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Product References

This document references the following CA products:

- CA ARCserve® Replication
- CA ARCserve® High Availability (HA)
- CA ARCserve® Assured Recovery
- CA ARCserve® Content Distribution

Throughout this Guide, the term, CA ARCserve RHA, is used to represent the entire product family, which was previously sold as CA XOsoft Replication (WANsync) and CA XOsoft High Availability (WANsyncHA).

Contact Technical Support

For your convenience, CA provides one site where you can access the information you need for your Home Office, Small Business, and Enterprise CA products. At arcserve.com/support, you can access the following:

- Online and telephone contact information for technical assistance and customer services
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- Product and documentation downloads
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Chapter 1: Introduction

CA ARCserve Replication and High Availability (CA ARCserve RHA) is a solution based on asynchronous real-time replication and automated application switchover and switchback to provide cost-effective business continuity for virtualized environments on Windows servers.

CA ARCserve RHA lets you replicate data to a local or remote server, making it possible to recover that data due to server crash or site disaster. You may switch your users to the replica server manually, or automatically, if you licensed High Availability. This Guide presents both Replication and High Availability concepts and procedures.

The procedures covered in this Guide should be followed as is. Customize the steps only if:

- You are familiar with CA ARCserve RHA and fully understand the potential impact of any changes you make.
- You have fully tested the steps in a lab environment before implementing in a production environment.

This section contains the following topics:

About This Guide (see page 7)
Related Documentation (see page 8)
Log On Account Conditions (see page 8)
Register CA ARCserve RHA Licenses (see page 8)

About This Guide

This document describes how to implement a CA ARCserve Replication and High Availability solution for virtualized environments. Please review each procedure before you begin. It is essential that you have the appropriate resources and permissions to carry out each task.

The Guide is organized into the following main sections:

- **Microsoft Windows Hyper-V** -- Full server replication and switchover for each individual guest machine
- **VMware vCenter Server** -- vCenter Management Console Replication and switchover
- **Full System High Availability (HA)** -- Transfers an entire physical system to a virtual machine hosted by a Hyper-V server
Related Documentation

Use this Guide with the CA ARCserve RHA Installation Guide and the CA ARCserve RHA Administration Guide.

Log On Account Conditions

The CA ARCserve RHA Engine service must satisfy certain account conditions for successful communication with other components. If these requirements are not met, scenarios may not run. If you lack the permissions required, contact your local IS team.

- It is a member of the Domain Admins group. If the Domain Admins group is not a member of the built-in domain local group Administrators you must use an account that is.
- It is a member of the local computer Administrators Group. If the Domain Admins group is not a member, add the account manually.
- For servers in a workgroup, use the Local System account.
- Master and Replica servers must reside in the same Active Directory forest.

Register CA ARCserve RHA Licenses

The CA ARCserve RHA licensing policy is based on a combination of several parameters which include the following:

- the operating systems involved
- the required solution
- the supported application and database servers
- the number of participating hosts
- additional modules (for example, Assured Recovery)

The license key that is generated for you is therefore tailored to your exact needs.

After logging in for the first time, or if your old license has expired, you must register the CA ARCserve RHA product using your license key. To register the product, you need to open the Manager, which does not depend on the existence of a valid registration key. After the Manager opens, a License Warning message appears, prompting you to register the product. A License Warning message also appears when your license is about to expire during the next 14 days.
When you are creating a scenario, some of the options might be disabled following the terms of your license. However, you can create any number of scenarios, since the validity of your license key is confirmed, before you try to run a specific scenario. Only when you click the Run button, the system checks whether you are allowed to run the selected scenario according to your license key. If the system determines that you do not have the required license for running this scenario, the scenario will not run and a message will appear on the Event pane informing you of the type of license you need.

To register CA ARCserve RHA using the license key

1. Open the Manager.

   The Welcome message appears, followed by a License Warning message informing you that your product is not registered. You are prompted to register it.

2. Click OK to close the message.

3. Open the Help menu and select the Register option.

   The Register CA ARCserve RHA dialog opens.

4. Complete the following fields:

   ■ Registration Key field - enter your registration key.
   ■ [Optional] In the Company Name field - enter your company name

5. Click the Register button to register the product and close the dialog.

   You can now start working with the CA ARCserve RHA Manager according to your license permissions.
Chapter 2: Protecting VMware vCenter Server Environments

This section contains the following topics:

- VMware vCenter Server RHA Configuration (see page 12)
- vCenter Server Replication and High Availability (see page 18)
- Redirection Methods (see page 41)
- How Switchover and Switchback Work (see page 49)
VMware vCenter Server RHA Configuration

vCenter Server has several components (Database Server, License Server and Web Access Server) that can be deployed to a single machine (local) or in a distributed manner.

- Install the same VMware vCenter Server components on the Replica so they match the components on the Master.
- Install the CA ARCserve RHA Engine on every vCenter Server.
- Master and Replica servers must reside in the same Active Directory forest and become members of the same domain or trusted domains.

The following describes the two main methods of configuring the vCenter Server:

- **Single machine (local) deployment**—the Database Server, vCenter Server, License Server and Web Access Server are all installed on the same machine. If you install these components on the Master server, you must also install them on the Replica server.

- **Distributed deployment**—vCenter Server and Web Access Server are installed on one machine, while the Database Server, the License Server, or both are installed on another. If the vCenter Server machine goes down, the database can still operate. If you use distributed deployment, you must ensure the settings on both the Master and Replica servers both point to the same distributed machine(s). For distributed deployment, create a SQL or Oracle HA scenario to protect the separate database. See the appropriate Operation Guide for more information.

**Important!** Regardless of the method you choose, the vCenter Server and the Web Access Server must be installed on the same machine.

If License Server deployment is distributed, perform one of the following:

- If License Server (A) is installed on the Master, install another instance of License Server (B) on the Replica and specify the B instance as the License Server for the vCenter Server running on the Replica.

- If License Server (A) is installed on a machine other than the Master server, specify the first instance (A) as the License Server for the vCenter Server running on the Replica.
In the following diagram, VMware vCenter Server is configured using the distributed deployment method. The vCenter Server system that houses the vCenter Server and Web Access Server is the Master Server. You must install the CA ARCserve RHA Engine on each vCenter Server in your environment:
Configure the vCenter Server Master Server

Consider the following points when configuring your vCenter Server environment:

- Each VMware ESX server locally stores the IP address of the vCenter Server managing it. This address must be changed to the standby server in the event of a switchover. We recommend using the vCenter Server Managed IP Address setting to automate switchover.
- Each VMware ESX server can be managed by only one vCenter Server. Connecting an ESX server to more than one vCenter Server automatically disconnects it from its original server.

When you configure CA ARCserve RHA on the vCenter Server Master Server, enter the same IP address you entered in the Managed IP Address field as the IP Mask field on the High Availability Properties screen.

If you do not use the Managed IP Address setting, you must manually reconnect all ESX servers to the standby vCenter Server after switchover.

To configure the vCenter Server Master server

1. Add another IP address to the Master server network interface card (NIC). For more information, refer to the topic, Add IP on the Master Server.
2. From the vCenter Server Runtime Settings screen, set the Managed IP address field to the same IP address you added in Step 1, not the Master server's IP address. For more information, refer to the VMware vCenter Server documentation.
3. Run the HostReconnect script to reconnect all ESX servers managed by the vCenter Server. Download this script from the VMware website.

Important! When you create HA scenarios, we recommend that you enable the Move IP redirection method on the Switchover Properties screen. If you enter additional IP addresses to the Master Server NIC, Move IP is enabled by default.

Configure the vCenter Server Replica Server

To set up VMware vCenter server for replication, configure a Replica server as follows:

- Install vCenter components identically on Master and Replica servers.
- If you are using distributed database deployment, configure vCenter server on the Replica to connect to the same Database Server configured for Master. If you are using local database deployment, configure vCenter server on the Replica to connect to the Database Server configured on the Replica.
Configure vCenter server on Replica to connect to License Server: If License Server is installed locally to the Master server, you must install another instance of License Server on the Replica and specify this instance in vCenter on the Replica. If the License Server is installed remotely to the Master, specify that instance in vCenter on the Replica.

Install the Engine on every vCenter server.

**Note:** For distributed database deployment, protect the database using CA ARCserve RHA for SQL Server or Oracle, as appropriate. Refer to the Operation Guide for more information. For distributed License Server deployment, the License Server cannot be protected in CA ARCserve RHA scenarios.

To set up VMware vCenter Server for high availability, configure a Replica server as follows:

- Install vCenter Server components identically on Master and Replica servers. Ensure the Replica has the same database type as the Master. You should also use the same folder structure on both servers.
- Configure the Database Server on the Replica according to the vCenter Server configuration method you used. For more information, see [Configure the vCenter Server Database Server](#). (see page 16)
- Configure the License Server on the Replica according to the vCenter Server configuration method you used. For more information, see [Configure the vCenter Server License Server](#). (see page 17)

**Note:** To protect the distributed (remote) database servers, create separate CA ARCserve RHA scenarios for SQL or Oracle, as appropriate. However, if the License Server is deployed separately, CA ARCserve RHA cannot protect it.
Configure the vCenter Server Database Server on the Replica

In the event of a failure, access to the Database Server is essential to a VMware vCenter Server high availability scenario.

**Note:** Specify the server name explicitly to prevent database auto-discovery problems.

**To configure the vCenter Server Database Server on the Replica server**

Do one of the following, depending on how your environment is configured:

- If you used single machine (local) deployment, configure the ODBC settings as follows:
  1. Install the Database Server on the Replica. Explicitly specify this instance on the Replica so that the Replica uses its local Database Server.
  2. Ensure the Database Server Instance Name is the same as the one specified on the Master.
  3. Ensure the Database Name is the same as the one specified on the Master.
  4. Ensure the Database Server installation path and database files path are the same as those specified on the Master.

Or:

- If you used distributed deployment, configure the ODBC settings as follows:
  1. Do not install the Database Server on the Replica. Instead, specify the same remote Database Server that is specified on the Master.
  2. Specify the same data source name (DSN) as on the Master. To do this, select **Use an existing database server** from the VMware vCenter Server Deployment Options - Step 1 screen and then enter the name of an already-configured DSN. Click No when asked if you wish to re-initialize the database and start over with a blank configuration.
Supported Databases VMware vCenter Server

CA ARCserve RHA supports the following databases when used in a VMware vCenter Server environment:

■ Microsoft SQL Server 2005
■ Oracle 10g

If the vCenter Server Database Server is deployed separately from the vCenter Server, you must create additional scenarios using the appropriate database application type to protect it. Database Servers are protected in vCenter Server scenarios only when deployed on the same machine hosting the vCenter Server.

**Note:** If you wish to protect MSDE and Microsoft SQL Server 2005 Express, visit the Microsoft technical support website and download the knowledge document, TEC445313.

Configure the vCenter Server License Server on the Replica

In the event of a failure, access to the License Server is also essential to a vCenter Server high availability scenario.

**To configure the vCenter Server License Server on the Replica server:**

Do one of the following:

■ If you used single machine (local) deployment:
  1. Install the License Server on the Replica.
  2. Replica uses its local License Server. From the VMware vCenter Server Deployment Options-Step 2 screen, choose Use an Existing License Server.
  3. Specify the Replica License Server and port number in the text field.

Or:

■ If you used distributed deployment:
  1. You do not need to install the License Server on the Replica.
  2. From the VMware vCenter Server Deployment Options-Step 2 screen, choose Use an Existing License Server
  3. Specify the same remote License Server that is specified on the Master in the text field.
vCenter Server Replication and High Availability

Create vCenter Server Replication Scenarios

VMware vCenter Server application data is file-based and is auto-discovered during scenario creation.

To create a new vCenter replication scenario

1. Open the Manager and choose Scenario, New or click the New Scenario button to launch the Scenario Creation wizard.
   
   The Welcome dialog opens.

2. Choose Create a New Scenario, select a Group Name and click Next.
   
   The Select Server and Product Type dialog opens.

3. Select vCenter, Replication and Disaster Recovery Scenario (DR) and click Next.
   
   Note: If you wish to specify Tasks on Replica, see the CA ARCserve RHA Administration Guide for more information.

   The Master and Replica Hosts dialog opens.

4. Type a Scenario Name, enter the Hostname or IP Address and Port number for both Master and Replica servers, enable the Verify Engine on Hosts option and then click Next.
   
   Wait for Engine Verification to complete.

5. Click Install to upgrade the Engine service on one or both servers, if necessary, and then click Next.
   
   The Master Configuration dialog opens.

6. If your vCenter database is SQL Server, discovery results are shown in the DB tree. If your vCenter database is Oracle, you are prompted for Database Connection credentials. Provide the required information and click OK.
   
   Clear or check components for disaster recovery, as desired, and then click Next.

   The Scenario Properties dialog opens.

7. Set the desired properties as described in the CA ARCserve RHA Administration Guide and click Next.
   
   The Master and Replica Properties dialog opens.

8. Set the desired properties and click Next.
   
   Wait for Scenario Verification to complete.

9. Resolve any warnings or errors reported at Verification and then click Next.
   
   The Scenario Run dialog opens.
10. Click Run Now to initiate replication and activate the scenario or click Finish to run the scenario later.
Create vCenter Server HA Scenarios

To create a new vCenter Server HA scenario

1. Open the Manager and click Scenario, New or click the New Scenario button. The Welcome dialog opens.

2. Choose Create a New Scenario and select a Scenario Group from the list. Click Next. The Select Server and Product Type dialog opens.

3. Choose VMware vCenter Server, High Availability Scenario (HA) and click Next. The Master and Replica Hosts dialog opens.

4. Type a Scenario Name, enter the Hostname or IP Address and Port number for both the Master and Replica servers, enable the Verify Engine on Hosts option, and then click Next. Wait while Engine Verification completes. If prompted for logon credentials, enter them and click OK.

5. If necessary, click Install to upgrade the Engine service on one or both Servers. If you are prompted for logon credentials, enter them and click OK. When installation completes, verify again and then click Next.

   Note: If you are using a local Oracle instance as the vCenter database, you are now prompted for logon credentials. Enter the Oracle DBA name and password now and click OK to start auto-discovery.

   The Database for Replication dialog opens and displays the auto-discovered results for the host you specified as the Master. For SQL Server, all databases used by vCenter are replicated by default.

6. Clear checkmarks next to the databases you do not want to replicate, if desired, and click Next.

   The Replica Configuration dialog opens. CA ARCserve RHA automatically compares Master and Replica configurations, ensuring they are identical.

7. Resolve errors, if any are displayed and then click Next. The Scenario Properties dialog opens.

8. Configure additional properties, if desired, and click Next. For more information, see Scenario Properties or the Administration Guide.

   The Master and Replica Properties dialog opens.

9. Make changes, if desired, and click Next. For more information, see Scenario Properties or the Administration Guide.

   Wait while the Switchover Properties dialog retrieves information.
10. Configure the desired redirection properties, and click Next. For vCenter HA scenarios, Move IP is automatically set to On. For more information, see Switching Over and Switching Back.

The Switchover and Reverse Replication Initiation dialog opens.

11. Choose automatic or manual switchover, and automatic or manual reverse replication, as desired, and click Next. You should not set both of these options to Automatic. For more information, see Scenario Properties or the Administration Guide.

12. Wait while Scenario Verification completes. Problems are reported in the dialog. You must resolve errors and should resolve any warnings before running the scenario. When scenario verification is successful, click Next.

13. Choose Run Now to start synchronization or Finish to save the scenario and run it later. For more information, see Run the Scenario from Outside the Wizard.

Set Scenario Properties

You can change a scenario configured using the Wizard or configure additional settings, or modify the scenario, using the Properties pane.

The Properties pane and its tabs are context-sensitive and change whenever you select a different node from a scenario folder. You must stop a scenario before configuring its properties. Certain values cannot be modified once set; they are noted. For full details on configuring scenario properties and their descriptions, see the CA ARCserve RHA Administration Guide.
Properties are organized into tabs on the CA ARCserve RHA Manager Framework pane. The tabs displayed are based upon server type, CA ARCserve RHA solution, and scenario status. Select the scenario for which you want to change properties, and then select the appropriate tab.

Settings on the Root Directories tab

Do the following:

1. Select a Master Server from the Scenario Pane. Double-click its Directories folder to add or remove Master Root Directories. Select or clear checkboxes next to folders, as desired, to include or exclude them. You may also edit directory names.

2. Select a Replica Server from the Scenario Pane. For each Master Root directory, you must specify a Replica Root directory. Double-click the Directories folder for the Replica server. Select or clear checkboxes next to folders, as desired, to hold the corresponding Master directory.
Settings on the Properties Tab

Scenario Properties

These settings establish default behavior for the entire scenario.

- General properties -- cannot be changed once created
- Replication properties -- select the replication mode (Online or Scheduled), synchronization values (File or Block, Ignore Files of Same Size/Type) and optional settings (Replicate NTFS Compress Attribute, Replicate NTFS ACL, Synchronize Windows Shares, Prevent Automatic Re-sync upon Error)
- Event notification properties -- specify a script to run, select email notification, or write to event log.
- Report Handling -- specify report settings, email distribution or script execution

Master and Replica Properties

These settings establish server properties on both Master and Replica. Some settings vary by server type.

- Host connection properties -- Enter the IP address, Port number and Fully Qualified Name of the Master and Replica.
- Replication properties -- These properties differ for Master and Replica. See the CA ARCserve RHA Administration Guide for more information.
- Spool properties -- Set the size, minimum disk free size and directory path. See Spool Directory Settings (see page 90) for more information.
- Event notification properties -- specify a script to run, select email notification, or write to event log.
- Report properties -- select synchronization or replication reports, specify distribution or script execution.
- (Replica) Scheduled Tasks -- set or suspend tasks, including Replica Integrity Testing for Assured Recovery. For more details, see the CA ARCserve RHA Administration Guide.
- (Replica) Recovery properties -- set delay, data rewind properties, or scheduled task for replica.
Settings on the HA Properties Tab

These settings control how switchover and switchback are performed.

- **Switchover properties** -- select automatic or manual switchover, provide switchover hostname, and reverse replication settings.
- **Hosts properties** -- specify the Master and Replica Fully Qualified Name.
- **Network Traffic Redirection properties** -- select Move IP, Redirect DNS, Switch Computer Name or User-defined scripts.
- **Is Alive properties** -- set the heartbeat frequency and check method.
- **DB Management properties (does not apply to File Server scenarios)** -- instructs CA ARCserve RHA to manage shares or services on a database server.
- **Action upon Success properties** -- defines custom scripts and arguments for use.

The Data Recovery Process

When an event causes loss of Master data, the data can be restored from any Replica. The recovery process is a synchronization process in the reverse direction - from a Replica to the Master.

CA ARCserve RHA enables you to recover data in two ways:

- **Recover lost data from the Replica to the Master** -- this option is a synchronization process in the reverse direction and requires you to stop the scenario. (This option is not recommended for Oracle, SQL or Exchange scenarios.)

- **Recover lost data from a certain event or point in time (Data Rewind)** -- This option uses a process of stamped checkpoints and user-defined bookmarks to roll corrupt data on the Master back to a time before corruption occurred.

**Important!** You must stop replication to initiate recovery.
Recover Lost Data from Replica

The following procedure is the same for all server types.

To recover all lost data from a Replica

1. On the Manager, select the desired scenario from the Scenario pane and stop it.

2. (For database applications only) Stop the database services on the Master host.

3. On the Manager, select the Replica host from the scenario folder. If multiple Replicas participate in a scenario, select the one from which you wish to recover data. The Restore Data option is now enabled.

4. From the Tools menu, select Restore Data or click the Restore data from the Standard toolbar.

   Note: If the user credentials you used to log in to the Manager are different than the ones required for working with the Engine on the Replica, a User Credentials dialog opens, asking you to enter logon account details for the selected Replica.

   The Recovery Method page of the Restore Data wizard appears.

   Note: If the Data Rewind property is set to On, another Restore Data dialog will appear. In this case, select the first option - Replace all data on Master with the data on Replica. This option simply restores data without a rewind.

5. Click Next. The Synchronization Method page appears.

6. Make sure that the appropriate Synchronization method is selected. For more details, see the CA ARCserve RHA Administration Guide. Click Finish.

   Once you finished initiating the recovery process, CA ARCserve RHA builds a temporary reverse tree using the selected Replica as the root, and the Master as the terminating node. After the Master recovery process ends, the temporary scenario is deleted, and you receive the following message in the Event pane: Synchronization finished.

   Note: If an error occurred during the temporary Recovery scenario run, the Recovery scenario may stop and remain in the Scenario pane. In this case, you should remove it by right-clicking it and selecting the Remove option from the pop-up menu. After the Recovery scenario is removed, the original scenario re-appears in the Scenario pane. Then, you can restart the original scenario, and repeat the recovery process if necessary.

7. By default, once a data recovery occurs a Synchronization Report is generated.

   Now, the replication process can restart following the original scenario.
Recover Active Server

In certain circumstances, it may be necessary to forcibly make the Master or Replica server the active server without completing the data synchronization process.

For example, if switchover occurred but no data was changed on the Replica server. In this case you may even have newer data on the Master server making it undesirable to synchronize data from the Replica to the Master server. CA ARCserve RHA allows Recover Active Server process, to use this option. You must ensure that the scenario is stopped, and select Recover Active Server from the Tools menu.

Important! While this option is the right choice in many situations, use it with caution. If used improperly data loss can occur. Usually, CA ARCserve RHA will not allow switchover from one host to another until all data is synchronized. It is designed this way so users are not redirected to an out of date data set that then overwrites what may be a more current data set. When using Recover Active Server, CA ARCserve RHA is forcing users to one server or the other with no regard as to which server has the correct data set. Thus, as an administrator, you must manually ensure that the server you are making active has the most up to date data set.

If the Recover Active Server method does not solve the problem, you can manually recover a server. For more information, refer to the section, Recovering Servers (see page 31).

Select either Make Master Active or Make Replica Active depending onto which server you want to force the active role.

Important! If a legitimate switchover in a disaster situation occurs and users are redirected to the Replica server for any period of time, it is important to replicate all changes on the Replica back to the Master before making the Master server active. Using Recover Active Server in such a situation results in loss of data.
Setting Bookmarks

A **bookmark** is a checkpoint that is manually set to mark a state back to which you can revert. We recommend setting a bookmark just before any activity that can cause data to become unstable. Bookmarks are set in real-time, and not for past events.

**Notes:**
- You can use this option only if you set the Recovery--Data Rewind option to **On** (default setting is **Off**).
- You cannot set bookmarks during the synchronization process.
- You can insert manual bookmarks for Full System HA scenarios.

**To set a bookmark**

1. Select the Replica host on the Scenario pane from which you want to rewind data when the required scenario is running.
2. Select the Set Rewind Bookmark option on the Tools menu.

   The Rewind Bookmark dialog opens.

   ![Rewind Bookmark dialog](image)

   The text that appears in the Rewind Bookmark dialog appears in the Rewind Points Selection dialog as the bookmark's name. The default name includes date and time.

3. Accept the default name, or enter a new name for the bookmark, and click OK.

   **Note:** It is recommended that you provide a meaningful name that will later help you recognize the required bookmark.

   The bookmark is set.

   **Note:** In some scenarios, such as Full System HA, applying journal changes is suspended until the bookmark is created and then resumed.
Data Rewind

The Data Rewind recovery method allows you to rewind data to a point in time before it was corrupted. The rewind process takes place on the Replica server before the reverse synchronization process starts. The Data Rewind method uses rewind points or bookmarks that enable you to reset the current data back to a previous state.

You can use this option only if you set the Recovery - Data Rewind option to On.

If this option is set to Off, the system will not register data rewind points. For more information about Data Rewind parameters (Retention Period, Max Disk Size), see the CA ARCserve RHA Administration Guide.

**Important:** The data rewind process operates in one way only - there is no replay forward. After rewind, all data subsequent to the rewind point will be lost, since data after the rewind point will be overwritten with new data.

**Note:** The automatic registration of the rewind points starts only after the synchronization process is completed, and the message All modifications during synchronization period are replicated appears on the Event pane. Similarly, you cannot manually set bookmarks during synchronization. In the following example, a File Server scenario is used, but the steps are the same for all scenario types.
To recover lost data using rewind points

1. Select the scenario that you want to stop from the Scenario pane on the Manager and stop it.

2. [For database applications only] Stop the database services on the Master host.

3. Select the Replica host from the scenario folder:
   
   **Note:** If multiple Replica servers participate in the required scenario, select the Replica from which you want to recover data.

4. Select Restore Data from the Tools menu or click the Restore Data button. If you are prompted for user credentials, enter the appropriate information and click OK.

   The Recovery Method page of the Restore Data Wizard opens.

5. Select one of the Rewind data options, depending on whether you want the rewind data synchronized back to the Master (option 2) or left on the Replica only (option 3).

   **Notes:**
   
   - If the user credentials you used to log in to the Manager are different than the ones required for working with the Engine on the Replica, a User credentials dialog appears, asking you to enter log on account details for the selected Replica.
   
   - The Include Registry Keys synchronization check box is enabled only if you activated this option before starting the scenario. If the check box is enabled, you can select it to include the synchronized Registry Keys in the recovery process.

   After you select a Rewind data option, a Recovery scenario is automatically created. This Recovery scenario will run until the end of the rewind process.

6. Click Next.

   The Rewind Point Selection page is displayed.

7. Wait until the Select Rewind Point button is enabled, and click it to view the existing rewind points.
The Select Rewind Point dialog opens.

The Select Rewind Point dialog displays a list of all rewind points appropriate to the application you are protecting. These include modifications of folders and files that were automatically registered by the system and user-defined bookmarks.

The list can be filtered according to the rewind point type or other criteria, using the Filter Rewind Points pane on the left.

8. Select the required rewind point and click OK.

**Note:** If you want to use a Bookmark as the rewind point, it is best practice to select the closest rewind point that indicates an actual event.

You return to the Rewind Point Selection page, which now displays information about the rewind point you selected.

9. Click Next.

The Synchronization Method page is displayed.

10. Select the Block Synchronization method and click Finish.

**Note:** If the user credentials you used to log in to the Manager are different than the ones required for working with the Engine on the Replica, a User credentials dialog appears, asking you to enter log on account details for the selected Replica.

CA ARCserve RHA rewinds the data to the point you selected. After the rewind process ends, you receive the following message in the Event pane: **Rewind process is completed successfully.**

If you chose to replace the data on the Master with the data on the Replica, CA ARCserve RHA starts a synchronization process from the Replica to the Master. Once the process ends, the temporary Recovery scenario is stopped and then deleted.

By default, once a data recovery occurs a Synchronization Report is generated. The Replication process can restart on the original scenario.

---

**How to Restore Data on vCenter Machines**

Using rewind points, vCenter Server has its own view on the Select Rewind Point dialog. Click the vCenter option to enable this view and then select a rewind point from the desired machine.
Recovering Servers

CA ARCserve RHA can detect when a Replica server is active and run the recovery process automatically. If recovery does not complete correctly for some reason, do the following:

- Perform the Recover Active Server procedure. For more information, see Recover Active Server.
- If the Recover Active Server procedure does not resolve the issue, try one or more of the following manual tasks appropriate to the redirection method you use:
  - If IP Redirection is used, manually remove the IP. You cannot use this method for scenarios that do not support Move IP redirection (Hyper-V HA, CS HA). For more information, see Manually Recover a Failed Server-Move IP Address. (see page 31)
  - If Switch Computer Name Redirection is used, manually switch the names. You cannot use this method for scenarios that do not support Switch Computer Name Redirection (Hyper-V HA, Exchange HA, vCenter HA if local Oracle is used). For more information, see Manually Recover a Failed Server-Switch Computer Name (see page 31).
  - If both IP and Switch Computer Name Redirection methods are used, manually remove the IP and switch the computer names. You cannot use this method for scenarios that do not support Move IP and Switch Computer Name redirection (Exchange, CS HA). For more information, refer to the topic, Manually Recover a Failed Server-IP and Switch Computer Name (see page 33).

Manually Recover a Failed Server-Move IP Address

If IP Redirection is used, you must remove the IP address manually. You cannot use this method for scenarios that do not support Move IP redirection (Hyper-V HA, CS HA).

To recover a failed server using Move IP Address redirection method

1. Boot the Master server without a network connection, to avoid IP conflicts.
2. From the TCP/IP properties dialog, remove the additional IP address.
3. Reboot the server and reconnect to the network.
4. If it is not already running, start the scenario from the Manager. If automatic reverse replication was set to On, the scenario runs in backward mode so that the Replica server is now active and the Master server is on standby.
5. Wait for synchronization to complete.
6. Perform a manual switchover to return the active role to the Master server. It is recommended that you do so outside of normal business hours.
Manually Recover a Failed Server-Switch Computer Name

**Important!** When Oracle is installed locally and used by vCenter Server, the Switch Computer Name redirection method is not supported.

To manually recover a failed server using the Switch Computer Name redirection method

1. Boot the Master server without a network connection, to avoid duplicate network names.

2. Rename the server to `<NewServerName>-RHA` and move it to a temporary workgroup. For example, if the server is called "Server1", rename it to "Server1-RHA". You will be required to reboot this machine. After the reboot completes, the following error appears: "At least one Service could not be started." Ignore this, it is normal under these circumstances because the Engine usually runs in a domain account.

3. Connect to the network.

4. Rejoin the domain, ensuring that you use the -RHA name assigned in step 2.

5. Reboot the computer.

6. If it is not already running, start the scenario from the Manager. (If automatic reverse replication was set to On, the scenario runs in backward mode so that the Replica server is now active and the Master server is now standby.)

7. Wait for synchronization to complete. Perform a manual switchover to make the Master server active. It is recommended that you do so outside of normal business hours.
Manually Recover Failed Server-IP and Switch Computer Name

If both IP and Switch Computer Name Redirection methods are used, you must remove the IP address and switch the computer names manually. You cannot use this method for scenarios that do not support Move IP Address and Switch Computer Name redirection (Exchange, CS HA).

To manually recover a failed server using both IP and Switch Computer Name redirection methods

1. Repair any hardware problems that could have caused the switchover, if any.
2. Reboot the server without a network connection to prevent IP conflicts.
3. From the TCP/IP properties dialog, remove the additional IP address.
4. From the System Properties, Computer Name dialog, change the Computer Name to <ServerName>-RHA. For example, if your server is called Server 3, rename it to Server 3-RHA.
5. Assign the server to a temporary workgroup.
6. Restart the computer to enable your changes to take effect. When rebooting completes, reconnect to the network now. Ignore the message, "At least one service failed during system startup." This is normal because the Engine runs in a domain, which is not currently available.
7. Rejoin the domain, making sure you use the -RHA name, and reboot again.
8. The reverse scenario begins and the Replica server assumes the active role. Wait while synchronization completes.
9. Perform a manual switchover by clicking the Perform Switchover button from the toolbar, to return the active role to the Master server.

Troubleshooting vCenter Server Scenarios

The following information is provided to help you resolve any errors and warnings.

EM00589 License Servers configured on vCenter are not consistent

Reason:
License Server deployment on the Master and Replica is not the same. One is locally installed and the other is remotely installed. These should be the same on Master and Replica.

Action:
Reconfigure the settings for the License Server on the Replica.
**EM00590 Databases configured on vCenter are not consistent**

**Reason:**
Either the deployment or the database type of the database server on the Master differs from the Replica and must be the same.

**Action:**
Reconfigure database settings on the Replica.

**EM00591 vCenter versions configured are not consistent**

**Reason:**
The vCenter version on the Master differs from that on the Replica and must be identical.

**Action:**
Re-install vCenter on the Replica.

**EM00592 Distributed databases configured on vCenter are not consistent**

**Reason:**
The Database Server hostname or instance name on the Master differs from that on the Replica and must be the same.

**Action:**
Reconfigure the database settings on the Replica.

**EM00594 Database usernames configured for vCenter are not identical**

**Reason:**
The account for vCenter used to access the Database Server on the Master differs from that on the Replica and should be identical.

**Action:**
Reconfigure the ODBC settings on the Replica.
EM00596 Oracle server name configured on replica for vCenter is not localhost

Reason:
This is a configuration error.

Action:
Change the ODBC setting using "localhost" as the hostname on the Replica.

EM00597 SQL server name configured on replica for vCenter is not localhost

Reason:
This is a configuration error.

Action:
Change the ODBC setting using "localhost" as the hostname on the Replica.

EM00598 The vCenter database names configured are not consistent

Reason:
This is a configuration problem.

Action:
Reconfigure the database settings on the Replica to match those on the Master.

EM00599 The vCenter database on master <IP Address> is distributed deployed and AR isn't supported

Reason:
If the vCenter Server database is on a remote machine, AR is not supported.

Action:
Restart CA ARCserve RHA. AR options should be dimmed when CA ARCserve RHA detects remote database deployment.

ER00603 Unknown parameter. vCenter configurations can't be compared

Reason:
This is due to an internal program error.

Action:
Retry.
**ER00604 vCenter HA information is not initialized**

**Reason:**
The Engine on the Master or Replica is having problems.

**Action:**
Verify the Engine is working and retry.

**EM00590 Databases configured on vCenter are not consistent**

**Reason:**
The Database server type on the Master differs from that on the Replica and must be the same.

**Action:**
Reconfigure the database server on the Replica.

**ER00605 Failed to configure DB Server**

**Reason:**
Something is wrong with the registry setting on the Replica:
HKEY_LOCAL_MACHINE_SOFTWARE\VMware, Inc.\VMware vCenter\DB

**Action:**
Confirm ODBC settings for vCenter are correct and check the registry key. If it does not exist, re-install vCenter on the Replica.

**ER00606 Failed to configure License Server**

**Reason:**
Something is wrong with the registry setting on the Replica:
HKEY_LOCAL_MACHINE_SOFTWARE\VMware, Inc.\VMware vCenter\vCenter

**Action:**
Check the registry key. If it does not exist, re-install vCenter on the Replica.

**ER00607 Failed to configure Managed IP**

**Reason:**
Something is wrong with the registry setting on the Replica:
HKEY_LOCAL_MACHINE_SOFTWARE\VMware, Inc.\VMware vCenter\vCenter

**Action:**
Check the registry key. If it does not exist, re-install vCenter on the Replica.
ER00608 Failed to configure DB password

Reason:
Something is wrong with the registry value "3" on the Replica:
HKEY_LOCAL_MACHINE\SOFTWARE\VMware, Inc.\VMware vCenter\DB

Action:
Check the registry key. If it does not exist, re-install vCenter on the Replica.

ER00609 Failed to configure Web Access Port

Reason:
Something is wrong with the registry value "WebCenterPort" on the Replica:
HKEY_LOCAL_MACHINE\SOFTWARE\VMware, Inc.\VMware vCenter

Action:
Check the registry key. If it does not exist, reinstall vCenter on the Replica.

WM00529 Distributed License Servers configured on vCenter are not consistent

Reason:
The registry value "License Path" of key
HKEY_LOCAL_MACHINE\SOFTWARE\VMware, Inc.\VMware vCenter on Replica should be the same as on Master.

Action:
Reconfigure the license server setting on the Replica.

WM00531 License Servers configured on vCenter are not consistent

Reason:
License Server deployment on the Master and Replica is not the same. One is locally installed and the other is remotely installed. These should be the same on Master and Replica.

Action:
Reconfigure the settings of the License Server on the Replica.
**WM00532 Databases configured on vCenter are not consistent**

**Reason:**
Either the deployment or the database type of the database server on the Master differs from the Replica and must be the same.

**Action:**
Reconfigure database settings on the Replica.

**WM00533 vCenter versions configured are not consistent**

**Reason:**
The vCenter version on the Master differs from that on the Replica and must be identical.

**Action:**
Re-install vCenter on the Replica.

**WM00534 Distributed databases configured on vCenter are not identical.**

**Reason:**
The Database Server hostname or instance name on the Master differs from that on the Replica and must be the same.

**Action:**
Reconfigure the database settings on the Replica.

**WM00535 Unable to receive vCenter information from <IP Address>**

**Reason:**
This is an internal program error, engine disconnect or timeout.

**Action:**
Wait and retry the request later.

**WM00536 Database usernames configured for vCenter are not identical**

**Reason:**
The account for vCenter used to access the Database Server on the Master differs from that on the Replica and should be identical.

**Action:**
Reconfigure the ODBC settings on the Replica.
**WM00537 WebCenter ports configured on vCenter are not identical**

**Reason:**
The WebCenter ports on the Master differ from those set on the Replica and should be identical.

**Action:**
Re-install vCenter on the Replica and ensure the WebCenter ports are the same as those on the Master.

**WM00538 The vCenter Managed IP <IP Address> isn't set in Move IP list**

**Reason:**
You have set a vCenter Managed IP but not added it to the Move IP properties located in the Switchover properties list.

**Action:**
Add the managed IP address to the Move IP list when setting switchover properties.

**WM00540 SQL server name configured on replica for vCenter is not localhost**

**Reason:**
This is a configuration error.

**Action:**
Change the ODBC setting using "localhost" as the hostname on the Replica.
WM00541 License server name configured on replica for vCenter is not localhost

**Reason:**
This is a configuration error.

**Action:**
Change the value "License Path" to "xxxx@localhost" style on Replica.

WM00542 License server ports configured for vCenter are not consistent

**Reason:**
This is a configuration error.

**Action:**
Re-install vCenter to reconfigure the license server on the Replica.

WM00543 License files folders configured are not consistent

**Reason:**
This is a configuration problem.

**Action:**
Reinstall vCenter to specify the correct folder for License files.

WM00544 The vCenter database names configured are not consistent

**Reason:**
This is a configuration problem.

**Action:**
Reconfigure the database settings on the Replica to match those on the Master.

WM00588 Distributed License Servers configured on vCenter are not consistent

The registry value "License Path" of key HKEY_LOCAL_MACHINE\SOFTWARE\VMware, Inc.\VMware vCenter on Replica should be the same as on Master.

**Action:**
Reconfigure the license server setting on the Replica.
Troubleshooting Oracle Databases

**Oracle database fails to start after switchover**

**Symptom:**
My vCenter Server HA scenario uses an Oracle database. After switchover, the Oracle database does not restart and I get the following errors:

- ER00319, 83, Error, <HOSTNAME><DATE/TIME>, Switchover Aborted
- ER00303, 82, Error, <HOSTNAME><DATE/TIME>, Unable to start vCenter Services
- ER00360, 81, Error, <HOSTNAME><DATE/TIME>, Unable to start vCenter after switchover. Service 'vpxd' not started

**Solution:**
These errors occur when the Oracle database does not successfully mount the following switchover. Use the command line to solve the problem:

1. Shut down
   ```
   [ORACLE_HOME]oradim.exe -shutdown -sid orcl -uspwd * -shutmode immediate
   ```
2. Start again
   ```
   [ORACLE_HOME]oradim.exe -startup -sid orcl -uspwd * -nocheck 0
   ```

Redirection Methods

**How Redirection Works**

Each server type supported by CA ARCserve RHA can be configured to use one or more redirection methods. You should enable redirection methods based on your environment and business needs. The following sections describe the supported redirection methods for VMware vCenter.
**DNS Redirection**

DNS Redirection changes the DNS "A" Record of the Master server to resolve to IP address of the Replica server. Upon failure of the Master, the Replica server modifies the appropriate DNS record so that references to the Master server resolve to the Replica’s IP address rather than the Master's IP address. This redirection method requires no network reconfiguration and works in LAN and WAN network configurations.

DNS redirection works only with A (host) type records and cannot update CNAME (Alias) records directly. However, if the CNAME record points to the modified A record, it is indirectly redirected.

Using the record that has the Master server's name is the default, however you can configure CA ARCserve RHA to redirect any DNS A (host) record via the Master's name in DNS setting in the switchover properties tab.

**Move IP Redirection**

Move IP redirection involves moving the Master server IP address to the Replica server.

This redirection method is preferred for Virtual Machine scenarios and is usable only in a LAN configuration in which the Master and Replica servers reside in the same network segment. In this configuration, switchover of the Master server causes the Replica to take over one or more of the IP addresses assigned to the Master server.

**Important!** Use this method only when both servers are on the same IP subnet.

When using Move IP as the redirection method, you must first add IP addresses to the Master host. For more information, refer to the topic, Add IP on the Master Server.

**Add IP on the Master Server**

You need to add an additional IP address to the Master host, (which is denoted as RHA-IP in the following steps) to use Move IP redirection in your HA scenarios. This new IP address is used for CA ARCserve RHA internal communication and replication. This is necessary because once switchover occurs, the current production IP address is no longer available on the Master -- it switches to the Replica server.

**Important!** Perform the following only if you are using the Move IP redirection method.
To add IP Address to Master Server

1. Open the Control Panel and select Network Connections.
2. Right-click Local Area Network and select Properties.
3. Click Internet Protocol (TCP/IP) and then click the Properties button.
4. Click Advanced.
5. Click Add and enter an additional IP address (RHA-IP).
   
   In the following screenshot, the RHA-IP IP address is 192.168.220.23 and the current production server IP address is 192.168.220.111.

6. Click Add.
7. Click OK.
8. Click OK to exit the LAN settings.

After you add the IP to the Master, you must add the RHA-IP to your HA scenarios. There are two ways to add the XO-IP address to an HA scenario:

- For new scenarios, from directly in the Wizard
- For existing scenarios, by modifying the master host name

The procedures for both ways follow.

**Add RHA-IP to Existing Scenarios**

Perform this procedure only if you are using the Move IP redirection method.

**To add the RHA-IP to existing scenarios:**

1. On the Scenario pane, select the required Master host.

2. Right-click the Master and select Rename from the pop-up menu. Then, enter the RHA-IP address.

3. On the Framework pane, select the Switchover tab and then select the Replica server as the switchover host.
4. Set the Move IP option to On. Ensure that the IP address under Move IP, IP/Mask matches the production server IP address: this is the IP address that will switch over. If you are moving more than one IP address you can add multiple production IP addresses by selecting Click here to add new IP/Mask.
Add RHA-IP to New Scenarios

**Note:** Perform this procedure only if you are using the Move IP redirection method.

During the initial run of the Scenario Creation Wizard, enter the RHA-IP and Replica IP addresses in the Master Hostname/IP and Replica Hostname/IP boxes, instead of the server names.

![Scenario Creation Wizard](image)

Switch Computer Name Redirection

If you are redirecting File Shares, in which clients connect via the Master server name, enable Switch Computer Name. For example, if the Master server name is fs01 and clients connect to `\fs01\sharename` or `\fs01.domain.com\sharename`, using the Switch Computer Name method redirects clients to the failover server. To use Switch Computer Name Redirection, both Master and Replica must belong to the same domain.

It is also recommended to enable one other method. The most common method is to use both DNS Redirection and Switch Computer Name. CA ARCserve RHA makes the required computer name switch by assigning a temporary name to the Master server and taking over its computer name for use with the Replica server.
CA ARCserve RHA updates records directly and does not generally require a reboot. If, however, you encounter any problems after switchover, consider setting the reboot option to On and testing again.

**Note:** For Windows Server 2008 systems, you must reboot the computer after a switchover occurs when the switch computer name method is used. We recommend setting the Reboot After Switchover and Switchback property to On when using this method.

### Automatic Redirection Using Switch Computer Name

When possible during switchover, CA ARCserve RHA renames the master host to `masterhostname-RHA` and assigns its original name to the replica server. This step prevents name conflict, since the master's name is now assigned to the replica server. In this graceful case, if automatic reverse replication is set to on, CA ARCserve RHA starts the backward scenario automatically. If Automatic Reverse Replication is set to Off, run the scenario again manually by selecting the Run button or choosing Run from the Tools menu. Once the backward scenario has run and synchronization is complete, you can click Perform Switchover to switch back.

### Scripts Redirection

CA ARCserve RHA can trigger custom scripts or batch files to perform the user redirection or any additional steps not covered by built-in methods. If the above methods are not appropriate or do not fully meet all requirements, see the *CA ARCserve RHA Administration Guide* for details on scripted redirection methods.

Because of the different ways in which a vCenter Server environment can be configured, redirection must ensure that the vCenter Server, Web Access, Database, and License Servers can all be accessed in the event of a failure. We recommend that you use the vCenter Managed IP feature. If the IP address of a vCenter Server system changes, the managed hosts connected to it are automatically reconnected if you use this feature.

<table>
<thead>
<tr>
<th>If you are using this redirection method</th>
<th>Under this condition</th>
<th>Perform this task</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Switch Computer Name</strong></td>
<td>If you are using SQL Server as the database and the Database Server is on the Master...</td>
<td>...no additional action is needed. Auto Configure changes the ODBC setting on the Replica to the database server local to the Replica.</td>
</tr>
<tr>
<td></td>
<td>If you are using Oracle as the database and the Database Server is on the Master...</td>
<td>...no additional action is needed.</td>
</tr>
<tr>
<td>If you are using this redirection method</td>
<td>Under this condition</td>
<td>Perform this task</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>----------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>If the Database Server (SQL or Oracle) is on a remote machine...</td>
<td>...no additional action is needed.</td>
<td></td>
</tr>
<tr>
<td>If the License Server is on the Master...</td>
<td>...change the License Path on the Replica to point to the local Replica License Server in registry: HKEY_LOCAL_MACHINE\SOFTWARE\VMware, Inc.\VMware vCenter Server key value: &quot;LicensePath&quot;=&quot;xxxxx@localhost&quot;</td>
<td></td>
</tr>
<tr>
<td>If the License Server is on a remote machine...</td>
<td>...no additional action is needed.</td>
<td></td>
</tr>
</tbody>
</table>

**Move IP Address**
If you are using the IP address to access vCenter Server... ...no additional action is needed. Auto Configure changes the path to the License Server in the registry.

**DNS**
If you are using the hostname to access the vCenter Server... ...enable the DNS redirection mode.

**Switching Over and Switching Back**

*Switchover* and *Switchback* is the process in which active and passive roles are exchanged between the Master and Replica servers, so that if the Master is currently active, it changes to passive after Switchover passes the active role to the Replica. If the Replica is active, it changes to passive after Switchover passes the active role to the Master. Switchover can be triggered at the push of a button or automatically by CA ARCserve RHA when it detects that the Master is unavailable, if you enabled the Perform Switchover Automatically option from the Switchover and Reverse Initiation dialog. When this option is Off, the system notifies you that the Master server is down so you can manually initiate switchover from the CA ARCserve RHA Manager.
How Switchover and Switchback Work

After the HA scenario starts running and the synchronization process is completed, the Replica checks the Master on a regular basis, by default every 30 seconds, to see if it is alive. The following types of monitoring checks are available:

- **Ping**—a request sent to the Master to verify that the Master is up and responding
- **Database check**—a request that verifies the appropriate services are running and all databases are mounted
- **User-defined check**—a custom request you can tailor to monitor specific applications

If an error occurs with any part of the set, the entire check is considered to have failed. If all checks fail throughout a configured timeout period (by default, 5 minutes), the Master server is considered to be down. Then, depending on the HA scenario configuration, CA ARCserve RHA sends you an alert or automatically initiates a switchover.

When you created an HA scenario, you defined how you want the switchover to be initiated.

- If you selected the Initiate Switchover manually option from the Switchover and Reverse Replication Initiation page, perform a manual switchover. For more information, refer to the topic, [Initiate Switchover](#) (see page 50).
- If you selected the Initiate Switchover automatically option, you can still perform a manual switchover, even if the Master is alive. You can initiate switchover when you want to test your system, or you want to use the Replica server to continue the application service while some form of maintenance is performed on the Master server. Triggered (automatic) switchover is in all ways identical to manual switchover performed by the administrator, except it is triggered by a resource failure on the master server rather than by an administrator manually initiating the switchover by clicking the Perform Switchover button. The timeout parameters are configurable and are more extensively covered in the [CA ARCserve RHA Administration Guide](#).

When you created an HA scenario, you defined how you want the reverse scenario to be initiated.

- If you selected the Initiate Reverse Replication automatically option from the Switchover and Reverse Replication Initiation page, replication in the reverse direction (from Replica to Master) automatically begins after a switchover has finished successfully.
- If you selected the Initiate Reverse Replication manually option, you must resynchronize data from Replica to Master, even after testing a clean switchover without a Master failure.
When the Reverse Replication feature is off, to start reverse replication after a switchover has occurred, click the Run button. The benefit to this feature is, if both the master and replica servers were online and connected during switchover, resynchronization in the reverse direction is not required. Resynchronization involves comparing the data on the master and replica servers to determine which changes to transfer before real-time replication starts; this can take some time. If automatic reverse replication is turned on, and both servers were online during switchover, replication is reversed without the need for resynchronization. This is the one situation in which resynchronization is not required.

**Initiate Switchover**

Once triggered, whether manually or automatically, the switchover process itself is fully automated.

**Note:** Though the following steps show Exchange scenario screens as examples, the procedure is similar for all server types.

**To initiate manual switchover**

1. Open the Manager and select the desired scenario from the Scenario pane. Ensure that it is running.
2. Click Perform Switchover.

A confirmation message appears.
3. Click OK.

A switchover from the Master server to the Replica server is initiated.

Detailed information about the switchover processes is displayed in the Events pane during switchover.

After the switchover is completed the scenario stops.

**Note:** The only case in which the scenario may continue to run after switchover is when you have selected Start automatically for Automatic Reverse Replication.

In the Event pane a message appears, informing you that switchover completed and the scenario has stopped.

Now, the Master becomes the stand-by server and the Replica becomes active server.
How Switchover and Switchback Work

Initiate Switchback

After a switchover is initiated, whether manually or automatically, at some point, you will want to reverse the server roles and make the original Master the active server and the Replica the standby server. Before you switch back the roles between servers, decide if you want the data on the original Replica server to overwrite the data on the original Master. If yes, you must first perform a reverse scenario, called a backward scenario.

**Note:** The following steps are the same regardless of server type.

**To initiate manual switchback**

1. Ensure that both Master and Replica servers are available on the network and that the Engine is running.
2. Open the Manager and select the desired scenario from the Scenario pane.
3. Perform one of the following:
   - If the scenario is already running, skip directly to Step 4
   - If the scenario is not running, perform these steps and then go to Step 4:
     a. Click Run on the toolbar to start the scenario.

CA ARCserve RHA detects that a switchover has occurred and verifies its state and configuration. After verification completes, the Verification Results dialog appears, listing existing errors and warnings if detected, and prompting you to approve the running of the backward scenario. If desired, click the Advanced button to open an additional pane with detailed information about the hosts that participate in the scenario.

![Verification Results dialog](image)
b. Select a synchronization method from the Run dialog and click OK to start resynchronization.

**Note:** See the *CA ARCserve RHA Administration Guide* for more information on Synchronization Methods.

After resynchronization completes, you receive a message in the Event pane: All modifications during synchronization period are replicated. Now, replication from the active server to the standby server begins.

**Note:** You are now ready to reverse the roles between the Master and Replica servers.
How Switchover and Switchback Work

4. Click Perform Switchover on the toolbar while the scenario is running to reverse the server roles. A confirmation message appears.

5. Click Yes to clear the message and start the switchback process.

   After the switchback is completed, the server roles are reversed back and the scenario automatically stops.

   **Note:** The scenario will continue to run after the switchback when the Reverse Replication Initiation option is defined as Start Automatically.

You may now run the scenario again in its original (forward) state.

Switchover Considerations

To prevent overwriting data, the best practice is to set *either* the Switchover or the Reverse Replication Initiation property to Automatic. If a server fails while both properties are set to Automatic, CA ARCserve RHA triggers Switchover without administrative involvement and could start Reverse Replication before you have investigated the cause of the failure. During Reverse Replication, CA ARCserve RHA overwrites data on your production server.

If a crash or outage occurs during switchover, you may need to perform the Recover Active Server (see page 90) procedure.

Run a Scenario

You can run a single scenario using the following procedure:

**To run the scenario**

1. From the Scenario pane, select the scenario you want to run.

2. Click Run on the Standard toolbar.

   Before initiating synchronization and replication, CA ARCserve RHA verifies your scenario configuration. When verification completes successfully, the Manager displays the message: *Are you sure you want to run scenario "scenario_name"?* If problems are discovered, the top pane displays any warning and error messages resulting from verification.
Note: Scenario Verification checks many different parameters between the Master and Replica servers to ensure a successful switchover. If any errors or warnings are reported you should not continue until they are resolved.

3. Correct errors before you continue. Errors are reported on the Event pane.

Note: Replication of mount points succeeds only if those were added to the Master before the Engine was started. If you included the mount points in the Master root directories when the Engine was already running, no error is reported but the replication does not start. In this case, you need to restart the Engine on the Master before initiating replication.

When no error is reported, the Run dialog appears and contains synchronization options.

![Run dialog]

Note: Do not use Skip Synchronization for any scenarios replicating a database.

4. If you have a large number of small files, select File Synchronization. If you have large files, select Block Synchronization. If you have low bandwidth, select Offline Synchronization to transfer data to an external device, then perform synchronization from that device. Select the Ignore same size/time files to skip the comparison of files with the same path, name, size and modification time, which are generally identical, to reduce synchronization time. You should enable the Skip Synchronization option only when you are certain the files on both Master and Replica are identical. (The default selections are File Synchronization and Ignore same size/time files option enabled).

5. Click the OK button. Synchronization may take a while, depending on database size and network bandwidth between the Master and Replica. You will receive the following message in the event window when the synchronization is complete: All modifications during synchronization are replicated.
At this point, the scenario is operational and active. By default, a Synchronization Report is generated when synchronization finishes. To view the report, refer to the topic, View a Report. You can also generate regular Replication Reports to monitor the replication process on each participating server. For more information, see the CA ARCserve RHA Administration Guide.

**Stop a Scenario**

**To stop a scenario**

1. From the Scenario pane, select the scenario you want to stop.
2. To stop the scenario, click the Stop button on the Standard toolbar.
   A confirmation message appears prompting you to approve the scenario stopping.
3. Click Yes in the confirmation message. The scenario stops.
   After stopping the scenario, the Manager no longer shows the green play symbol to the left of the scenario, the scenario state turns to Stopped by user and the Statistics tab is no longer available on the Framework pane.

**View a Report**

CA ARCserve RHA can generate reports on the replication and synchronization processes. These reports can be stored on your desired location, opened for view from the Report Center, sent by email to a specified address, or they can trigger script execution.

The default storage directory of the generated reports is: 

\[ProgramFilesFolder]\CA\ARCserveRHA\Manager\reports

**To view reports**

**Note:** Though an Exchange report is shown for illustrative purposes, the steps and screens are similar regardless of the type of scenario.

1. To view reports, locate the Tools menu, click Reports, and then select Show Scenario Reports.
The Report Center opens in a new window.

The Report Center consists of two tables:

- The upper table - Available Reports per Scenario - contains a list of all scenarios that have reports, with the type and number of available reports for each scenario.
- The lower table - Reports - contains a list of all the reports that are available for the scenario selected in the upper table.

2. To view a specific report, select from the Available Reports per Scenario table the scenario that this report represents. Then, from the Reports table below, click the report you want to open.

**Note:** Depending on your settings, for Synchronization and Replication reports a Detailed report can be generated in addition to the Summary report. Both reports represent the same process, but the Detailed report also provides a list of the files that participated in the process.
The report you selected appears in a new window.

<table>
<thead>
<tr>
<th>Synchronization mode</th>
<th>Block Synchronization (include files with the same size and modification time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario</td>
<td>Exchange 1</td>
</tr>
<tr>
<td>Master host</td>
<td>192.168.60.201</td>
</tr>
<tr>
<td>Replica host</td>
<td>192.168.60.123</td>
</tr>
<tr>
<td>Scenario start time</td>
<td>12/22/2009 08:57:32</td>
</tr>
<tr>
<td>Report start time</td>
<td>12/22/2009 08:58:07</td>
</tr>
<tr>
<td>Report finish time</td>
<td>12/22/2009 08:58:15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EVENT</th>
<th>BYTES</th>
<th>TIME STAMP</th>
<th>FILE NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 3: Protecting Hyper-V Environments

This section contains the following topics:

Hyper-V Server Configuration Requirements (see page 59)
Hyper-V Replication and High Availability (see page 67)
Switching Over and Switching Back (see page 75)
The Data Recovery Process (see page 85)
Additional Information and Tips (see page 88)

Hyper-V Server Configuration Requirements

- Install 64-bit Microsoft Windows Server 2008 with the Windows 6.0-KB950050-x86.msu patch on Master and Replica, each with a CPU and motherboard capable of running Hyper-V. The Replica does not require Windows Server 2008, 64-bit.

- Configure the same number and type of network connections on the Replica that exists on the Master.

- Both Master and Replica servers should reside in the same Active Directory forest and be members of the same domain or trusted domains.
Hyper-V HA Configuration

Because Hyper-V is a Windows Server 2008 feature, you must set up two Windows Server 2008 machines, one Master and one Replica, to enable CA ARCserve RHA. You can use CA ARCserve RHA with only one Hyper-V server, but your protection will be limited to only Replication.

For HA, you must install the Hyper-V Integration Components on every Guest OS in your Hyper-V environment. This is so CA ARCserve HA can determine VM hostnames. For a list of supported guest operating systems, please see the Microsoft website.

Install CA ARCserve RHA on each Windows Server 2008 machine at the Server (Parent Partition) level. To achieve failover at the individual VM level, instead of merely at the Hyper-V Server, you must create scenarios for each VM in the environment. CA ARCserve RHA permits you to select more than one VM while creating the scenario, and then splits the entire selection into "sub-scenarios", effectively assigning one VM to a scenario. The names of each scenario are based on the names of their respective virtual machines.

In the following image, two virtual machines have been set up on a Hyper-V system. Integration Components were installed in each guest operating system. The Engine is installed on the Hyper-V machine, not in the VMs.
Hyper-V VM Auto-Discovery

When you create a Hyper-V scenario, the Engine collects information about all virtual machines on the Hyper-V server and stores this data in a scenario configuration file. This is an .XML file. The following information is collected:

**Virtual Machine Settings**

These settings are stored in an XML file named `<VM GUID>.XML`, where VM GUID is the unique global identifier for the virtual machine. This file resides in the `%ProgramData%\Microsoft\Windows\Hyper-V\Virtual Machines` folder.

**Virtual Machine Folder**

There is a folder for each virtual machine and the name of the folder is `<VM GUID>`. This folder contains VSV and BIN files when a virtual machine is running.

**Virtual Hard Disks (VHDS)**

VHDs are hard disks associated with each VM. These files could be in different locations and have a .VHD extension.

**Snapshots**

All snapshots for a virtual machine are placed in the snapshot folder. All files inside a snapshot are considered for replication. Any VHD files in the snapshot have the extension, .AVHD. Multiple snapshots for a VM have multiple AVHD files. All files are discovered and replicated.

**ACLs**

In addition to files and folders, security data such as ACLs and owner information for each folder and file are replicated. This security information is needed to register and run the virtual machine on the Replica server.

**Virtual Network Configuration**

If a VM is connected to a virtual network, the network data setting is included in the XML configuration file.
Configure Hyper-V for High Availability

The following information applies only to CA ARCserve RHA High Availability. The default Hyper-V settings are usually sufficient when using CA ARCserve RHA but there are some default changes you should make to ensure virtual machines can easily and successfully be started on the Replica when the Master is unavailable:

- Integration Components are required by default. However, if you set the Is Alive, Check Method, Connect to DB property to Off, CA ARCserve RHA skips this check.
- The Snapshot folder cannot be overlapped for any CA ARCserve RHA-protected virtual machine but Microsoft puts all virtual machine snapshots in the same folder by default.

The following procedure uses a Windows guest as an example, but works for any supported Hyper-V guest operating system.

To configure Hyper-V for High Availability

1. Launch the Hyper-V Manager wizard.
2. From the New Virtual Machine wizard dialog, enter a Name, select the Store the virtual machine in a different location option and then provide the location. We recommend changing the default path to a NAS or SAN volume. Click Next.
3. From the Assign Memory dialog, set guest memory. Typically, 512 MB is sufficient for a single service guest. Click **Next**.

![Assign Memory](image)

4. From the Configure Networking dialog, select the virtual network adapter. Make sure you select a virtual network adapter that is bound to the physical network adapter. Click **Next**.

![Configure Networking](image)
5. From the Connect Virtual Hard Disk dialog, select **Create a virtual hard disk**. By default, the virtual disk is created under the VM folder. You may also use an existing disk. Click **Next**.

6. From the Installation Options dialog, select **Install an operating system later** and click **Next**.
7. From the Completing the New Virtual Machine Wizard dialog, select **Start the virtual machine after it is created** and click **Finish** to exit the wizard.
8. The snapshot folder is automatically set to the virtual machine folder. Click OK.

9. Once the operating system is ready, connect to the virtual machine. Click the Action menu and select **Insert Integration Services Setup Disk**.

10. Install the integration services in the guest OS.
You should also configure the Hyper-V Replica as follows:

- Install 64-bit Microsoft Windows Server 2008 with the Windows6.0KB950050-x86.msu Hyper-V patch on the Master server, with a CPU and motherboard capable of running Hyper-V. The Replica server can run any Windows-based system.
- Configure the same number of network connections on the Replica that exists on the Master.

Hyper-V Replication and High Availability

Create a New Hyper-V Replication Scenario

Replication configuration properties are stored in scenarios. You need to create a scenario for each server you wish to protect.

To create a Hyper V Replication Scenario
1. Open the Manager and choose Scenario, New or click the New Scenario button.
   The Welcome dialog opens.
2. Choose Create a New Scenario, select a Group from the list and click Next.
   Note: All scenarios you create are put in this scenario group. If you do not change the name, the final group name includes the Master server name as part of it.
3. The Select Server and Product Type dialog opens. Choose Hyper-V, Replication and Data Recovery Scenario (DR) and click Next.
4. The Master and Replica Hosts dialog opens. Select or type a Scenario group Name, enter the Hostname or IP Address and Port number for both Master and Replica servers, enable the Verify CA ARCserve RHA Engine on Hosts option and click Next.
5. Wait for Engine Verification to complete. Click Install if you need to upgrade the Engine service on one or both servers. When ready, click Next.
6. The Select Database for Replication dialog opens. Review the list of results auto-discovered on the Master server. By default, all VMs are replicated. Clear choices if desired and click Next.
7. The Replica Root Directories dialog opens. Accept the defaults or select the desired root directories on the Replica and click Next.
8. The Scenario Properties dialog opens. Set properties, as desired, and click Next.
9. The Master and Replica Properties dialog opens. Set properties, as desired, and click **Next**.

10. Wait for Scenario Verification to complete. Resolve any warning or errors and click **Next**.

11. From the Scenario Run dialog, click **Run Now** to initiate synchronization and activate the scenario or click **Finish** to run the scenario later.

**Hyper-V Replication Properties**

If you wish to change a scenario created with the Wizard or configure additional settings, you can use the Properties pane to modify the scenario.

The Properties pane and its tabs are context-sensitive and change whenever you select a different node from a scenario folder. You must stop a scenario before configuring its properties. Certain values cannot be modified once set; they are noted. For full details on configuring scenario properties and their descriptions, see the *CA ARCserve RHA Administration Guide*.

Properties are organized into tabs on the Manager Framework pane. The tabs displayed are based upon server type, CA ARCserve RHA solution, and scenario status. Select the scenario for which you wish to change properties, and then select the appropriate tab. The following screen shows an example:
Settings on the Root Directories tab

Select a Master Server from the Scenario Pane. Double-click its Directories folder to add or remove Master Root Directories. You cannot directly update the Hyper-V root directory. Double-clicking it launches Auto Discovery, which lists all virtual machines on the Master. You can add or remove virtual machines from the Auto Discovery Results dialog.

Select a Replica Server from the Scenario Pane. For each Master Root directory, you must specify a Replica Root directory. Double-click the Directories folder for the Replica server. Select or clear checkboxes next to folders, as desired, to hold the corresponding Master directory.

Settings on the Properties Tab

Scenario Properties

These settings establish default behavior for the entire scenario.

- General properties -- cannot be changed once created
- Replication properties -- choose the replication mode (Online or Scheduled), synchronization values (File or Block, Ignore Files of Same Size/Type) and optional settings (Replicate NTFS Compress Attribute, Replicate NTFS ACL, Synchronize Windows Shares, Prevent Automatic Re-sync upon Error)
- Event notification properties -- specify a script to run, choose email notification, or write results to the event log
- Report Handling -- specify report settings, email distribution or script execution

Master and Replica Properties

These settings establish server properties on both Master and Replica. Some settings vary by server type.

- Host connection properties -- Enter the IP address, Port number and Fully Qualified Name of the Master and Replica
- Replication properties -- Enable Hyper-V scheduled bookmarks for Master. These properties differ for Master and Replica. See the CA ARCserve RHA Administration Guide for more information.
- Spool properties -- Set the size, minimum disk free size and directory path. See Spool Directory Settings (see page 90) for more information.
- Event notification properties -- specify a script to run or choose email notification and write results to the event log.
- Report properties -- choose synchronization or replication reports, specify distribution or script execution.
- (Replica) Recovery properties -- set delay or data rewind properties.
Hyper-V HA Properties

If you wish to change a scenario configured through the Wizard or configure additional settings, you can use the Properties pane to modify the scenario.

The Properties pane and its tabs are context-sensitive and change whenever you select a different node from a scenario folder. You must stop a scenario before configuring its properties. Certain values cannot be modified once set; they are noted. For full details on configuring scenario properties and their descriptions, see the CA ARCserve RHA Administration Guide.

Properties are organized into tabs on the Manager Framework pane. The tabs displayed are based upon server type, CA ARCserve RHA solution, and scenario status. Select the scenario for which you wish to change properties, and then select the appropriate tab. The following screen shows an example:

Settings on the Root Directories tab

Select a Master Server from the Scenario Pane. Double-click its Directories folder to add or remove Master Root Directories. You cannot directly update the Hyper-V root directory. Double-clicking it launches Auto Discovery, which lists all virtual machines on the Master.

Select a Replica Server from the Scenario Pane. For each Master Root directory, you must specify a Replica Root directory. Double-click the Directories folder for the Replica server.
Settings on the Properties Tab

Scenario Properties
These settings establish default behavior for the entire scenario.
- General properties -- cannot be changed once created
- Replication properties -- choose the replication mode (Online or Scheduled), synchronization values (File or Block, Ignore Files of Same Size/Type) and optional settings (Replicate NTFS Compress Attribute, Replicate NTFS ACL, Synchronize Windows Shares, Prevent Automatic Re-sync upon Error)
- Event notification properties -- specify a script to run or choose email notification and write results to the event log
- Report Handling -- specify report settings, email distribution or script execution

Master and Replica Properties
These settings establish server properties on both Master and Replica. Some settings vary by server type.
- Host connection properties -- Enter the IP address, Port number and Fully Qualified Name of the Master and Replica.
- Replication properties -- Enable Hyper-V scheduled bookmarks for master. These properties differ for Master and Replica. See the CA ARCserve RHA Administration Guide for more information.
- Spool properties -- Set the size, minimum disk free size and directory path. See Spool Directory Settings (see page 90) for more information.
- Event notification properties -- specify a script to run or choose email notification and write results to the event log.
- Report properties -- choose synchronization or replication reports, specify distribution or script execution.
- (Replica) Recovery properties -- set delay or data rewind properties. Data rewind is On by default.

Settings on the HA Properties Tab
These settings control how switchover and switchback are performed.
- Switchover properties -- choose automatic or manual switchover, provide switchover hostname, virtual network mappings, and reverse replication settings
- Hosts properties -- specify the Master and Replica Fully Qualified Name
- Is Alive properties -- set the heartbeat frequency and check method
- Action upon Success properties -- defines custom scripts and arguments for use
Create a New Hyper-V High Availability Scenario

For Hyper-V, it is possible to perform switchover at the individual VM level, rather than the whole Hyper-V server, which means you need a separate HA scenario for every virtual machine in the Hyper-V environment. To make scenario creation easier, you can select multiple VMs from the Master that inherit the same scenario properties. This 'multiple VM' scenario is then split into sub-scenarios so you can manage each virtual machine independently.

**To create a new Hyper-V HA Scenario**

1. Start Manager. Select File, Create, New Scenario or click the New Scenario button.
   
   The Welcome dialog opens.

2. Click Create a New Scenario and type a Scenario Group Name, or select one from the list and then click Next.
   
   **Note:** If you do not assign a Scenario Group Name, all scenarios you create default to the Scenarios Group. This group becomes part of the scenario name and updates automatically to Hyper-V after the scenario wizard is completed.

   The Select Server and Product Type dialog opens.

3. Select MS Hyper-V, High Availability Scenario (HA) and then click Next.

   The Master and Replica Hosts dialog opens.

4. Type a Scenario Name, enter the Hostname or IP Address and Port number for both Master and Replica servers, enable the Verify Engine on Hosts option, and then click Next.

   You may be prompted for user credentials. If so, enter the appropriate credentials and click OK.

   If you enabled engine verification, the Engine Verification dialog opens.

5. Wait for verification to complete. Click Install to install the Engine on the specified hosts or click Next.

   The Database for Replication dialog opens, listing the auto-discovered virtual machines found on the Master server you specified. By default, all virtual machines are selected for replication. For HA, the entire VM with all related files must be selected.

6. Select or clear virtual machines for replication and click Next.

   The Scenario Properties dialog opens.

7. Change properties, as desired, and then click Next. For more information, see the *CA ARCserve RHA Administration Guide*.

   The Master and Replica Properties dialog opens.
8. Change properties, as desired, and then click Next. Scheduled Bookmarks are automatically set to On with a default of 1 hour, but you may adjust the schedule, if needed. For more information, see the *CA ARCserve RHA Administration Guide*.

   Wait while the Switchover Properties dialog retrieves information.

9. When Switchover Properties opens, select Click to edit VN mappings.

   The Virtual Network Mappings dialog opens. If there is only one virtual network adapter in both the Master and Replica servers, they are mapped automatically.

10. Map the virtual machines listed to the desired virtual networks on the Replica and click OK.

11. Set any other switchover properties, as desired, and click Next.

   The Switchover and Reverse Replication Initiation dialog opens. We recommend setting Switchover to Automatic and Reverse Replication to Manual.

12. Choose the desired method for initiating switchover and reverse replication and click Next.

   Wait while the Scenario Verification process completes.

   If Scenario Verification lists any errors, you must resolve them to continue. If any warnings are listed, you should also resolve them to successfully continue. After making changes, click Retry to repeat verification.

   Click Next.

   The Scenario Run dialog opens.

13. Click Run Now to start synchronization and activate the scenario. Click Finish to run the scenario later.
How Hyper-V Redirection Works

Of the traditional high availability Redirection Methods (Move IP, Switch Computer Name, DNS), only DNS redirection is supported in Hyper-V scenarios. In Hyper-V environments, CA ARCserve RHA protects each individual virtual machine, allowing you to perform not only switchover, but load balancing during periods of high activity.

Using DNS redirection with Hyper-V is different from doing so for other scenario types. On the High Availability Properties tab, make the following adjustments to the Redirect DNS properties in the Hosts and Network Traffic Redirection properties groups:

- In the Hosts group, the host name should be the Virtual Machine Fully Qualified Name. This name is auto-discovered if the virtual machine is On and has a heartbeat. Set Redirect DNS to On.
- In the Network Traffic Redirection group, the DNS server IP is also auto-discovered but by default, is set to the DNS IP on the Master server. You must change this IP to the DNS IP of the virtual machine.

For forward scenarios, the DNS record of the virtual machine points to the IP address entered in the Virtual Machine IPs on Replica in DNS field after DNS redirection occurs. After the virtual machine is started, it automatically registers itself in the DNS server provided you enabled the option, Register this connection's address in DNS in the Windows Advanced TCP/IP Settings dialog. After DNS redirection, the virtual machine has two DNS records in the DNS server. You must manually remove one to run a forward scenario and add one to run a backward scenario.

On Hyper-V-enabled machines, a virtual machine exists on both the Master and Replica servers, with only one VM turned "on" at any given time. When CA ARCserve RHA detects a failure, that is, if the "Is alive" check returns false, CA ARCserve RHA activates the virtual machine on the Replica server. In order for this to happen automatically, you are required to set virtual network mappings during scenario creation so that virtual network adapters present on the Master server can be substituted with the appropriate Replica server settings.
Switching Over and Switching Back

Switchover and Switchback is the process in which active and passive roles are exchanged between the Master and Replica servers, so that if the Master is currently active, it changes to passive after Switchover passes the active role to the Replica. If the Replica is active, it changes to passive after Switchover passes the active role to the Master. Switchover can be triggered at the push of a button or automatically by CA ARCserve RHA when it detects that the Master is unavailable, if you enabled the Perform Switchover Automatically option from the Switchover and Reverse Initiation dialog. When this option is Off, the system notifies you that the Master server is down so you can manually initiate switchover from the CA ARCserve RHA Manager.

How Switchover and Switchback Work

After the HA scenario starts running and the synchronization process is completed, the Replica checks the Master on a regular basis, by default every 30 seconds, to see if it is alive. The following types of monitoring checks are available:

- **Ping** -- a request sent to the VM on the Master to verify that the VM is up and responding. If the Is Alive check returns false, the Replica brings up the VM automatically.

- **User-defined check** -- a custom request you can tailor to monitor specific applications.

- **Connect to database** -- a request sent to the Master to verify that the appropriate services are running, and the VM is active and responding to pings.

These checks are performed sequentially (if enabled). If an error occurs with any part of the set, the entire check is considered to have failed. If all checks fail throughout a configured timeout period (by default, 5 minutes), the VM on the Master server is considered to be down. Then, depending on the HA scenario configuration, CA ARCserve RHA sends you an alert or automatically initiates a switchover.
When you created an HA scenario, you defined how you want the switchover to be initiated.

- If you selected the Initiate Switchover manually option from the Switchover and Reverse Replication Initiation page, perform a manual switchover. For more information, refer to the topic, *Initiate Switchover* (see page 77).

- If you selected the Initiate Switchover automatically option, you can still perform a manual switchover, even if the Master is alive. You can initiate switchover when you want to test your system, or you want to use the Replica server to continue the application service while some form of maintenance is performed on the Master server. Triggered (automatic) switchover is in all ways identical to manual switchover performed by the administrator, except it is triggered by a resource failure on the master server rather than by an administrator manually initiating the switchover by clicking the Perform Switchover button. Server ping response, application service status, and VM connectivity are monitored. The timeout parameters are configurable and are more extensively covered in the *CA ARCserve RHA Administration Guide*.

When you created an HA scenario, you defined how you want the reverse scenario to be initiated.

- If you selected the Initiate Reverse Replication automatically option from the Switchover and Reverse Replication Initiation page, replication in the reverse direction (from Replica to Master) automatically begins after a switchover, once the original Master server becomes available again.

- If you selected the Initiate Reverse Replication manually option, you need to perform switchback manually. If you select the manual option and do not initiate a manual switchback, you must resynchronize data from Replica to Master, even after testing a clean switchover without a Master failure.

When the Reverse Replication feature is off, to start reverse replication after a switchover has occurred, click the Run button. The benefit to this feature is resynchronization in the reverse direction is not required, if both the master and replica servers were online and connected during switchover. Resynchronization involves comparing the data on the master and replica servers to determine which changes to transfer before real-time replication starts; this can take some time. If automatic reverse replication is turned on, and both servers were online during switchover, replication is reversed without the need for resynchronization. This is the one situation in which resynchronization is not required.
Initiate Switchover

Once triggered, whether manually or automatically, the switchover process itself is fully automated.

**To initiate manual switchover**

1. Open the Manager and select the desired scenario from the Scenario pane. Verify it is running.

2. Click on the **Perform Switchover** button, or select from the **Tools** menu then **Perform Switchover** option:

   ![Perform Switchover](image)

   A confirmation message appears.

3. Click **OK** on the **Perform Switchover** confirmation message. This procedure initiates a switchover from the Master server to the Replica server:

   ![Switchover Diagram](image)
Switching Over and Switching Back

Detailed information about the switchover processes is located in the Events pane during switchover.

4. After the switchover is completed the scenario stops:

<table>
<thead>
<tr>
<th>Scenario</th>
<th>State</th>
<th>Product</th>
<th>Server</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>XDRWHypVM1</td>
<td>Editing</td>
<td>DR</td>
<td>HyperV</td>
<td>Online</td>
</tr>
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<td>XDRWHypVM2</td>
<td>Editing</td>
<td>HA</td>
<td>HyperV</td>
<td>Online</td>
</tr>
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<td>Stopped by user</td>
<td>DR</td>
<td>HyperV</td>
<td>Online</td>
</tr>
<tr>
<td>XDRWHypVM1</td>
<td>Changed</td>
<td>Synchronized</td>
<td>Flat</td>
<td>In pool</td>
</tr>
</tbody>
</table>

**Note:** The only case in which the scenario may continue to run after switchover is when automatic reverse replication is defined as Start automatically.

In the Event pane a message appears, informing you that Switchover completed, and then that the Scenario has stopped.

Now, the Master becomes passive and the Replica becomes active.

**Initiate Switchback**

After a switchover is initiated, whether manually or automatically, at some point, you will want to reverse the server roles and make the original Master the active server and the Replica the standby server. Before you switch back the roles between servers, decide if you want the data on the original Replica server to overwrite the data on the original Master. If yes, you must first perform a reverse scenario, called a backward scenario.

**Note:** The following steps are the same regardless of server type.

**To initiate manual switchback**

1. Ensure that both Master and Replica servers are available on the network and that the Engine is running.
2. Open the Manager and select the desired scenario from the Scenario pane.
3. Perform one of the following:
   - If the scenario is already running, skip directly to Step 4
   - If the scenario is not running, perform these steps and then go to Step 4:
     a. Click Run on the toolbar to start the scenario.

     CA ARCserve RHA detects that a switchover has occurred and verifies its state and configuration. After verification completes, the Verification Results dialog appears, listing existing errors and warnings if detected, and prompting you to approve the running of the backward scenario. If desired, click the Advanced button to open an additional pane with detailed information about the hosts that participate in the scenario.
b. Select a synchronization method from the Run dialog and click OK to start resynchronization.

**Note:** See the *CA ARCserve RHA Administration Guide* for more information on Synchronization Methods.

After resynchronization completes, you receive a message in the Event pane: All modifications during synchronization period are replicated. Now, replication from the active server to the standby server begins.

**Note:** You are now ready to reverse the roles between the Master and Replica servers.
4. Click Perform Switchover on the toolbar while the scenario is running to reverse the server roles. A confirmation message appears.

5. Click Yes to clear the message and start the switchback process.
   
   After the switchback is completed, the server roles are reversed back and the scenario automatically stops.
   
   **Note:** The scenario will continue to run after the switchback when the Reverse Replication Initiation option is defined as Start Automatically.

   You may now run the scenario again in its original (forward) state.

**Switchover Considerations**

To prevent overwriting data, the best practice is to set either the Switchover or the Reverse Replication Initiation property to Automatic. If a server fails while both properties are set to Automatic, CA ARCserve RHA triggers Switchover without administrative involvement and could start Reverse Replication before you have investigated the cause of the failure. During Reverse Replication, CA ARCserve RHA overwrites data on your production server.

If a crash or outage occurs during switchover, you may need to perform the [Recover Active Server](#) (see page 90) procedure.
Run a Scenario from Outside the Wizard

After you create a scenario, you need to run it to start the replication process. Normally, before changes to data on the Master can be replicated on the Replica, the Master and the Replica need to be synchronized. Therefore, the first step in initiating a replication is synchronizing the Master and Replica servers. After the servers have been synchronized, online replication starts automatically, continuously updating the Replica with all of the changes that occur on the Master.

**Note:** In order for the replication process to succeed, verify that the user under which the Engine is running has Read permission on the Master, and Read and Write permissions on each replication root directory and included files, and on all participating Replica hosts.

**To start a scenario:**
1. From the Scenario pane, select the scenario you want to run.
2. To run the scenario, click the **Run** button on the Standard toolbar.
   CA ARCserve RHA verifies the scenario before running it.
   If the scenario was not set up correctly or problems occurred in the participating hosts, errors are reported on the Event pane.

   **Notes:**
   - If any errors are displayed, you cannot run the scenario. These errors must be corrected before you can start the replication process.
   - Replication of mount points will succeed only if those were added to the Master before the Engine was started. If you included the mount points in the Master root directories when the Engine was already running, no error is reported but the replication does not start. In this case, you need to restart the Engine on the Master before initiating replication.

   When no error is reported, the **Run** dialog appears.
3. From the Run screen, select the following and then click OK:
   - **Synchronization Method** -- For database and virtual machine applications, Block Synchronization is usually best but for File Servers or other applications with large numbers of small files, choose File Synchronization. See the **CA ARCserve RHA Administration Guide** for more information.
   - **Ignore same size/time files** -- Disable this option for database applications. Enable this option for File Server applications to speed up the comparison process and reduce overall synchronization time. See the **CA ARCserve RHA Administration Guide** for more information.
   - **Skip Synchronization** -- Select this option only if you are certain that the data in the Master and Replica root directories is identical.
The Manager indicates that the scenario is running with a green play symbol to the left of the scenario, and with the scenario's state, which turns into **Running**:

<table>
<thead>
<tr>
<th>Scenario</th>
<th>State</th>
<th>Product</th>
<th>Server</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>HyperV XDRWHYPERVERV1</td>
<td>Editing</td>
<td>DR</td>
<td>HyperV</td>
<td>Online</td>
</tr>
<tr>
<td>HyperV XDRWHYPERVERV2</td>
<td>Editing</td>
<td>HA</td>
<td>HyperV</td>
<td>Online</td>
</tr>
<tr>
<td>HyperV XDRWHYPERVERV1 1</td>
<td>Running</td>
<td>DR</td>
<td>HyperV</td>
<td>Online</td>
</tr>
</tbody>
</table>

Once a scenario is running, a Statistics tab appears at the bottom of the Framework pane, displaying a graphical view of the replication.

By default, once synchronization occurs, a Synchronization Report is generated. To view the report, refer to the topic, **View a Report** (see page 56).

**Note:** You can also generate a Replication Report on a regular basis to monitor the replication process on each participating server. For more information, see *CA ARCserve RHA Administration Guide*.

---

**Stop a Scenario**

**To stop a scenario**

1. From the Scenario pane, select the scenario you want to stop.

2. To stop the scenario, click the Stop button on the Standard toolbar.
   
   A confirmation message appears prompting you to approve the scenario stopping.

3. Click Yes in the confirmation message. The scenario stops.

   After stopping the scenario, the Manager no longer shows the green play symbol to the left of the scenario, the scenario state turns to Stopped by user and the Statistics tab is no longer available on the Framework pane.
View a Report

CA ARCserve RHA can generate reports on the replication and synchronization processes. These reports can be stored on your desired location, opened for view from the Report Center, sent by email to a specified address, or they can trigger script execution.

The default storage directory of the generated reports is: 

\[\text{ProgramFilesFolder}\backslash\text{CA}\backslash\text{XOsoft}\backslash\text{Manager}\backslash\text{reports}\]

To view a report

1. To view a report, first you need to open the Report Center. There are two ways to open it:
   - On the Overview Page, click the Report Center link on the Quick Start pane on the left.
   - From the Tools menu, select the Reports option and then Show Scenario Reports.

   The Report Center opens in a new window.

   The Report Center consists of two tables:
   - The upper table - Available Reports per Scenario - contains a list of all scenarios that have reports, along with the type and number of available reports for each scenario.
   - The lower table - Reports - contains a list of all the reports that are available for the scenario selected in the upper table.

2. To view a specific report, select from the Available Reports per Scenario table the scenario that this report represents. Then, from the Reports table below, click the report you want to open:

<table>
<thead>
<tr>
<th>Host</th>
<th>Changes found</th>
<th>Type</th>
<th>Date</th>
<th>Time</th>
<th>Summary</th>
<th>Detailed</th>
<th>Size (bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>XORHW/FER1/2</td>
<td>Changes found</td>
<td>Synchronization</td>
<td>12/15/08</td>
<td>22:04:07</td>
<td></td>
<td></td>
<td>1923</td>
</tr>
<tr>
<td>XORHW/FER1/2</td>
<td>Changes found</td>
<td>Synchronization</td>
<td>12/15/08</td>
<td>04:46:54</td>
<td></td>
<td></td>
<td>2540</td>
</tr>
<tr>
<td>XORHW/FER1/2</td>
<td>Changes found</td>
<td>Synchronization</td>
<td>12/15/08</td>
<td>04:46:54</td>
<td></td>
<td></td>
<td>3479</td>
</tr>
</tbody>
</table>

Note: Depending on your settings, for Synchronization and Replication reports a Detailed report can be generated in addition to the Summary report. Both reports represent the same process, but the Detailed report also provides a list of the files that participated in the process.

The report you selected appears in a new window.
The Data Recovery Process

When an event causes loss of Master data, the data can be restored from any Replica. The recovery process is in fact a synchronization process in the reverse direction - from a Replica to the Master. You can recover lost data from the Replica to the master -- this option is a synchronization process in the reverse direction and requires you to stop the scenario. Or, you can recover lost data from a certain event or point in time (Data Rewind) -- This option uses a process of stamped checkpoints and user-defined bookmarks to roll corrupt data on the Master back to a time before corruption occurred.

Important! You must stop replication in order to initiate recovery.

Setting Bookmarks

A bookmark is a checkpoint that is manually set to mark a state that you may want to rewind back to. We recommend setting a bookmark just before any activity that may cause data to become unstable. Bookmarks are set in real-time, and not for past events.

Notes:
- You can use this option only if you set the Recovery - Data Rewind option to On, in the Replica Properties list.
- You cannot set bookmarks during the synchronization process.
- Hyper-V HA allows you to schedule bookmarks.

To set a bookmark
1. When the required scenario is running, select the Replica host from which you want to rewind data.
2. From the menu, select Tools, Set Rewind Bookmark.

The Rewind bookmark dialog appears:
The text that appears in the **Rewind bookmark** dialog will appear in the **Rewind Points Selection** dialog as the bookmark’s name. The default name includes date and time.

3. Accept the default name, or enter a new name for the bookmark. It is recommended to give a meaningful name that will later help you recognize the required bookmark. Then, click OK.

The bookmark is set.

In Master and Replica Properties, the Enable scheduled bookmark option is Off by default. Scheduling bookmarks allows you to use the Data Rewind option (default is Off). Set a regular bookmark schedule by clicking the Value column for Schedule Setting.

---

**How to Restore Data on Hyper-V Machines**

The process of restoring data from a Hyper-V virtual machine is much like restoring data in any other scenario with the following conditions:

- **Stop the VM** -- CA ARCserve RHA automatically powers off the VM before recovery so that the existing VM can be overwritten. After restore completes, you need to restart the VM manually.

- **Select a bookmark** -- You must roll data back to a specific point in time called a bookmark, or rewind point. The default frequency is 1 hour, but bookmarks can be set at frequencies you define. When you create the Hyper-V scenario, ensure the Enable Hyper-V Scheduled Bookmarks setting is set to On from the Master and Replica Properties screen. For existing scenarios, you can edit this property manually.

- **Synchronize data** -- Use File or Block synchronization.
Recover Hyper-V Data with Rewind Points

For Hyper-V scenarios, the Data Rewind recovery method also applies.

**To recover lost data using rewind points in a Hyper-V Server HA scenario**

1. From the Manager, select the desired scenario and stop it.
2. From the Manager, select the Replica host to enable Restore Data options.
3. From the Tools menu, select Restore Data, or click the Restore Data button to open the Recovery Method dialog.
4. Choose the desired Rewind Data method, depending on whether you want the rewind data synchronized back to the Master or left on the Replica only. When you choose a Rewind Data option, a Recovery Scenario is automatically created. This Recovery Scenario runs until the end of the rewind process. Click Next to continue.
5. Wait while the Rewind Point Selection dialog retrieves information. When the Select Rewind Point button is enabled, click it to continue.
6. The Select Rewind Point dialog for Hyper-V opens.

![Select Rewind Point Dialog](image)

This dialog displays information specific to Hyper-V scenarios. You can choose to display rewind points by file name or start time. Select the desired rewind point and click OK to return to the Rewind Point Selection dialog, which now displays the rewind point you selected.

7. Click Next to open the Synchronization Method dialog.
8. Choose Block Synchronization and then click Finish.
CA ARCserve RHA rewinds the data to the point you selected. After the rewind process ends, the following message is displayed in the Event Pane: Rewind process is completed successfully.

If you chose to replace the data on the Master with the data on the Replica, CA ARCserve RHA starts a synchronization process from the Replica to the Master. Once completed, the temporary Recovery Scenario is stopped and then deleted. If you wish, you can view the Synchronization Report that is generated by default. At this time, Replication can restart on the original scenario.

**How to Start a Hyper-V VM on the Replica Server**

When a virtual machine fails over to the Replica server, CA ARCserve RHA starts the virtual machine on the Replica automatically.

**Additional Information and Tips**

This chapter provides you with helpful information concerning the application.

- By default, the spool is located in the CA ARCserve RHA installation /tmp directory. You can change the default location by modifying the pathname for spool directory. It is best to configure the spool on a non-SQL database or log file drive. Using a dedicated volume for the spool folder can increase performance under high load. If you do change the spool location, please remember to remove the new path from the anti-virus scans, both scheduled and real-time.

- CA ARCserve RHA supports bandwidth limitation and bandwidth limitation scheduling. If you require such features, please consult the CA ARCserve RHA Administration Guide.

**Troubleshooting Hyper-V**

The following information is provided to help you resolve certain problems:

**CV01378 Hyper-V HA scenario has unassigned virtual network mapping**

**Reason:**

The scenario you created discovered more than one virtual network on the Replica. You must map additional virtual networks manually.

**Action:**

From High Availability Properties, expand Switchover properties and click "Click to edit virtual network mapping" to map virtual networks manually.
Could not edit virtual network mappings

**Reason:**
This is an internal error.

**Action:**
1. Restart the Control Service.
2. Re-create the scenario.
3. Collect log messages and the scenario .xmc file.
4. Contact Support.

Could not retrieve list of virtual networks from replica

**Reason:**
This is an internal communication error, but the scenario is likely correctly configured.

**Action:**
1. Collect log messages and the scenario .xmc file.
2. Contact Support.

The Replica Server has no virtual networks defined. This could mean the Replica has no Hyper-V role enabled or no virtual networks were configured.

**Reason:**
The Replica Server has no virtual networks defined. This could mean the Replica has no Hyper-V role enabled or no virtual networks were configured.

**Action:**
Ensure the Hyper-V role is enabled on the Replica server. Ensure at least one virtual network is defined.

Editing error

**Reason:**
You left a required field blank or provided an invalid entry.

**Action:**
Ensure all fields are completed and entries are valid.
Spool Directory Settings

The CA ARCserve RHA spool is a folder on disk where data to be replicated is backed up (spooled) if bandwidth is not sufficient to transfer the amount of changes in real-time. Data can spool due to temporary network disconnections, network congestion, or simply because the network bandwidth is not sufficient to transfer the amount of data changing over on the server. In addition to storing changes waiting on available bandwidth, spool space is also used as part of the normal synchronization process. Thus, some spool build up during synchronization is normal.

Place the spool folder on a drive with relatively low use such as a dedicated volume or boot/system volume. Do not place the spool folder on a volume containing frequently accessed system (OS), user, or application data. Examples include volumes containing databases, shared files, or the system pagefile. By default, the spool folder is located in the tmp folder under the CA ARCserve RHA installation directory. The spool parameters, located in the properties tab (on both master and replica) or set with the New Scenario Wizard, determines how much disk space is available for the spool. In most cases the default values are sufficient. However, if you change this value, it should be at least 10% of the total dataset size. For example, if you are replicating 50 GB of data on a server you should ensure that at least 5 GB of space is available for spool.

**Important!** If you change the spool location, remember to remove the new path from file level antivirus scans: both scheduled and real time.

**Note:** The Spool Directory is not a pre-allocated space folder and will be used only if needed.
Chapter 4: Protecting Full Systems

This section contains the following topics:

- How Full System Scenarios Work (see page 92)
- Configuring Master and Replica for Full System HA (see page 94)
- Create Full System HA Scenarios (see page 95)
- Additional Scenario Properties for Full System HA (see page 97)
- Redirection Methods for Full System HA Scenarios (see page 97)
- Running a Full System HA Scenario (see page 98)
- Restore Full Systems (see page 98)
- Perform Full System Assured Recovery Testing (see page 98)
How Full System Scenarios Work

Use Full System scenarios to protect any server, regardless of application type. Replication, High Availability and Assured Recovery are supported.

Full System scenarios are application-independent and let you transfer an entire physical machine (Master), including all system status information, to a virtualized (Hyper-V enabled) Replica that supports the guest operating system of the active server. Data is replicated to a virtual hard drive (VHD) file stored on the VM. At switchover, the physical Master is disabled, a virtual machine is created on the Hyper-V server and the VHD file is mounted as a disk. The new VM is booted and integration services are deployed.

**Note**: You cannot run two Full System scenarios that protect the same physical Master.

**Scenario Creation** -- Create a Full System scenario that identifies a physical machine as the Master server and a Hyper-V virtual machine server as the Replica, and specifies the following information unique to Full System scenarios:

- **Volume List** -- You can select which volumes on the Master to include in the scenario. The system and boot volumes must be protected and are always selected by default.
- **Root Directory List** -- Since there is no root directory concept in Full System scenarios, this list is used to guide which data is replicated to virtual disk.
- **Local Directory on VM** -- This is the location of the virtual disk stored on the Hyper-V server. All virtual disks are stored here. It also stores the virtual disk volume mount point. CA ARCserve RHA replicates data from the source directory on the physical Master to the mount point on the virtual Replica.
- **Network Adapter List** -- This stores all network adapter information (adapter name, adapter ID, IP address, MAC address, and so on) on the physical machine. This information is used to create network mapping lists between the physical machine’s adapter and the virtual machine’s adapter.
- Network Mapping List -- When the virtual machine is created, the network adapter on the VM is set according to the information in this list.
- CPU/Memory Value -- When the virtual machine is created, CA ARCserve RHA sets the CPU number and memory size of the VM according to configuration properties defined in the scenario.

**Scenario Start** -- CA ARCserve RHA validates the stored scenario to verify no errors exist that could prevent a successful switchover, if needed.

**Synchronization** -- The physical Master creates and transfers the virtual disk file to the local directory on the virtual Replica. After transfer, the virtual disk file is stored in the directory you specified on the Root Replica Directory dialog during scenario creation.

**Replication** -- The physical Master replicates any data changes to the virtual disk file stored on the Replica in real time mode. The virtual disk file is mounted as a directory on the Hyper-V server file system.

**Switchover** -- If the physical Master is unavailable, CA ARCserve RHA initiates switchover according to the properties set during scenario creation. CA ARCserve RHA stops the P2V scenario and disables the physical machine network. The virtual machine is created on the Hyper-V server using the same name as the physical Master. The virtual disk is mounted and the network adapter for the virtual machine is added according to the network mapping list defined in the stored scenario. Finally, the virtual machine is booted. For end users accessing the failed physical Master, switchover takes several minutes.

**Data Recovery** -- Launch the Data Recovery Wizard and select a restore point. You can select the volumes to be restored and the target to which these volumes should be restored. CA ARCserve RHA creates and starts the restore scenario.

**Assured Recovery** -- You can perform manual or automatic assured recovery. Select the virtual Replica and click Replica Integration Testing, select the type of Assured Recovery and continue. CA ARCserve RHA stops applying journal changes, starts the AR process by creating a virtual machine with the specified virtual disks and then starts the VM. CA ARCserve RHA resumes applying journal changes when AR is stopped.
Configuring Master and Replica for Full System HA

For Full System high availability, the Master can be any Windows machine, physical or virtual, supported as both a Hyper-V guest OS and by the CA ARCserve RHA Engine.

The Replica server must be a Windows Server 2008 SP2 or Windows Server 2008 R2 with Hyper-V enabled.

**Note:** Full System HA on Windows Server 2008 SP1 (and older) is not supported, but Replication and AR are supported on these systems. Full System HA is supported only on Windows Server 2003 SP2, R2 SP2, Windows Server 2008 SP2, and Windows Server 2008 R2.
Create Full System HA Scenarios

Create Full System scenarios as you would any other scenario, using the Scenario Creation Wizard.

To create a new Full System Scenario

1. Start CA ARCserve RHA Manager. Select File, Create, New Scenario or click the New Scenario button.

   The Welcome dialog opens.

2. Click Create a New Scenario and type a Scenario Group Name, or select one from the list and then click Next.

   The Select Server and Product Type dialog opens. Select Full System, choose High Availability. For Tasks on Replica, select Assured Recovery or None, as desired, and then click Next.

   The Master and Replica Hosts dialog opens.

3. Type a Scenario Name, enter the Hostname or IP Address and Port number for both the physical Master and virtual Replica servers, enable the Verify CA ARCserve RHA Engine on Hosts option, and then click Next. For the Master, enter a physical machine. For the Replica, enter a Hyper-V server.

   You may be prompted for user credentials. If so, enter the appropriate credentials and click OK.

4. If you enabled engine verification, the Engine Verification dialog opens.

   Wait for verification to complete. If necessary, click Install to install the Engine on the specified hosts or click Next to continue.

   The Master Root Directories dialog opens, showing the list of volumes identified on the physical Master during the Auto-Discovery process. Boot and system volumes are selected by default and cannot be changed. Click Next.

   The Volume Setting screen opens.

5. Specify the VM directory on the Replica. Select volumes to be protected, as desired and click Next. Note that Filter options are not available for these scenarios.

   The Replica Root Directories dialog opens.

6. Set the virtual machine's local directory and click Next.

   The Scenario Properties dialog opens.

7. Change properties, as desired, and then click Next. For more information, see the CA ARCserve RHA Administration Guide.

   The Master and Replica Properties dialog opens.

8. Change properties, as desired, and then click Next. For more information, see the CA ARCserve RHA Administration Guide.
Wait while the Switchover Properties dialog retrieves information. The following information is acquired: CPU number, memory size on VM, adapter information on physical Master, and the Network Mapping List. You can change the acquired information after scenario creation completes.

When Switchover Properties opens, select Click to edit VN mappings.

9. The Virtual Network Mappings dialog opens. If there is only one virtual network adapter in both the Master and Replica servers, they are mapped automatically.

Map the virtual machines listed to the desired virtual networks on the Replica and click OK.

10. Set any other switchover properties, as desired, and click Next.

Wait while the Scenario Verification process completes.

If Scenario Verification lists any errors, you must resolve them to continue. If any warnings are listed, you should also resolve them to successfully continue. After making changes, click Retry to repeat verification.

11. Click Next.

The Scenario Run dialog opens.

Click Run Now to start synchronization and activate the scenario. Click Finish to run the scenario later.
Additional Scenario Properties for Full System HA

You can manually change the following properties after the scenario creation process is complete:

**Virtual Machine Local Directory**

In the Replica Root Directory list, double-click the virtual machine local directory to browse and select a new location. Click OK and then click the disk icon to save the modified scenario.

**CPU Core**

On the High Availability Properties tab, expand Virtual Machine settings. Click CPU Core to modify the number.

**Memory Size**

Click Memory Size to modify the value.

**Virtual Network Mappings**

Besides the Virtual Network Mappings setting, click the entry, "Click to edit Virtual Network Mappings" to display the Physical Network Mapping dialog.

**Virtual Machine Name**

You may change the Virtual Machine Name, if desired. By default, the Master hostname is used.

Save the modified scenario when you are done modifying these settings.

Redirection Methods for Full System HA Scenarios

For Full System HA scenarios, Switch computer name and IP redirection are not supported; you may only choose DNS redirection. You can also customize the network resource to be used on the virtual machine. Specify the IP, gateway DNS and WINS address on the mapped NIC, if it uses static IP.
Running a Full System HA Scenario

When you start a Full System HA scenario, the software first validates the scenario configuration with a verification check. During synchronization, the data in protected volumes on the physical machine is replicated to a virtual disk file on the Hyper-V Replica. You may select file, block or volume level synchronization. Volume synchronization gives better performance in LAN-based environments but syncs all data from the Master to the Replica. As long as you have completed one successful synchronization, a subsequent file or block level sync offers a significant load reduction. For resynchronization, block level sync is used by default.

During replication, the software replicates all file system changes that occur on the physical machine to the Hyper-V Replica and applies those changes to the data on the virtual disk.

Restore Full Systems

Use the Data Recovery Wizard to restore a full system. Launch the wizard, select the restore point and then choose the volume or volumes you wish to restore. Choose all volumes to restore the full system. Specify a restore target. By default, the restore target is the original physical Master, but if that machine is damaged, you may specify another server. (You will need logon credentials.) CA ARCserve RHA creates a restore scenario, runs the verification process and then starts the scenario.

Upon starting the restore scenario, the restore Master sends all selected files to the target server and merges any necessary registry keys before launching a reboot of the target server.

Perform Full System Assured Recovery Testing

You can perform Assured Recovery Testing for Full System HA scenarios manually or automatically.

During AR Testing, the software suspends journal application, creates a VM with the virtual hard disk file and a snapshot to save possible changes, then starts the VM. If you chose automatic AR testing, wait for the software to stop the test. If you chose manual, you'll need to stop the AR manually.

Once stopped, the software resumes applying journal changes.

For more information, see the section, Testing Assured Recovery and Managing VSS Snapshots.
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