CA XOsoft™ High Availability for Windows

Microsoft® Hyper-V Operation Guide

CA Product References

This document references the following CA products:

- CA XOsoft™ Replication
- CA XOsoft™ High Availability (HA)
- CA XOsoft™ Assured Recovery
- CA XOsoft Continuous Data Protection (CDP)

Contact CA

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 http://ca.com/support, you can access the following:

- Online and telephone contact information for technical assistance and customer services
- Information about user communities and forums
- Product and documentation downloads
- CA Support policies and guidelines
- Other helpful resources appropriate for your product

Provide Feedback

If you have comments or questions about CA product documentation, you can send a message to techpubs@ca.com.

If you would like to provide feedback about CA product documentation, complete our short customer survey, which is also available on the CA support website, found at http://ca.com/support.

Note: CA XOsoft is sold in Japan under the names, CA ARCserve Replication and CA ARCserve High Availability.

Contents

Chapter 1: Introduction

CA XOsoft High Availability (HA) is a high availability solution based on asynchronous real-time replication and automated application switchover and switchback to provide cost-effective business continuity for file servers and other application servers on both 32- and 64-bit Windows servers.

CA XOsoft HA offers push-button or fully automatic switchover of mission-critical servers over a LAN or WAN, server status monitoring, and integrated continuous data protection as a guard against data corruption, all in a system that sets the standard for ease of configuration and management.

When disaster strikes, whether in the form of a hurricane, a blackout, or far more likely, a virus attack or software or user error, your ability to respond well to the crisis can make the difference between a bright future and the end of your business. At the very least, you are likely to incur significant costs in lost business and, perhaps more importantly, lost confidence by your customers, investors, and other stakeholders. Disaster recovery planning (DRP) is not just about insurance. It is about maintaining your competitive edge. CA XOsoft HA is designed to give you that edge.

This section contains the following topics:

About This Guide

This document describes how to implement a CA XOsoft HA solution for Hyper-V. Please review each procedure before you begin. It is essential that you have the appropriate resources and permissions to carry out each task.

Related Documentation

Use this Guide along with the *CA XOsoft Installation Guide* and the *CA XOsoft User Guide*.

Server Requirements

To implement CA XOsoft or CA XOsoft HA, refer to the appropriate list of requirements, depending on the server type you selected. These components are licensed separately. If you do not have the license required to access support for a specific server type, please contact Tech Support.

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.
- Install Integration Components in each Guest OS to obtain IP addresses and host names of virtual machines.
- 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.

Log On Account Conditions

The CA XOsoft Replication and CA XOsoft HA 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 machine 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.

Servers Operating in a Workgroup

For servers in a workgroup, set the CA XOsoft Engine service account to Local System (unless you have added any custom scripts that require higher level permissions).

License Registration

CA XOsoft licensing policy is based on a combination of several parameters, which include: the operating systems involved, the required solution, the supported application and database servers, the number of participating hosts, and the additional modules - Assured Recovery and CDP Repository. 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 need to register CA XOsoft product using your license key. To register the product, you need to open CA XOsoft Manager, which does not depend on the existence of a valid registration key. Once 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.

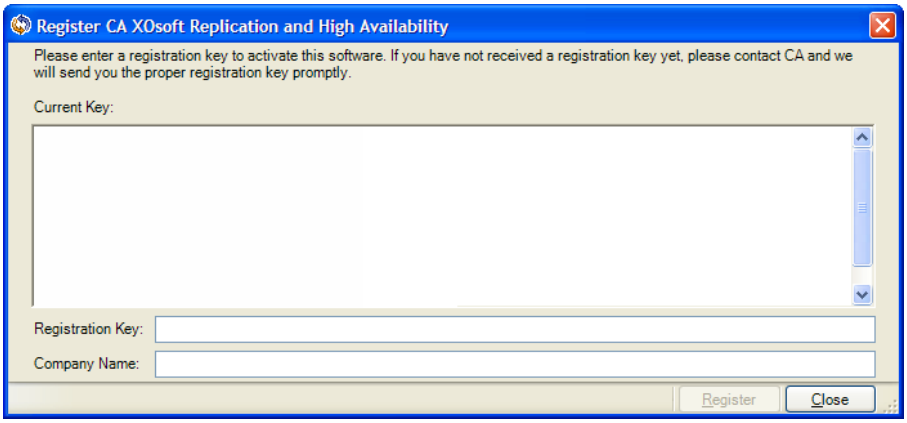
When you are creating a scenario, some of the options might be disabled following the terms of your license. However, you can create as many scenarios as you wish, since the validity of your license key is first checked when you try to run a specific scenario. Only when you click the **Run** button, 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 XOsoft using the license key

1. Open the Manager. The **Welcome** message appears. Then, a **License Warning** message appears informing you that your product is not registered and prompting you to register it.

2. Click **OK** to close the message. Then, open the **Help** menu and select the **Register** option.

The **Register CA XOsoft Replication and High Availability** dialog opens.



3. Enter the following information:
   - In the **Registration Key box** - enter your registration key.
   - [Optional] **Company Name** box - enter your company name
4. Click the **Register** button to register the product and close the dialog.

   Now you can start working with the CA XOsoft Manager according to your license permissions.

About Virtualization

Virtual machines make it possible for a single physical computer to be split into logical partitions, each effectively behaving as a separate physical machine, running its own operating system and applications. CA XOsoft supports Microsoft Hyper-V Server 2008, a Windows product that allows you to set up virtual machines on 64-bit Windows Server 2008 systems whose hardware supports virtualization when the Hyper-V role is enabled.

Supported Configurations for Hyper-V

This section describes the various configuration options available in a virtual environment. Before proceeding, ensure you have read and understood these recommendations.

Hyper-V

You can set up Hyper-V Server on just the Master server, where Microsoft Windows Server 2008 is running on a 64-bit system with virtualization hardware. In this case, your CA XOsoft protection is limited to Disaster Recovery only.

Or, you can set up Hyper-V on both the Master and Replica servers where Microsoft Windows Server 2008 is running on 64-bit, hardware-assisted virtualization systems. In this case, you can achieve Disaster Recovery and High Availability protection with CA XOsoft.

CA XOsoft HA allows you to create scenarios in which a virtual machine is created on both Master and Replica servers. Each virtual machine is "on" or "off". In the event of a failure, a VM on the Master can be turned off and its corresponding VM on the Replica turned on independent of the other virtual machines running on the Master server. Determining a redirection method is therefore not necessary in such scenarios.

Chapter 2: Protecting Hyper-V Environments

In a Hyper-V environment, the level of protection possible depends on your implementation needs. Is local high availability important? If yes, configure two servers, each running Microsoft Windows Server 2008 with Hyper-V. In the event of a failure, virtual machines running on the Hyper-V Master server can then be activated on the Hyper-V Replica automatically or at your command. Is remote disaster recovery important? If yes, only the Master server requires Microsoft Windows Server 2008 with Hyper-V, while the Replica server can be configured with any Windows version.

This section contains the following topics:

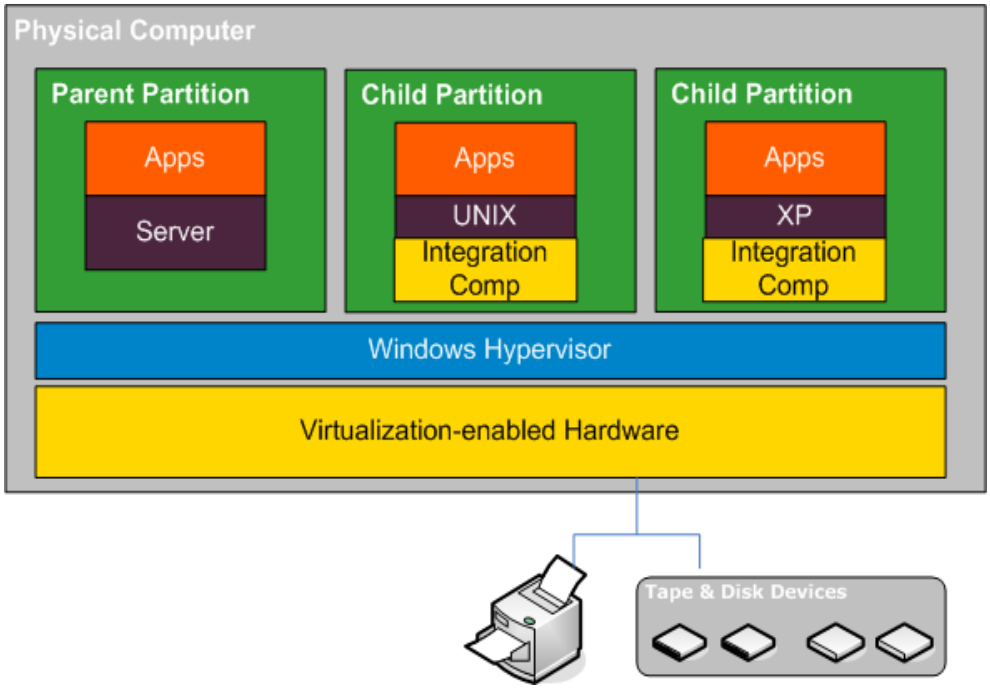
Hyper-V Configuration

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 XOsoft HA. You can use CA XOsoft with only one Hyper-V server, but your protection will be limited to only disaster recovery.

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

Install CA XOsoft HA 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 XOsoft HA 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 CA XOsoft HA 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 CA XOsoft 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 CA XOsoft High Availability

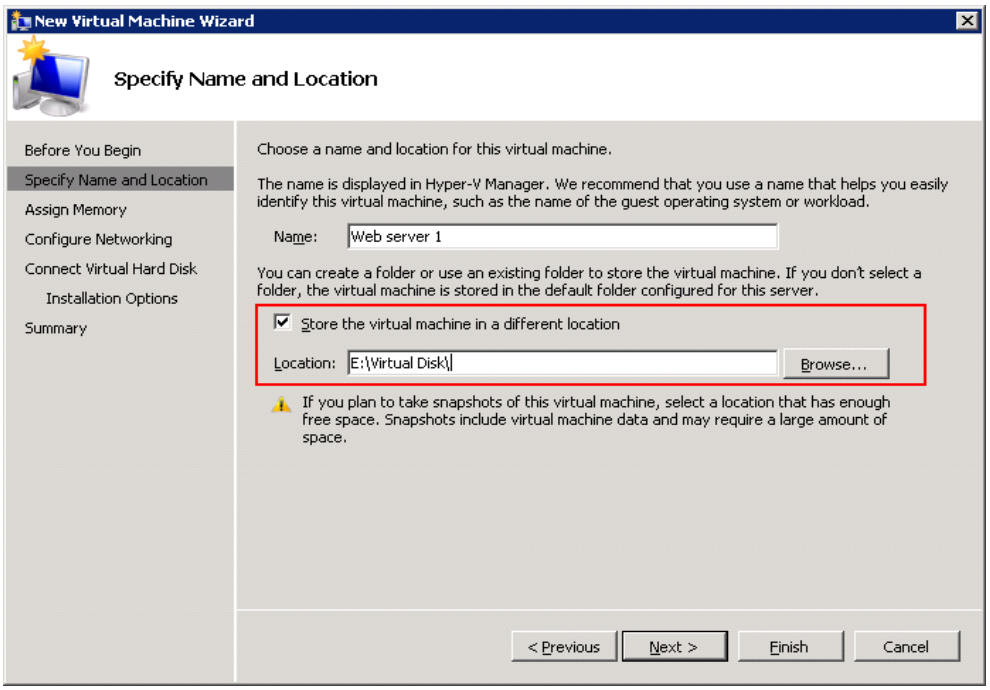
The default Hyper-V settings are usually sufficient when using CA XOsoft but there are some default changes you should make to ensure virtual machines can easily and successfully be started on the Replica when the Master is unavailable:

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

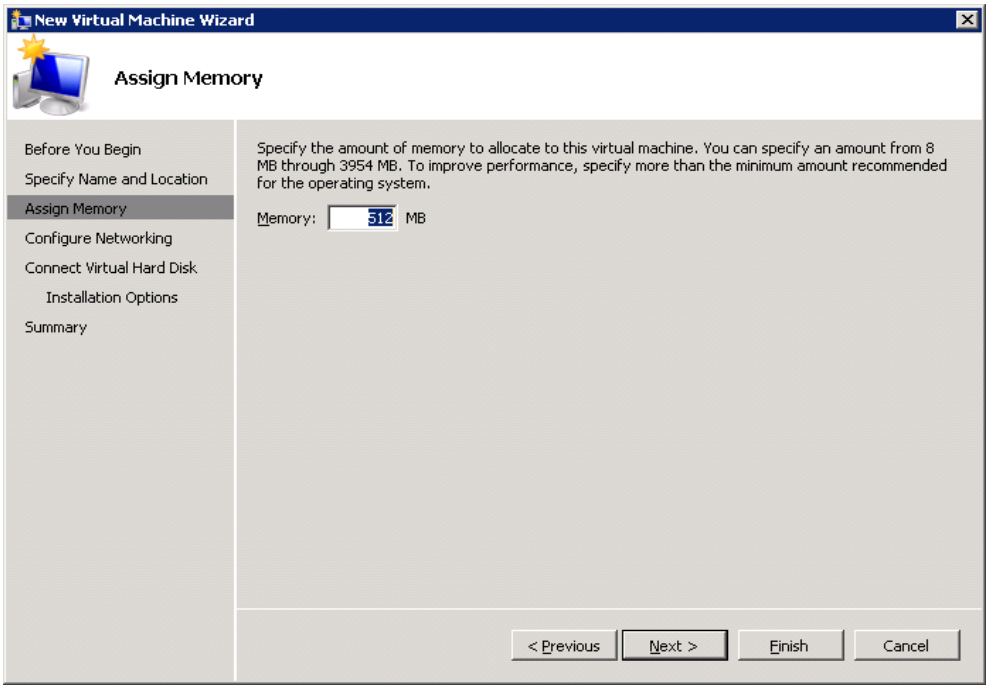
The following procedure uses a Windows guest as an example, but works for any supported Hyper-V guest operating system.

To configure Hyper-V for CA XOsoft High Availability

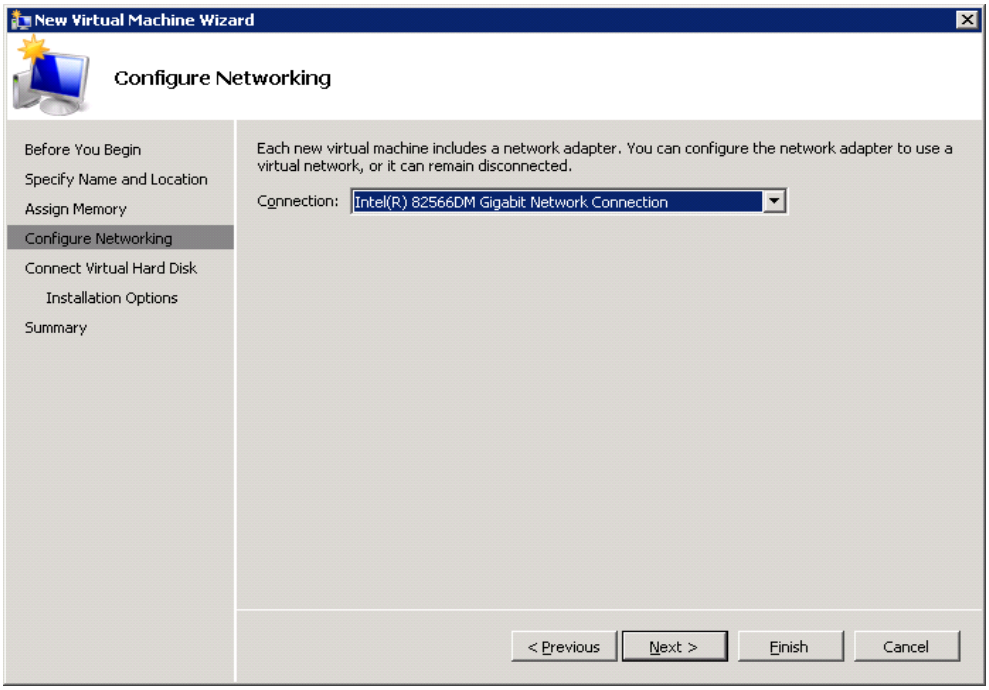
1. Launch the Hyper-V Manager wizard.
2. From the New Virtual Machine wizard dialog, enter a Name, select the Store the virtual machine in a different location option and then provide the location. We recommend changing the default path to a NAS or SAN volume. Click Next.



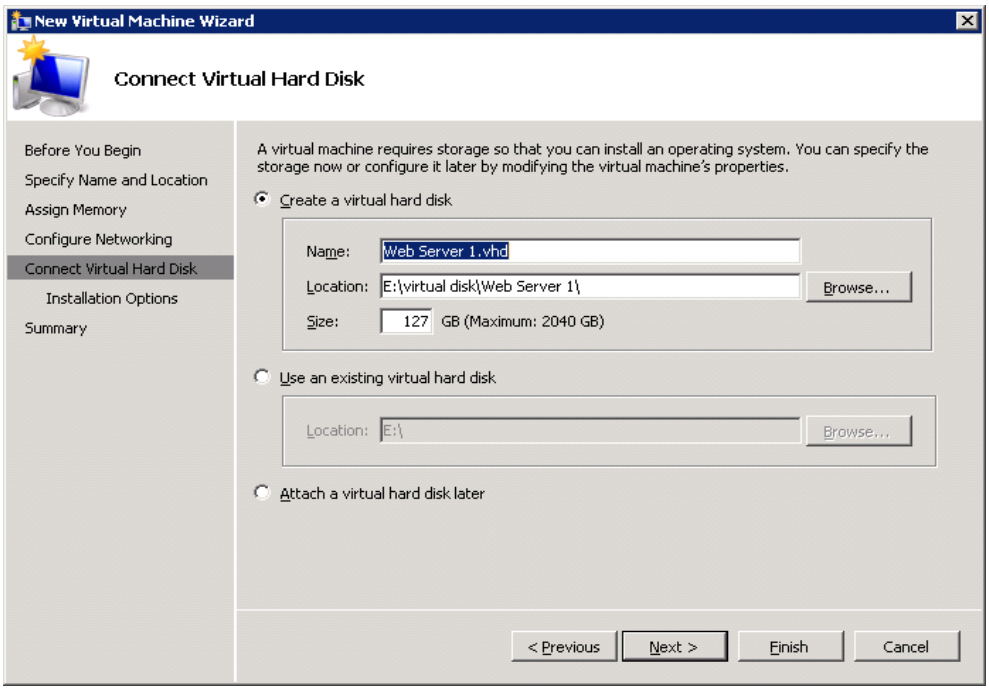
3. From the Assign Memory dialog, set guest memory. Typically, 512 MB is sufficient for a single service guest. Click Next.



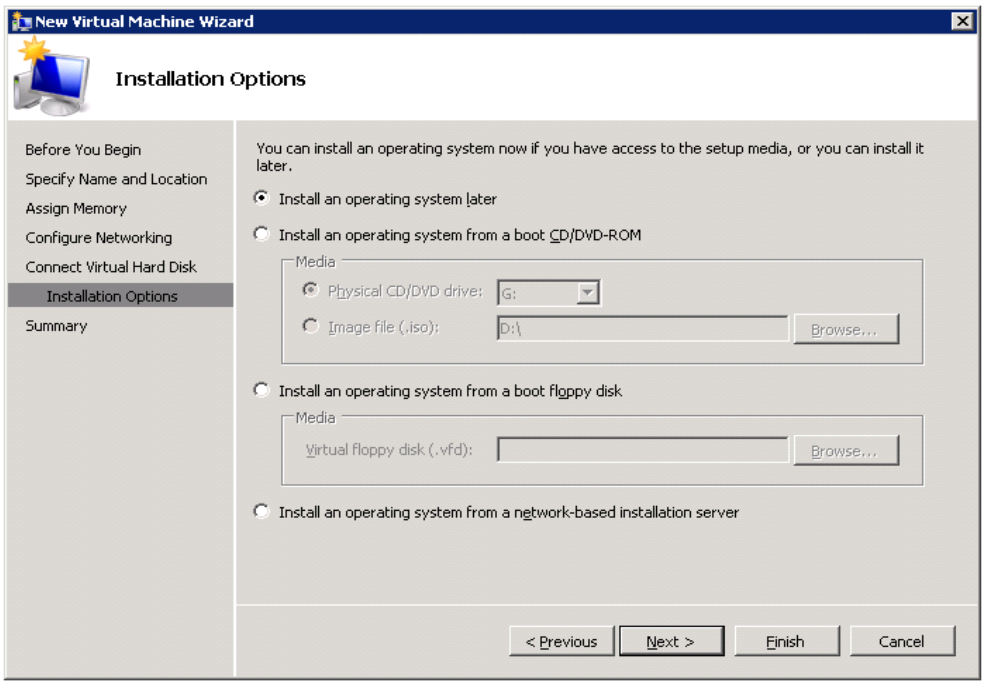
4. From the Configure Networking dialog, select the virtual network adapter. Make sure you select a virtual network adapter that is bound to the physical network adapter. Click Next.



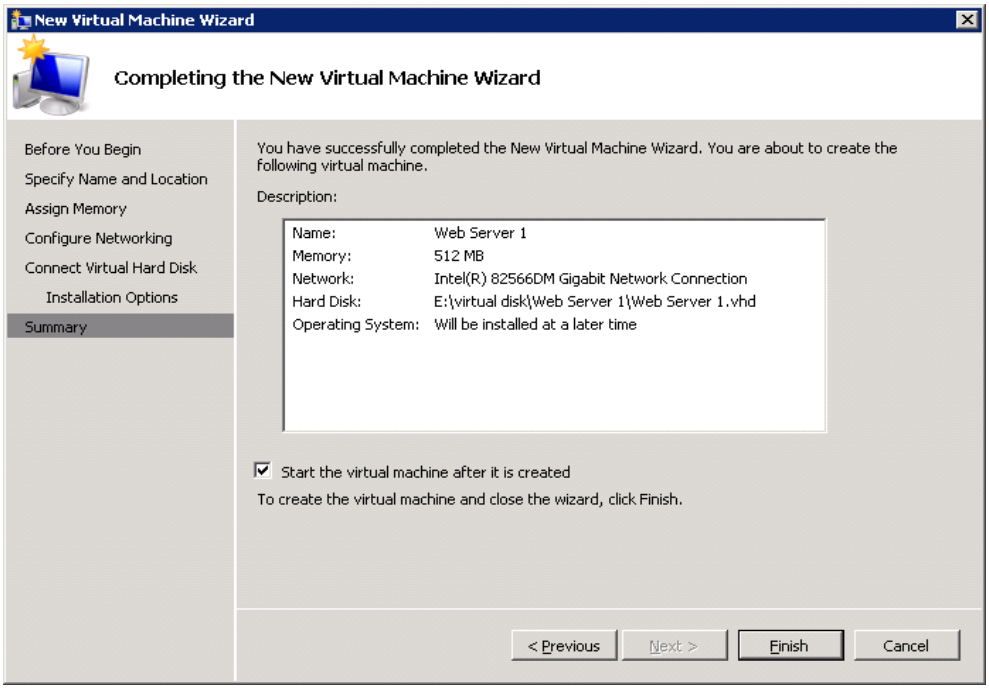
5. From the Connect Virtual Hard Disk dialog, select Create a virtual hard disk. By default, the virtual disk is created under the VM folder. You may also use an existing disk. Click Next.



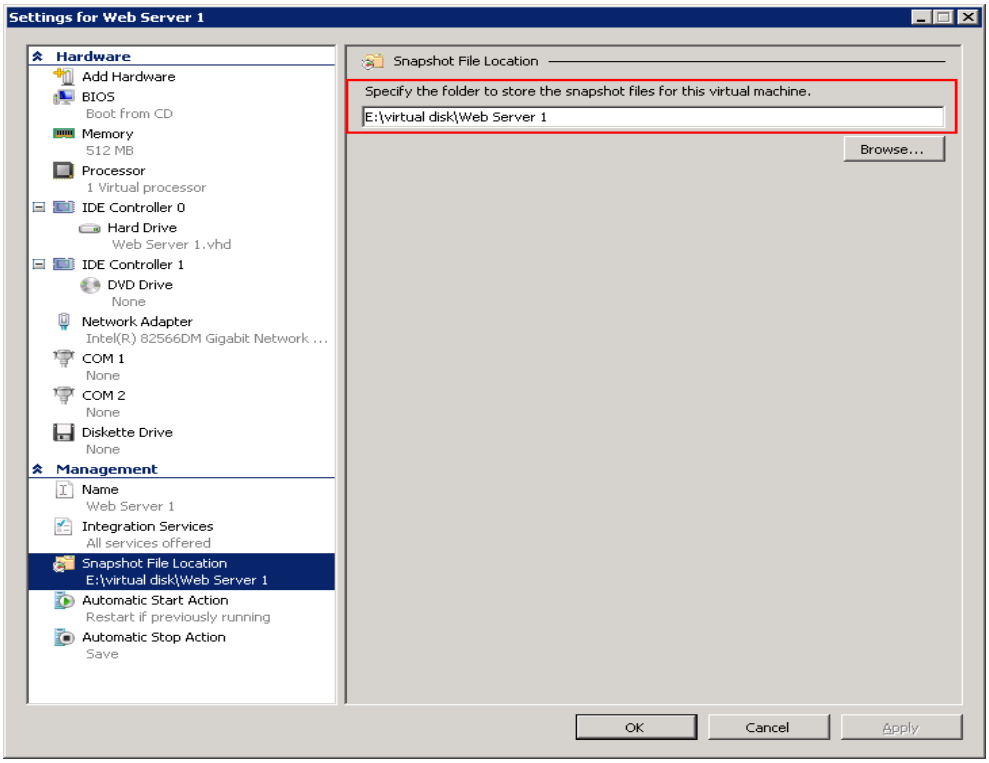
6. From the Installation Options dialog, select Install an operating system later and click Next.



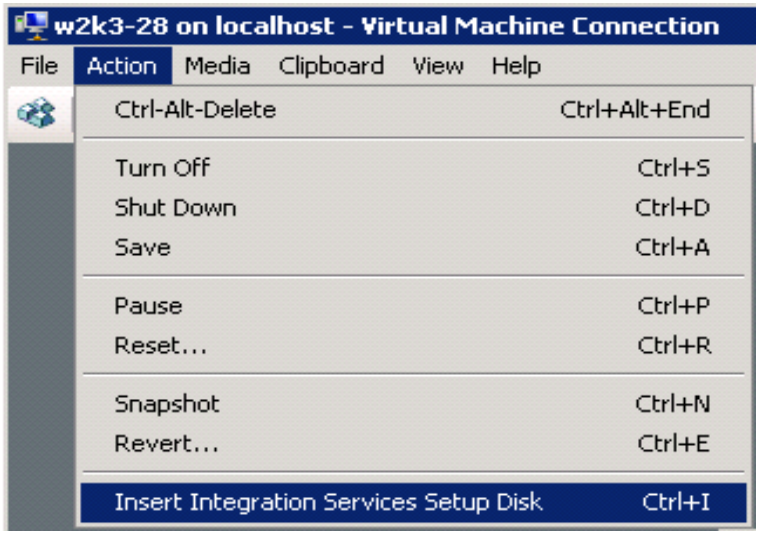
7. From the Completing the New Virtual Machine Wizard dialog, select Start the virtual machine after it is created and click Finish to exit the wizard.



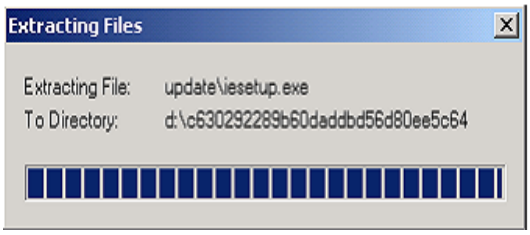
8. The snapshot folder is automatically set to the virtual machine folder. Click OK.



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.



How Hyper-V Redirection Works

Traditional CA XOsoft HA Redirection Methods (Move IP, Switch Computer Name, DNS) do not apply to Hyper-V. In Hyper-V environments, CA XOsoft protects each individual virtual machine, allowing you to perform not only switchover, but load balancing during periods of high activity.

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 XOsoft detects a failure, that is, if the "Is alive" check returns false, CA XOsoft 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.

Chapter 3: Creating and Using Scenarios

This section describes how to create and use high availability scenarios.

This section contains the following topics:

Create New Hyper-V 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 CA XOsoft 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.

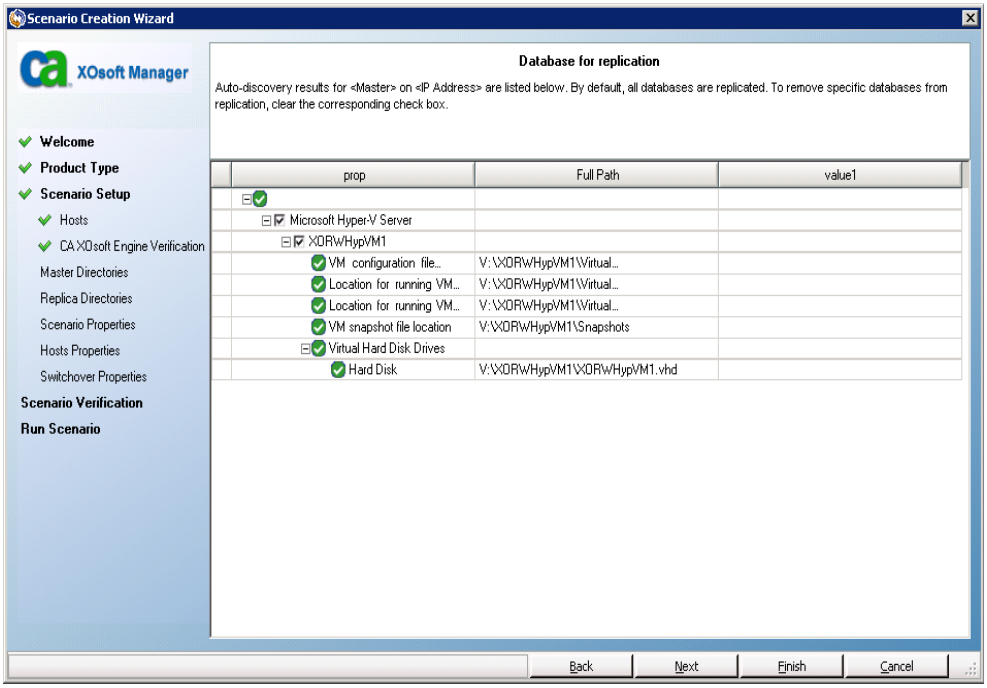
4. Type a Scenario Name, enter the Hostname or IP Address and Port number for both Master and Replica servers, enable the Verify CA XOsoft Engine on Hosts option, and then click Next.

   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 XOsoft User 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 XOsoft User 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.

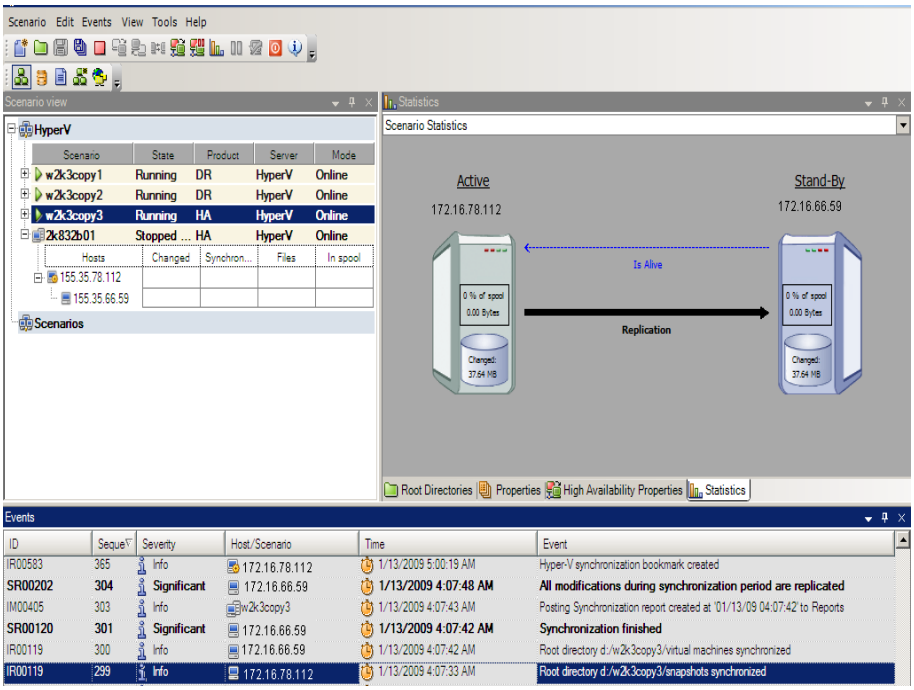
13. Click Run Now to start synchronization and activate the scenario. Click Finish to run the scenario later.

Scenario 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 XOsoft User Guide.

Properties are organized into tabs on the CA XOsoft Manager Framework pane. The tabs displayed are based upon server type, CA XOsoft 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 XOsoft User Guide for more information.
- Spool properties -- Set the size, minimum disk free size and directory path. See Spool Directory Settings (see page 47) 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

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 CA XOsoft 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 XOsoft verifies the scenario before running it.

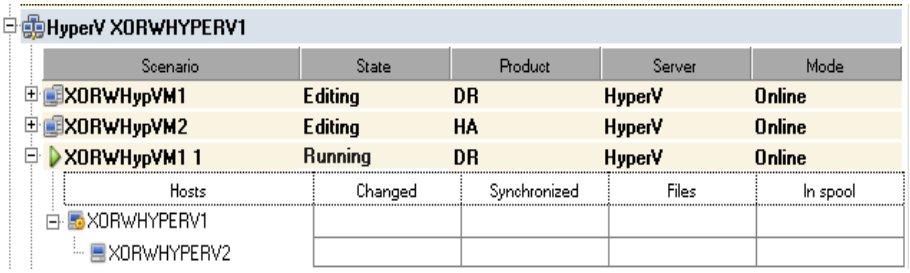
   If the scenario was not set up correctly or problems occurred in the participating hosts, errors are reported on the Event pane.

   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 XOsoft User Guide for more information.
   - **Ignore files of same size/time** -- 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 XOsoft User 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**:



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.

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 XOsoft User 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's state turns into **Stopped by user**, and the Statistics tab is no longer available on the Framework pane.

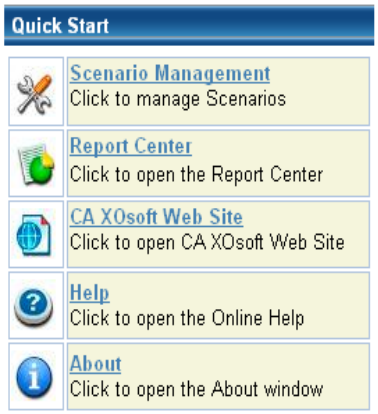
View a Report

CA XOsoft 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\XOsoft\Manager\reports*

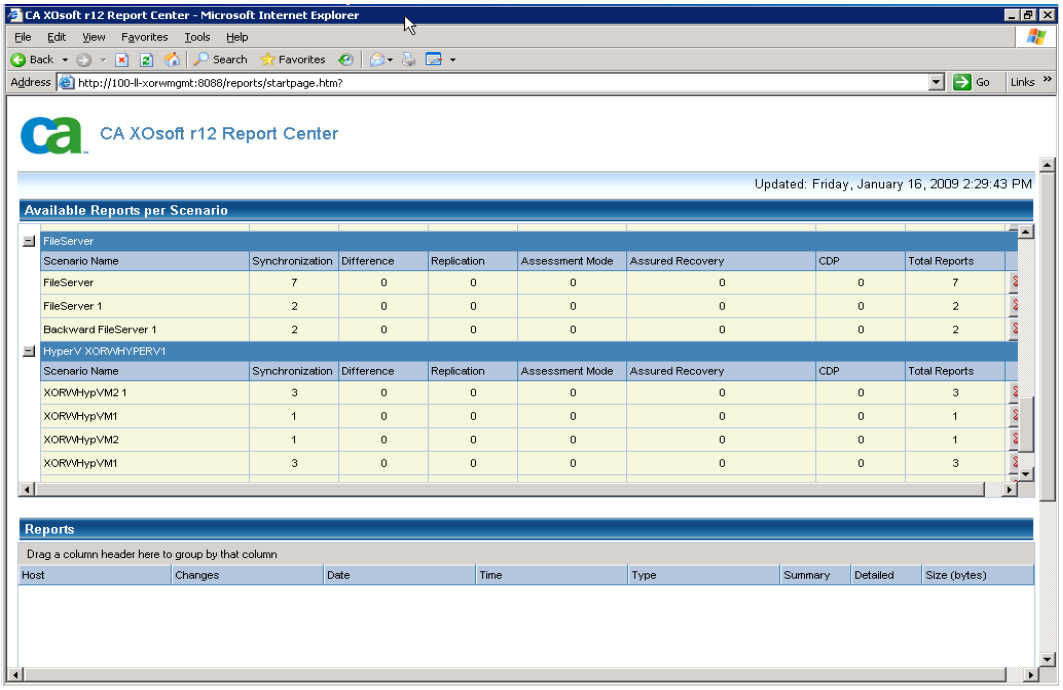
To view a report

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:



2. 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.

3. 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:

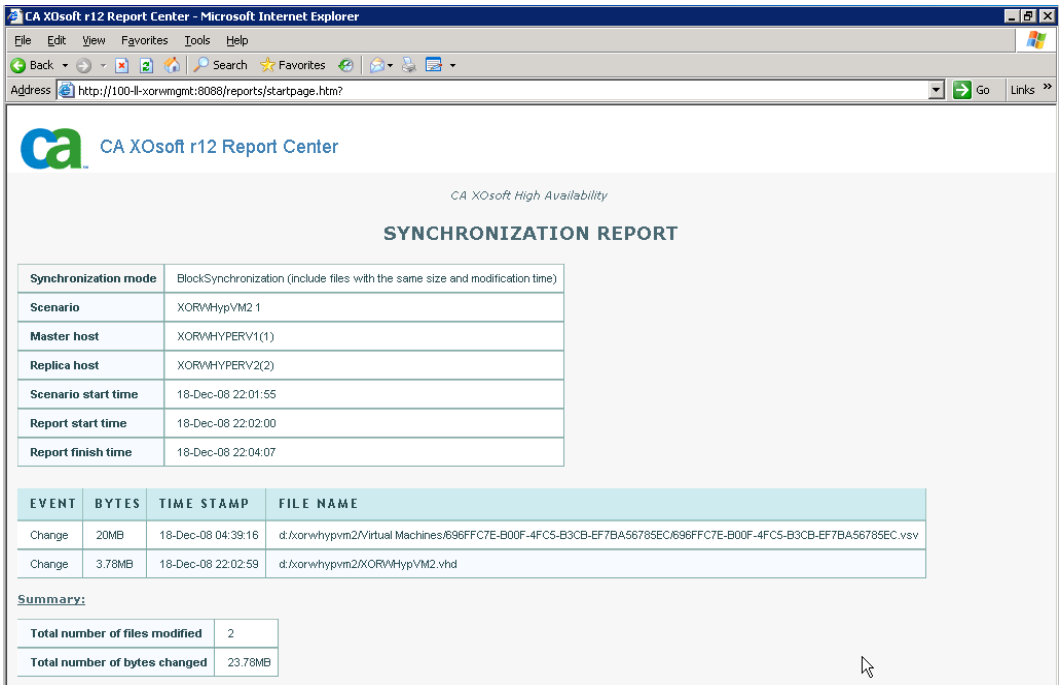
Reports

Drag a column header here to group by that column

Host	Changes	Date	Time	Type	Summary	Detailed	Size (bytes)
XORWHYPERV2	Changes found	12/18/08	22:04:07	Synchronization			1923
XORWHYPERV2	Changes found	12/18/08	04:49:54	Synchronization			2548
XORWHYPERV2	Changes found	12/18/08	04:06:35	Synchronization			3479

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:



Chapter 4: 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 XOsoft HA 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 XOsoft Manager.

This section contains the following topics:

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 XOsoft HA 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 33).
- 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 XOsoft User 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, one 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.

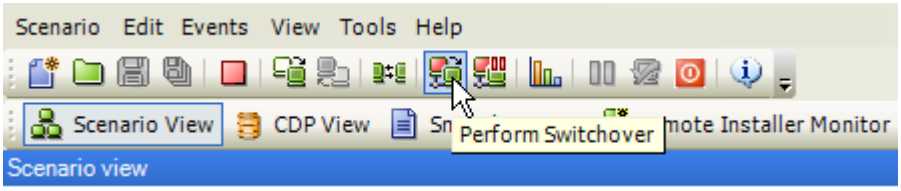
When the Reverse Replication feature is off, to start reverse replication after a switchover has occurred, click the Run button. The benefit to this feature is resynchronization in the reverse direction is not required, if both the master and replica servers were online and connected during switchover. 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

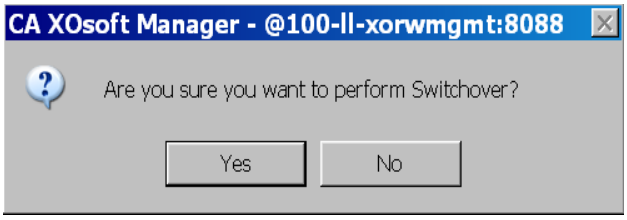
Once triggered, whether manually or automatically, the switchover process itself is fully automated.

To initiate manual switchover

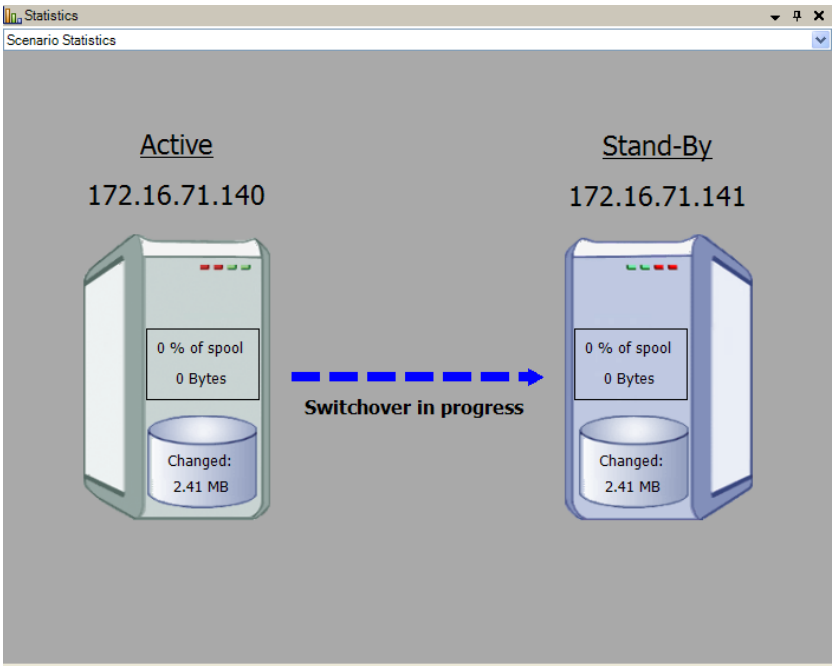
1. Open the Manager and select the desired scenario from the Scenario pane. Verify it is running.
2. Click on the **Perform Switchover** button, or select from the **Tools** menu the **Perform Switchover** option:



A confirmation message appears:

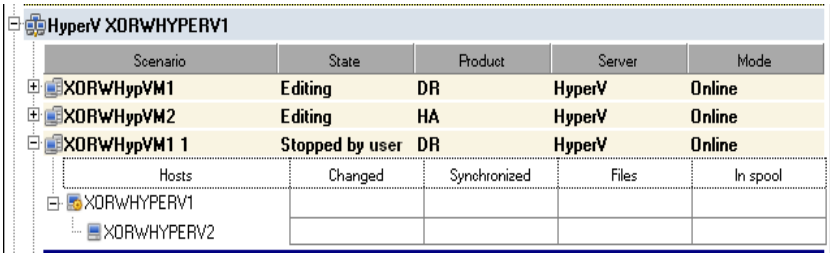


3. Click **OK** on the **Perform Switchover** confirmation message. This procedure initiates a switchover from the Master server to the Replica server:



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

4. After the switchover is completed the scenario stops:



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

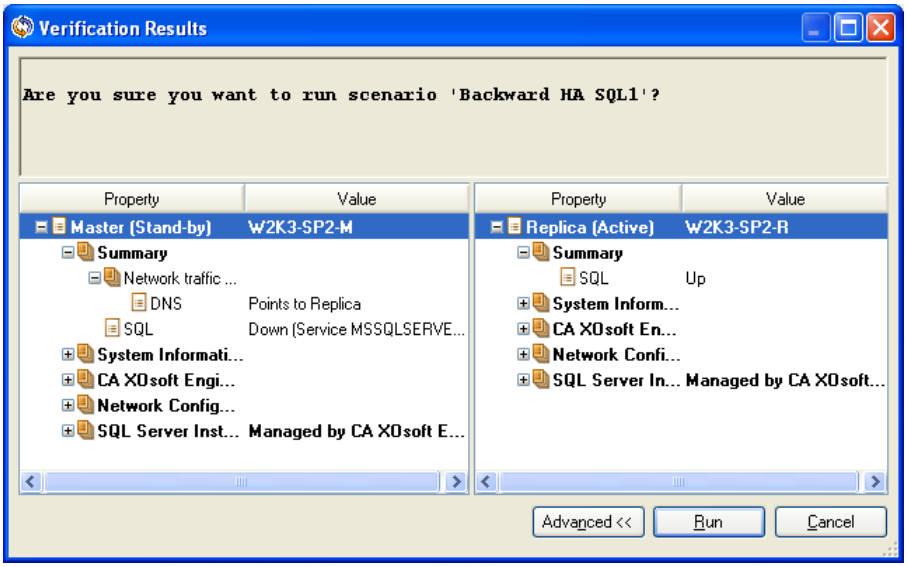
After a switchover is initiated, whether manually or automatically, at some point, you will want to reverse the server roles and make the original Master the active server again the Replica the standby server. Before you switch back the roles between servers, decide if you want to the data on the original 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

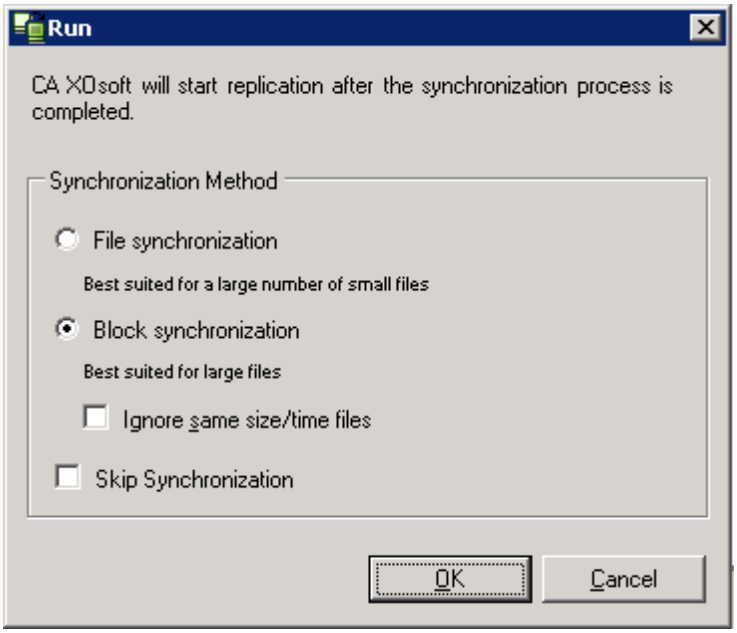
1. Ensure that both Master and Replica servers are available on the network and that the CA XOsoft Engine is running.
2. Open the Manager and select the desired scenario from the Scenario pane.
3. Perform one of the following:
   - If the scenario is already running, skip directly to Step 4
   - If the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

     CA XOsoft HA 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.

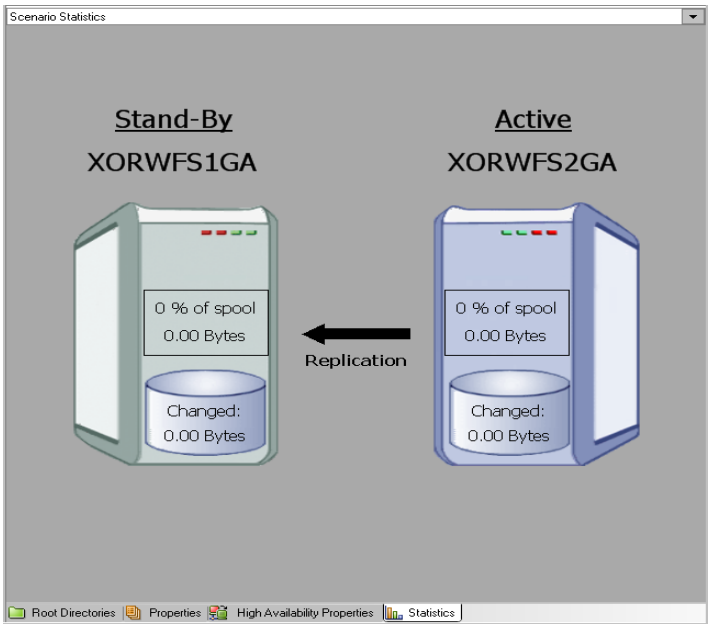


b. Select a synchronization method from the Run dialog and click OK to start resynchronization.

Note: See the CA XOsoft User 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

It is not recommended to set both the Switchover and Reverse Replication Initiation options to automatic in a production environment. While these options are individually beneficial it is best practice to set only one or the other to automatic. The reason for this recommendation is that automatic switchover allows CA XOsoft HA to trigger a switchover, after a failure is detected, without administrative involvement. If automatic reverse replication is also on, CA XOsoft HA may start to overwrite data on the failed production server before an administrator is able to assess the failure situation. Overwriting data on a failed server before an administrator can assess the situation may have undesirable consequences. Due to this possibility, setting both options to automatic is not recommended. Please choose either one or the other depending on what best fits your requirements. When only one option is used at a time these settings can be very beneficial and may be used safely.

Chapter 5: Recovering Data

This section contains the following topics:

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.

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.

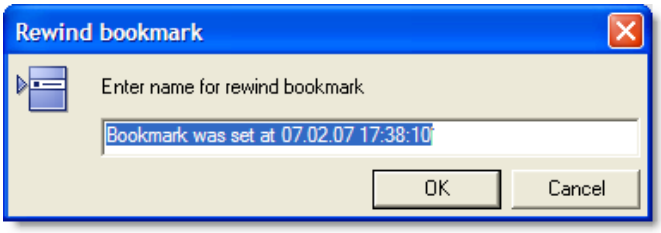
Notes:

- 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 allows you to schedule bookmarks.

To set a bookmark

1. When the required scenario is running, 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.

2. 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.

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:

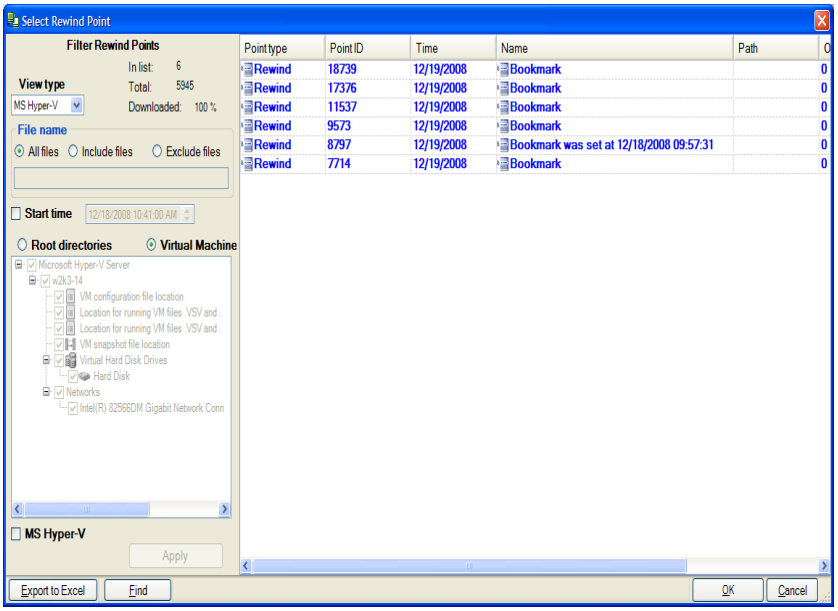
- **Stop the VM** -- CA XOsoft automatically powers off the VM before recovery so that the existing VM can be overwritten. After restore completes, you need to restart the VM manually.
- **Select a bookmark** -- You must roll data back to a specific point in time called a bookmark, or rewind point. The 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 CA XOsoft HA 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.



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 XOsoft HA 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 XOsoft HA 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 XOsoft HA starts the virtual machines on the Replica automatically.

Appendix A: Additional Information and Tips

This chapter provides you with helpful information concerning the application.

- By default, the spool is located in the CA XOsoft 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 XOsoft supports bandwidth limitation and bandwidth limitation scheduling. If you require such features, please consult the *CA XOsoft User Guide*.

This section contains the following topics:

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 XOsoft 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 CA XOsoft 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 XOsoft 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 choose to 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. Please note that this space is not pre-allocated.

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

Note: The CA XOsoft Spool Directory is not a pre-allocated space folder and will be used only if needed.

Index