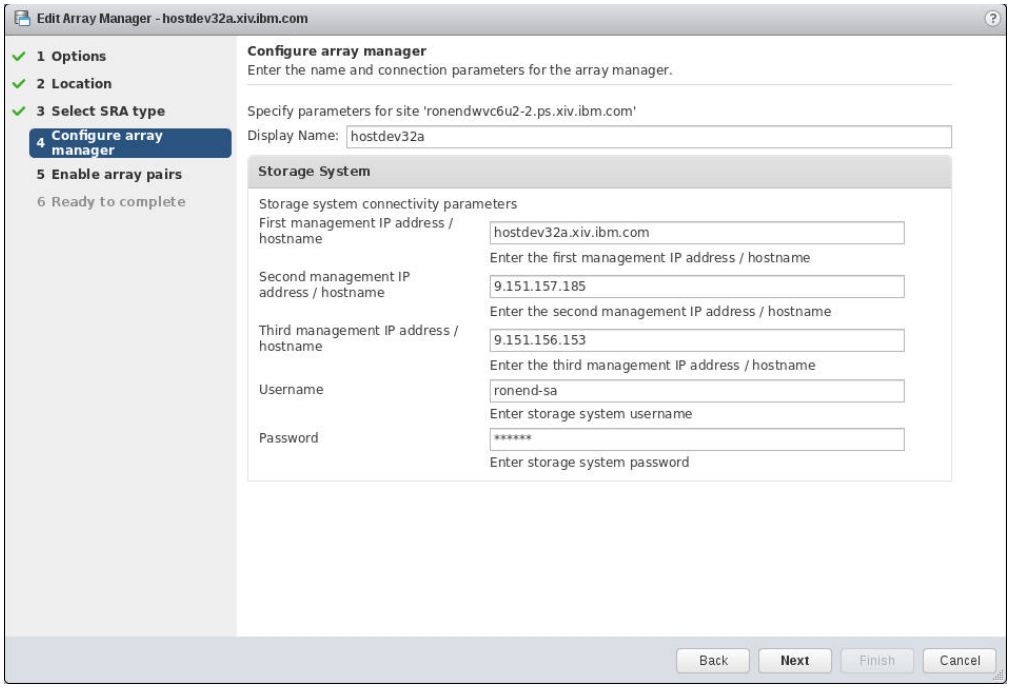

Figure 51. Add Array Manager – Configure array manager

The **Enable Array Pairs** panel is displayed.

6. In the **Enable Array Pairs** panel, select the relevant check boxes to enable the array pairs. Then, click **Next**.

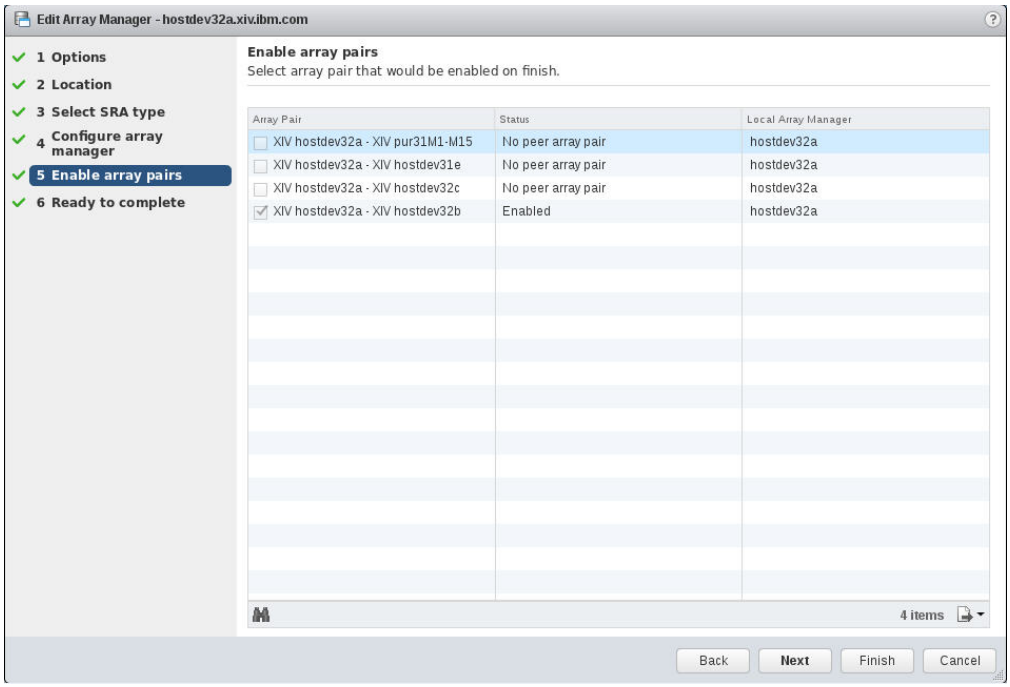

Figure 52. Add Array Manager – Enable array pairs

7. If the connection to the storage system is successful, a message about the connection success is displayed. Review the specified information for array manager, and then click **Finish** to exit the wizard. If the connection is not

successful, click **Back** and check the storage system connection parameters.

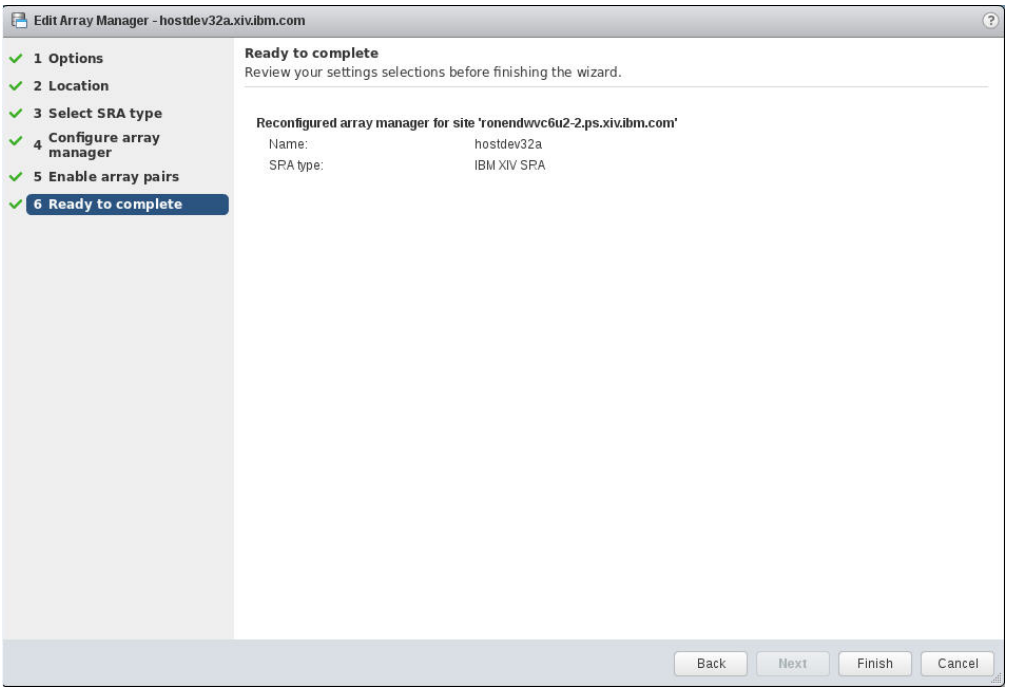

Figure 53. Add Array Manager – Ready to Complete

Initiating SRA operations

The IBM XIV SRA supports different VMware vCenter SRM operations, as detailed in the following table.

Table 1. IBM XIV SRA operation types

Operation type	Description or reference
Add supported IBM storage systems	See "Adding a storage system as an Array Manager" on page 43.
Refresh volume information (display updated information)	See Figure 56 on page 49.
Create protection groups and recovery plans for storage volumes and datastores that utilize these volumes.	See Figure 55 on page 49.
Test (failover test)	Test the storage replication configuration by creating snapshots at the recovery site and then mapping these snapshots, in the following manner: • In case of synchronous mirroring, the snapshots are created at the recovery site and are mapped to the ESXi host or hosts. • In case of asynchronous mirroring, the last replicated snapshot is duplicated at the recovery site and then mapped to the ESXi host or hosts. • At the end of the failover test workflow, these temporary snapshots are unmapped and deleted.

Table 1. IBM XIV SRA operation types (continued)

Operation type	Description or reference
Cleanup	Delete existing snapshots after the Test operation. Only the snapshots that were created by the IBM XIV SRA are deleted.
Recovery (failover)	Switch the operation to the recovery site in case of a planned migration or an unplanned disaster (when the protected site is unavailable), in the following manner: 1. At the recovery site, the XIV SRA creates snapshots of the volumes as backup. If the recovery is part of a planned migration (as opposed to unplanned disaster), the protected site volumes are first locked to read-only state. 2. The XIV SRA promotes the recovery site volumes to Master volumes (role). 3. The XIV SRA maps these volumes to the ESXi host or hosts.
Reprotect	Reverse the replication direction and mirroring from failed-over devices to the primary protected devices, in the following manner: 1. The XIV SRA creates a fail-safe snapshot of the previously protected volumes. 2. The XIV SRA unmaps the volumes at the original protected site and sets these volumes as the mirror targets. 3. The XIV SRA changes the role of the previously protected volumes to Slave volumes (role). 4. The XIV SRA activates the mirroring and restores the replication between the two sites.

Note: Depending on the mirroring type:

- If the mirroring is asynchronous, the IBM XIV SRA starts the synchronization job before the initiation of the Test, Recovery, and Reprotect operations.
- If the mirror is synchronous, the IBM XIV SRA only verifies that the mirroring state is indeed synchronized before initiating the Test, Recovery, and Reprotect operations.

Tip:

- To better visualize the Test, Recovery, and Reprotect operations, see "Concept diagram" on page 1.
- For more information about the snapshot aspects of Test, Recovery, and Reprotect, see "Snapshot creation principles" on page 50.

The following figures show the typical contents of the following tabs, which are available when a specific storage system is selected on the SRM Array Managers panel:

- **Summary** – Displays general details regarding the selected storage system and its interoperability with the IBM XIV SRA
- **Array Pairs** – Displays the details of storage systems that are paired with the selected storage system. You can enable or disable the pairing as needed.

- **Devices** – Displays the details of mirrored volumes that are defined on the selected storage system, including information regarding the mirroring direction, remote volume, related datastore, protection group and consistency group.

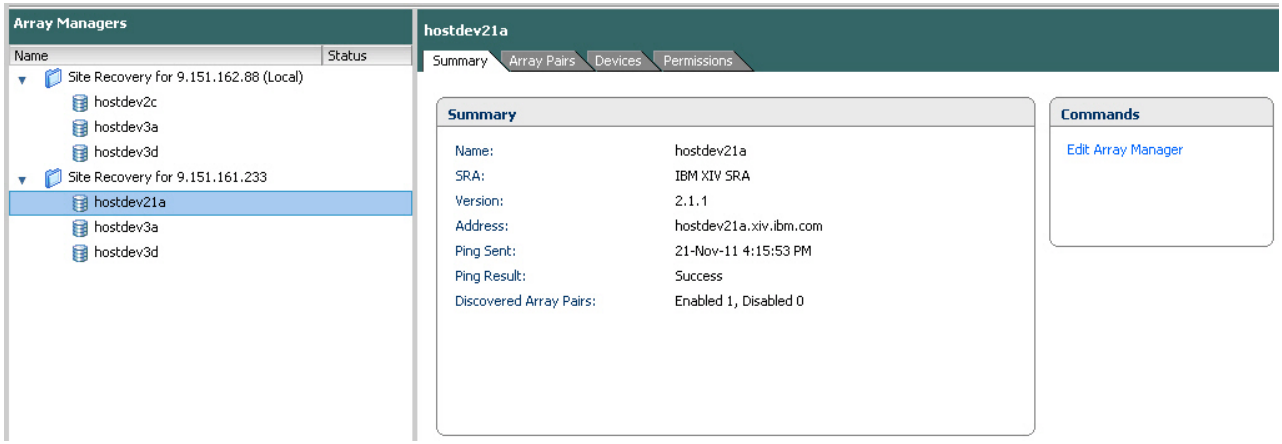

Figure 54. Array Managers – storage system – Summary tab

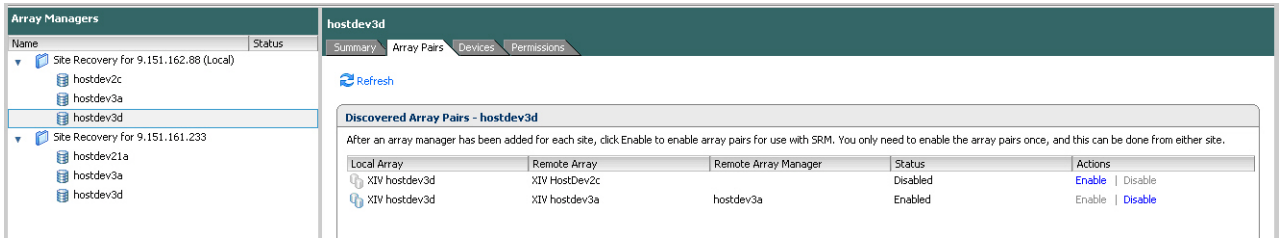

Figure 55. Array Managers – storage system – Array Pairs tab

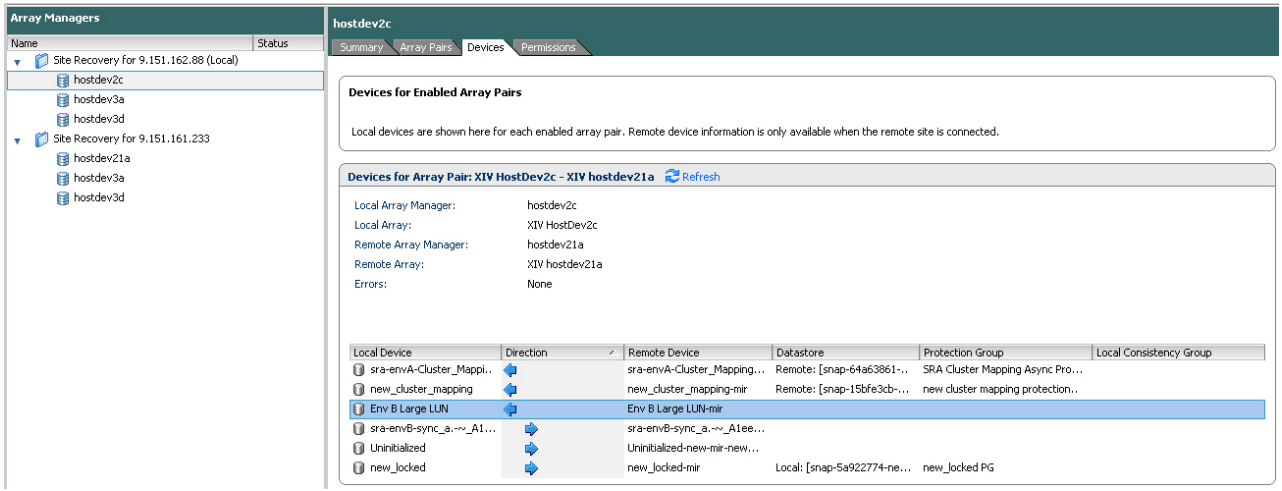

Figure 56. Array Managers – storage system – Devices tab

For more detailed information about how to operate Site Recovery Manager and perform complete DRP for your VMware server sites, refer to the relevant VMware vCenter Site Recovery Manager documentation.

Snapshot creation principles

Snapshots are created when the following SRM operations are initiated: Test, Recovery, and Reprotect.

Table 2 summarizes the snapshot creation principles per SRM operation type.

Table 2. SRM operations and snapshot creation

VMware vCenter SRM operation	Results	Snapshot name format
Test (a site-to-site failover test is performed)	Snapshots of the target volumes are created, unlocked for read-write, and then mapped and used at the recovery site. **Note:** These volume snapshots are unmapped and deleted when the Cleanup operation is initiated after the Test operation is concluded.	`sra_test_<volume name>_<time stamp>`
Recovery (a site-to-site failover is performed)	Snapshots of the target volumes are created at the recovery site before these volumes are opened for read-write operations.	`sra_synced_<volume name>`
Reprotect (the previously protected site becomes the recovery site)	Snapshots of the original source volumes are created before these volumes can be used as the mirroring target.	`sra_synced_<volume name>`

Note: When using consistency groups, the name of each consistency group replaces the volume in the snapshot name. For more information about consistency groups, refer to the relevant IBM storage system documentation.

To view the history log of these SRM operations, click **Recovery Plans** > **History**.

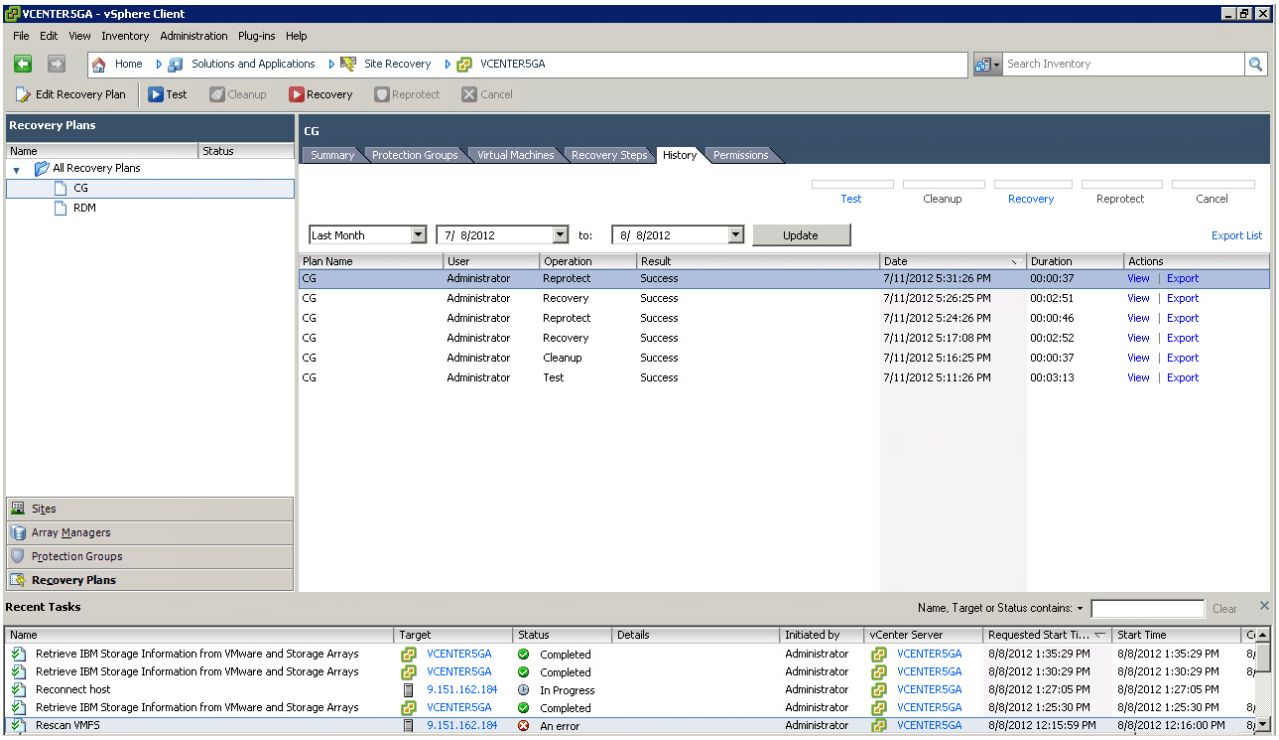

Figure 57. Recovery Plans – History tab

Chapter 5. Best practices

This chapter summarizes recommended practices when using the IBM XIV SRA.

Consider the following recommendations for:

- Storage pool snapshot size
- Naming convention
- Volumes in a consistency group
- Immediate log collection
- Reversing replication roles

Storage pool snapshot size

Consider allocating extra storage pool snapshot space for storage volumes on XIV and Spectrum Accelerate storage systems.

As mentioned in "Verifying the mirroring configuration" on page 5, the storage pools that contain the replicated volumes at both the protected and recovery sites should have sufficient size for creating the volume snapshots.

For XIV and Spectrum Accelerate storage systems, the requirement is to allocate a minimum of 17 GB for each volume, with additional 17 GB as spare space. No such limitation exists for FlashSystem A9000 and A9000R.

As a best practice, if your volumes are working in a high write rate, consider allocating larger storage pool space for snapshots.

Naming convention

Naming storage pools and volumes across different sites might need identical names.

To avoid confusion and to attain a 100% duplicated recovery site, give identical names to the storage pools and volumes at both the protected and recovery sites.

Volumes in a consistency group

If the volumes of a single datastore are not grouped together, datastore consistency issues may arise.

To ensure datastore consistency in Recovery or Test operations, place all volumes of a single datastore in one consistency group. For more information about consistency groups, refer to the relevant IBM storage system documentation.

Immediate log collection

The SRA log information might be overwritten due to fast log filling and rotation.

To ensure that the full information is provided to IBM Support in case of a technical issue, it is recommended to collect the SRA log immediately, as explained in "Checking the log file" on page 55.

Reversing replication roles

When mirroring is enabled, the master volume or consistency group is designated as 'primary' and the slave volume or consistency group is designated as 'secondary'. If for any reason, the replication roles have been reversed, the IBM XIV SRA may fail to identify the current replication state properly.

To avoid replication failure, use the following XCLI commands:

- **mirror_list -x** to check the current replication role designations
- **mirror_change_destination** to switch the volume or consistency group replication roles

For full description of the relevant XCLI commands, refer to the relevant IBM storage system documentation.

Chapter 6. Troubleshooting

This chapter can help you solve technical problems that you may encounter when using the IBM XIV SRA.

If you encounter an error, refer to the following troubleshooting sections:

- "Checking the log file"
- "Handling warning and error messages" on page 56

Note: For up-to-date information about known issues and possible workarounds, refer to the latest IBM XIV Storage Replication Adapter release notes.

Checking the log file

Events are recorded separately at each site in a log file (each site with its own log file).

About this task

The IBM XIV SRA log file records events at the local site. When encountering an issue and you are not sure whether the problem is at the local site or the remote site, you can collect a log file from the local site as well as from the remote site. These two log files may provide helpful information.

Note:

- It is recommended to always attach the log files when opening a new support request. In most cases you will be requested to provide the log file so that the support team could have more detailed information about the technical problem you encountered.
- Upon any technical issue that you might encounter, try to collect the SRA log immediately or as fast as possible, as it might be overwritten due to rapid log file filling and rotation.

Perform the following procedure to retrieve the SRA log together with other SRM logs at a given site (local or remote).

Procedure

1. From the vSphere Client Home page, go to **Solutions and Application** > **Site Recovery** > **Sites**.
2. Right-click on the local site name and then click **Export System Logs**.

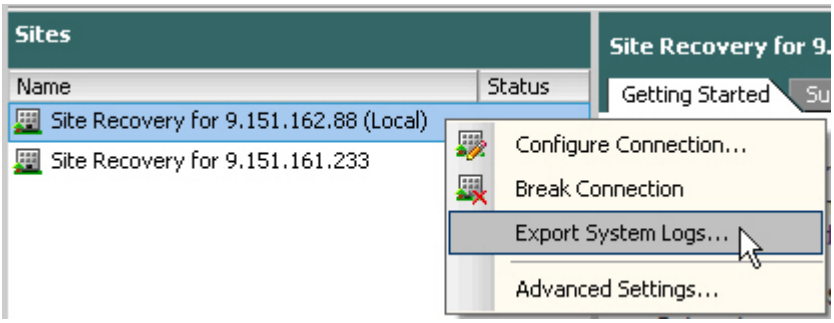

Figure 58. Clicking Export System Logs

3. Click **Browse** to set the directory to which you want to export the log file, and then click **OK**.

Note: When a volume mapping operation fails (for example, when the specified FC ports do not belong to any storage system host), the Test or Failover operations fail. However, SRM does not display a proper message, so the SRA log file can provide indication regarding the mapping failure.

Handling warning and error messages

The following tables summarize the different possible warnings or errors you might encounter when working with the IBM XIV SRA.

Table 3 lists the warning messages, and Table 4 on page 57 lists the error messages.

Table 3. IBM XIV SRA warning messages

Warning code number	Warning text	Recommended action
500	The replication process for this device is already in progress.	No further action is required.
2001	No access groups were provided during the Failover Test operation. Snapshots were created but could not be mapped.	Check the SRA log file, request assistance from your storage administrator, or open a support request.
2002	Snapshot space in the storage pool may exceed its limit if snapshots are created for the requested groups or devices.	Extend the snapshot size for the pool, or delete old snapshots.
2003	Could not find hosts on the storage system that matches the provided initiators.	Verify that your ESX/ESXi hosts are defined in the storage arrays.
2004	The mapping operation has failed.	Check the SRA log file, request assistance from your storage administrator, or open a support request.

Table 4. IBM XIV SRA error messages

Error code number	Error text	How to resolve
100	Command is not supported. An internal error has occurred.	Open a support request and receive specific guidance from the support team. In your request, attach the relevant log file or files.
101	Locale is not supported. An internal error has occurred.	Change to English locale or open a support request and receive specific guidance from the support team.
1001	Failed to connect.	Make sure that the IP address or hostname is correct, and verify your user credentials.
1002	Already in Test state.	Check the SRA log file, request assistance from your storage administrator, or open a support request.
1003	The snapshot for this storage device was not found.	Check the SRA log file, request assistance from your storage administrator, or open a support request.
1004	Removal of mapping for this device has failed.	Check the SRA log file, request assistance from your storage administrator, or open a support request.
1005	The secondary volume or consistency group is not in consistency state.	Wait for the initialization or synchronization to complete, and then retry the operation.
1006	Failover operation could not be performed for this device.	Check the SRA log file, request assistance from your storage administrator, or open a support request
1007	The device could not be verified for a failover operation.	Check the SRA log file, request assistance from your storage administrator, or open a support request.
1008	The mapping removal and snapshot deletion operations could not be performed.	Check the SRA log file, request assistance from your storage administrator, or open a support request.
1009	Could not find the remote mirroring definition for the storage device.	Check the SRA log file, request assistance from your storage administrator, or open a support request.
1010	The restore replication operation has failed.	Check the SRA log file, request assistance from your storage administrator, or open a support request.
1011	The reverse replication operation has failed.	Check the SRA log file, request assistance from your storage administrator, or open a support request.

Table 4. IBM XIV SRA error messages (continued)

Error code number	Error text	How to resolve
1012	Could not establish an immediate synchronization.	Check the SRA log file, request assistance from your storage administrator, or open a support request.
1013	There is insufficient space allocated in the storage pool for creating new snapshots for this device.	Extend the storage pool, or delete old snapshots.
1014	The operation has failed.	Check the SRA log file, request assistance from your storage administrator, or open a support request.
1015	SRA internal error has occurred.	Open a support request and provide the information detailed in the log file.
1016	The failover preparation operation has failed.	Check the SRA log file, request assistance from your storage administrator, or open a support request.
1017	There is no mirror connectivity between the protected site and the recovery site.	Request assistance from your storage administrator.
1018	Failed to create snapshot for the storage device.	Check the SRA log file, contact your storage administrator, or open a support request.
1019	Already in Failover state.	Check the SRA log file, request assistance from your storage administrator, or open a support request.
1020	There are no target mirroring connections for this storage device.	Make sure that the mirroring connectivity for your recovery storage device is properly set. For assistance, contact your storage administrator.
1021	Unsupported storage system microcode version has been detected.	Make sure that the microcode version of the relevant storage system that you are trying to connect is supported. For more information, refer to the release notes.
1022	Insufficient user privileges.	Make sure that the user account you are using has the required privileges.
1023	Mirroring error: inactive mirroring.	Check the SRA log file or use the XIV management GUI or the Hyper-Scale Manager UI to find the cause of this error.

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