

VMware vSphere Replication Administration

vSphere Replication 5.5

This document supports the version of each product listed and supports all subsequent versions until the document is replaced by a new edition. To check for more recent editions of this document, see <http://www.vmware.com/support/pubs>.

EN-001114-03

vmware[®]

You can find the most up-to-date technical documentation on the VMware Web site at:

<http://www.vmware.com/support/>

The VMware Web site also provides the latest product updates.

If you have comments about this documentation, submit your feedback to:

docfeedback@vmware.com

Copyright © 2012–2014 VMware, Inc. All rights reserved. [Copyright and trademark information.](#)

VMware, Inc.
3401 Hillview Ave.
Palo Alto, CA 94304
www.vmware.com

Contents

vSphere Replication Administration	5
Updated Information	7
1 Overview of VMware vSphere Replication	9
Contents of the vSphere Replication Appliance	10
vSphere Replication Client Plug-In	10
Source and Target Sites	11
How vSphere Replication Works	11
2 vSphere Replication Roles and Permissions	15
Assign vSphere Replication Roles to Users	15
Assign VRM Replication Viewer Role	15
Assign VRM Virtual Machine Replication User Role	16
Assign VRM Virtual Machine Recovery User Role	16
Clone Existing VRM Administrator Role and Modify Privileges	17
vSphere Replication Roles Reference	17
3 vSphere Replication System Requirements	21
vSphere Replication Licensing	21
vSphere Replication Network Ports	22
Operational Limits of vSphere Replication	22
Compatibility of vSphere Replication with Other vSphere Features	22
vSphere Replication Compatibility with Other Software	23
Bandwidth Requirements for vSphere Replication	23
4 Installing vSphere Replication	27
Deploy the vSphere Replication Virtual Appliance	27
Configure vSphere Replication Connections	28
Uninstall vSphere Replication	29
Unregister vSphere Replication from vCenter Server if the Appliance Was Deleted	30
5 Deploying Additional vSphere Replication Servers	31
Deploy an Additional vSphere Replication Server	31
Register an Additional vSphere Replication Server	32
Reconfigure vSphere Replication Server Settings	32
Unregister and Remove a vSphere Replication Server	33
Disable the Embedded vSphere Replication Server	33
6 Upgrading vSphere Replication	35
Upgrade vSphere Replication by Using the Downloadable ISO Image	35

	Update vCenter Server IP Address in vSphere Replication Management Server	36
	Update vSphere Replication By Using vSphere Update Manager	36
	Update vSphere Replication by Using the VAMI	37
7	Reconfigure the vSphere Replication Appliance	41
	Reconfigure General vSphere Replication Settings	42
	Change the SSL Certificate of the vSphere Replication Appliance	42
	Change the Password of the vSphere Replication Appliance	45
	Change Keystore and Truststore Passwords of the vSphere Replication Appliance	45
	Configure vSphere Replication Network Settings	46
	Configure vSphere Replication System Settings	47
	Reconfigure vSphere Replication to Use an External Database	48
	Use the Embedded vSphere Replication Database	51
8	Replicating Virtual Machines	53
	How the Recovery Point Objective Affects Replication Scheduling	54
	Replicating a Virtual Machine and Enabling Multiple Point in Time Instances	54
	Using vSphere Replication with Virtual SAN Storage	55
	Replicating Virtual Machines Using Replication Seeds	57
	Replicating a Virtual Machine in a Single vCenter Server Instance	57
	Configure Replication for a Single Virtual Machine	57
	Configure Replication for Multiple Virtual Machines	59
	Move a Virtual Machine to a New vSphere Replication Server	60
	Stop Replicating a Virtual Machine	60
	Reconfiguring Replications	61
9	Performing a Recovery with vSphere Replication	63
	Recover Virtual Machines by Using vSphere Replication	63
	Failback of Virtual Machines in vSphere Replication	65
10	Monitoring and Managing Replications in vSphere Replication	67
	View the Replication Summary for a Site	67
	Identifying Replication Problems in the Issues Tab	69
	Manage Target Sites	69
	Manage Replication Servers	69
11	Troubleshooting vSphere Replication	71
	vSphere Replication Limitations	71
	Access the vSphere Replication Logs	72
	vSphere Replication Events and Alarms	73
	Solutions for Common vSphere Replication Problems	76
	Index	89

vSphere Replication Administration

vSphere Replication Administration provides information about installing, configuring, and using VMware vSphere Replication.

Intended Audience

This information is intended for anyone who wants to protect the virtual machines in their virtual infrastructure by using vSphere Replication. The information is written for experienced Windows or Linux system administrators who are familiar with virtual machine technology and datacenter operations.

Updated Information

vSphere Replication Administration is updated with each release of the product or when necessary.

This table provides the update history of *vSphere Replication Administration*.

Revision	Description
001114-03	Corrected “Compatibility of vSphere Replication with Other vSphere Features,” on page 22, “Using vSphere Replication with Virtual SAN Storage,” on page 55, “Configure Replication for a Single Virtual Machine,” on page 57, and “Configure Replication for Multiple Virtual Machines,” on page 59 to state that using vSphere Replication with Virtual SAN storage is supported on both the source and target sites.
001114-02	Included additional vSphere Replication limitations in “vSphere Replication Limitations,” on page 71 Added troubleshooting topics: <ul style="list-style-type: none">■ “Initial Full Synchronization of Virtual Machine Files to VMware Virtual SAN Storage Is Slow,” on page 86■ “vSphere Web Client 5.1.x Non-Functioning Option Binds vSphere Replication Traffic to a Specific vmknic,” on page 86■ “Configuring Replication Fails After Rebuilding VRMS,” on page 87■ “vSphere Replication Operations Run Slowly as the Number of Replications Increases,” on page 87 Added information on Virtual SAN: <ul style="list-style-type: none">■ “Using vSphere Replication with Virtual SAN Storage,” on page 55■ “Configure Replication for Multiple Virtual Machines,” on page 59■ “vSphere Replication Operations Run Slowly as the Number of Replications Increases,” on page 87 Explained how to update the vCenter Server IP address in vSphere Replication Management Server in “Update vCenter Server IP Address in vSphere Replication Management Server,” on page 36 Clarified that you can update a minor release of vSphere Replication using VUM and VAMI and vSphere Replication Servers using VAMI: <ul style="list-style-type: none">■ “Update vSphere Replication By Using vSphere Update Manager,” on page 36■ “Update vSphere Replication by Using the VAMI,” on page 37■ “Update vSphere Replication Servers by Using the VAMI,” on page 38 Explained how to disable the embedded vSphere Replication server in “Disable the Embedded vSphere Replication Server,” on page 33 Updated Virtual SAN support in “Compatibility of vSphere Replication with Other vSphere Features,” on page 22 Added vSphere Replication bandwidth requirements in “Bandwidth Requirements for vSphere Replication,” on page 23 and “Calculate Bandwidth for vSphere Replication,” on page 25 Described the vSphere Replication Management Server in “Contents of the vSphere Replication Appliance,” on page 10
001114-01	Clarified that upgrade to vSphere Replication 5.5 is only available via the downloadable ISO image in Chapter 6, “Upgrading vSphere Replication,” on page 35
001114-00	Initial release.

Overview of VMware vSphere Replication

1

VMware vSphere Replication is an extension to VMware vCenter Server that provides hypervisor-based virtual machine replication and recovery.

vSphere Replication is an alternative to storage-based replication. It protects virtual machines from partial or complete site failures by replicating the virtual machines between the following sites:

- From a source site to a target site
- Within a single site from one cluster to another
- From multiple source sites to a shared remote target site

vSphere Replication provides several benefits as compared to storage-based replication.

- Data protection at lower cost per virtual machine.
- A replication solution that allows flexibility in storage vendor selection at the source and target sites.
- Overall lower cost per replication.

You can use vSphere Replication with the vCenter Server Appliance or with a standard vCenter Server installation. You can have a vCenter Server Appliance on one site and a standard vCenter Server installation on the other.

With vSphere Replication, you can replicate virtual machines from a source datacenter to a target site quickly and efficiently.

You can deploy additional vSphere Replication servers to meet your load balancing needs.

After you set up the replication infrastructure, you can choose the virtual machines to be replicated at a different recovery point objective (RPO). You can enable multi-point in time retention policy to store more than one instance of the replicated virtual machine. After recovery, the retained instances are available as snapshots of the recovered virtual machine.

You can use VMware Virtual SAN datastores as target datastores and choose destination storage profiles for the replica virtual machine and its disks when configuring replications.

NOTE VMware Virtual SAN is a fully supported feature of vSphere 5.5u1.

- You can use Virtual SAN in production environments with vSphere Replication 5.5.1 and vSphere 5.5u1.
 - Virtual SAN is an experimental feature in vSphere 5.5. You can perform testing with Virtual SAN with vSphere Replication 5.5.0 and vSphere 5.5, but it is not supported for use in production environments. See the release notes for the vSphere Replication 5.5.0 release for information about how to enable Virtual SAN in vSphere 5.5.
-

You can configure all vSphere Replication features in the vSphere Web Client. You can manage sites monitor the status of a replication through the replication management and monitoring dashboard.

- [Contents of the vSphere Replication Appliance](#) on page 10
The vSphere Replication appliance provides all the components that vSphere Replication requires.
- [vSphere Replication Client Plug-In](#) on page 10
The vSphere Replication appliance adds a plug-in to the vSphere Web Client.
- [Source and Target Sites](#) on page 11
In a typical vSphere Replication installation, the source site provides business-critical datacenter services. The target site is an alternative facility to which you can migrate these services.
- [How vSphere Replication Works](#) on page 11
With vSphere Replication, you can configure replication of a virtual machine from a source site to a target site, monitor and manage the status of the replication, and recover the virtual machine at the target site.

Contents of the vSphere Replication Appliance

The vSphere Replication appliance provides all the components that vSphere Replication requires.

- A plug-in to the vSphere Web Client that provides a user interface for vSphere Replication.
- An embedded database that stores replication configuration and management information.
- A vSphere Replication management server:
 - Configures the vSphere Replication server.
 - Enables, manages, and monitors replications.
 - Authenticates users and checks their permissions to perform vSphere Replication operations.
- A vSphere Replication server that provides the core of the vSphere Replication infrastructure.

You can use vSphere Replication immediately after you deploy the appliance. The vSphere Replication appliance provides a virtual appliance management interface (VAMI) that you can use to reconfigure the appliance after deployment, if necessary. For example, you can use the VAMI to change the appliance security settings, change the network settings, or configure an external database. You can deploy additional vSphere Replication Servers using a separate .ovf package.

vSphere Replication Client Plug-In

The vSphere Replication appliance adds a plug-in to the vSphere Web Client.

You use the vSphere Replication client plug-in to perform all vSphere Replication actions.

- Configure connections between vSphere Replication sites.
- View all vCenter Server instances that are registered with the same SSO and status of each vSphere Replication extension.
- Deploy and register additional vSphere Replication servers.
- Configure the replication of individual or multiple virtual machines.
- View incoming and outgoing replications.
- Monitor and manage the status of the replications.
- Recover virtual machines.

Source and Target Sites

In a typical vSphere Replication installation, the source site provides business-critical datacenter services. The target site is an alternative facility to which you can migrate these services.

The source site can be any site where vCenter Server supports a critical business need. The target site can be in another location, or in the same room to establish redundancy. The target site is usually located in a facility that is unlikely to be affected by environmental, infrastructure, or other disturbances that might affect the source site.

vSphere Replication has the following requirements for the vSphere® configurations at each site:

- Each site must have at least one datacenter.
- The target site must have hardware, network, and storage resources that can support the same virtual machines and workloads as the source site.
- The sites must be connected by a reliable IP network.
- The target site must have access to networks (public and private) comparable to those on the source site, although not necessarily the same range of network addresses.

Connecting Source and Target Sites

Before you replicate virtual machines between two sites, you must connect the sites. If the sites use different SSO, you must provide authentication details for the target site, including IP or FQDN, user and password information. When connecting sites, users at both sites must have **VRM remote.Manage VRM** privilege.

When you connect sites that are part of the same SSO, you need to select the target site only without providing authentication details, as you are already logged in. After connecting the sites, you can monitor the connectivity state between them at **Target Sites** tab.

How vSphere Replication Works

With vSphere Replication, you can configure replication of a virtual machine from a source site to a target site, monitor and manage the status of the replication, and recover the virtual machine at the target site.

When you configure a virtual machine for replication, the vSphere Replication agent sends changed blocks in the virtual machine disks from the source site to the target site, where they are applied to the copy of the virtual machine. This process occurs independently of the storage layer. vSphere Replication performs an initial full synchronization of the source virtual machine and its replica copy. You can use replication seeds to reduce the amount of time and bandwidth required for the initial replication.

During replication configuration, you can set a recovery point objective (RPO) and enable retention of instances from multiple points in time (MPIT).

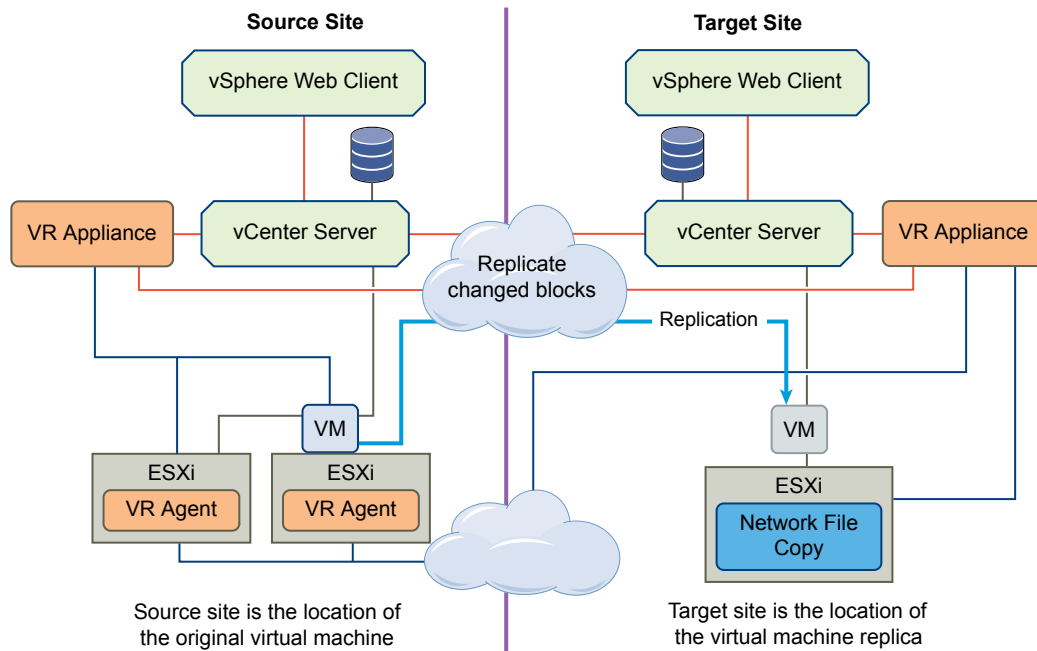
As administrator, you can monitor and manage the status of the replication. You can view information for incoming and outgoing replications, source and target site status, replication issues, and for warnings and errors.

When you manually recover a virtual machine, vSphere Replication creates a copy of the virtual machine connected to the replica disk, but does not connect any of the virtual network cards to port groups. You can review the recovery and status of the replica virtual machine and attach it to the networks. You can recover virtual machines at different points in time, such as the last known consistent state. vSphere Replication presents the retained instances as ordinary virtual machine snapshots to which you can revert the virtual machine.

vSphere Replication stores replication configuration data in its embedded database. You can also configure vSphere Replication to use an external database.

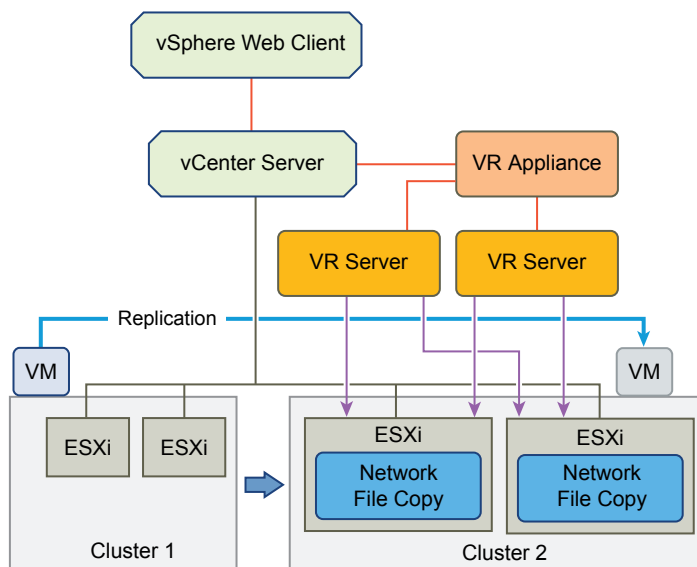
You can replicate a virtual machine between two sites. vSphere Replication is installed on both source and target sites. Only one vSphere Replication appliance is deployed on each vCenter Server. You can deploy additional vSphere Replication Servers.

Figure 1-1. Replication Between Two Sites

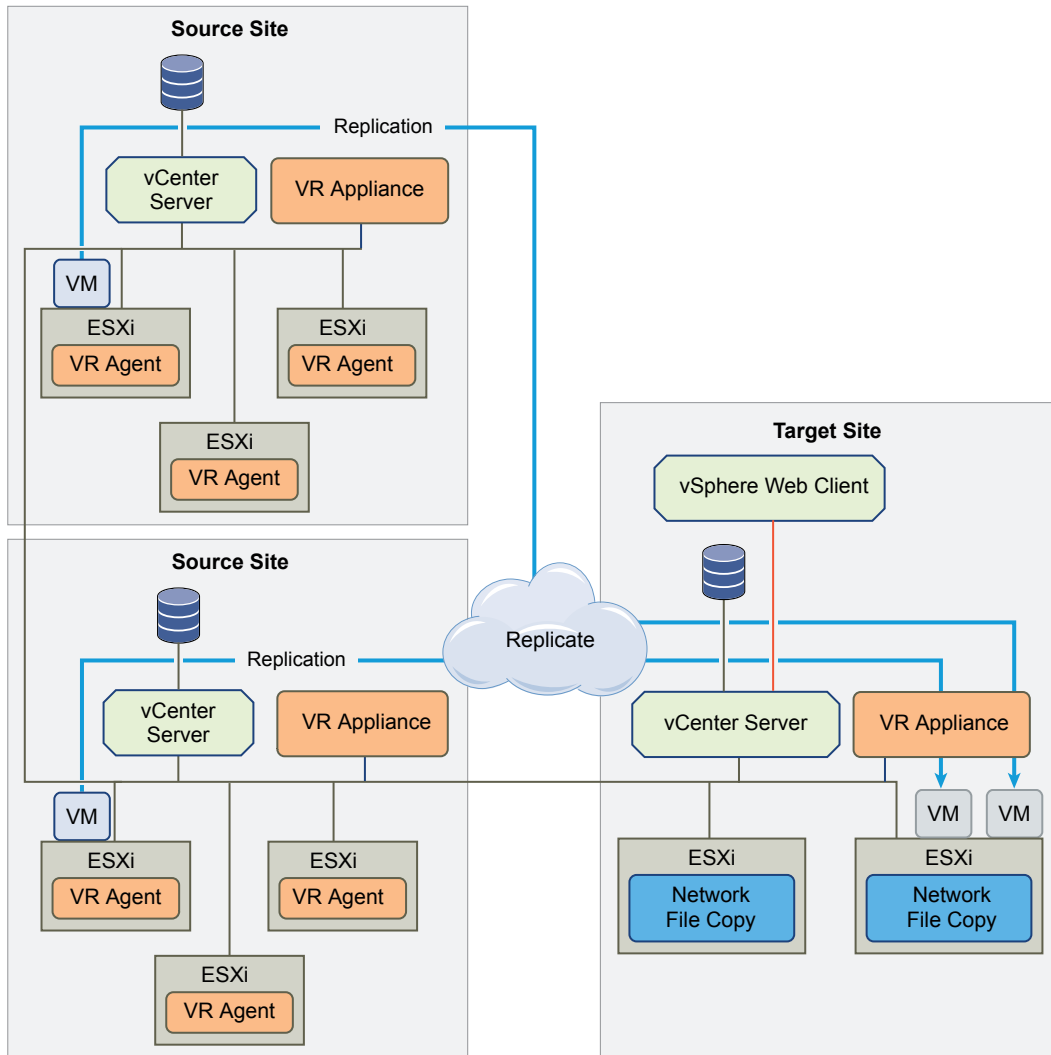


You can add multiple Additional vSphere Replication servers in a single vCenter Server to replicate virtual machines to other clusters.

Figure 1-2. Replication In a Single vCenter Server



You can replicate virtual machines to a shared target site.

Figure 1-3. Replication to a Shared Target Site

vSphere Replication Roles and Permissions

2

You can use any predefined roles or clone an existing role, and add or remove privileges from it based on your needs.

This chapter includes the following topics:

- [“Assign vSphere Replication Roles to Users,”](#) on page 15
- [“Assign VRM Replication Viewer Role,”](#) on page 15
- [“Assign VRM Virtual Machine Replication User Role,”](#) on page 16
- [“Assign VRM Virtual Machine Recovery User Role,”](#) on page 16
- [“Clone Existing VRM Administrator Role and Modify Privileges,”](#) on page 17
- [“vSphere Replication Roles Reference,”](#) on page 17

Assign vSphere Replication Roles to Users

You create roles and assign permissions for vSphere Replication in the same way as you do in vCenter.

See vSphere Users and Permissions in vSphere Security.

Assign VRM Replication Viewer Role

In this example, you create a vSphere Replication user that can view only replications sites and replications configured between them, but cannot perform modifications.

Prerequisites

- Verify that you have two sites connected and replication configured between them.
- Verify that you have another user account for each site.

Procedure

- 1 Log in as Administrator on the source site.
- 2 Select **vCenter > Manage > Permissions** and assign the **VRM replication viewer** role with the propagate option to this user.
- 3 Assign the same privilege on the target replication site.
- 4 Log in as the user with the assigned VRM replication viewer role.

The user cannot perform modifications on the configured replication, nor on the replication sites. Running operations result in Permission to perform this operation was denied.

Assign VRM Virtual Machine Replication User Role

In this example, you create a vSphere Replication user who can only configure replication between sites and use a specific datastore on the target site.

Prerequisites

- Verify that two sites are connected.
- Verify that you have another user account for each site.

Procedure

- 1 Log in as the Administrator user on the source site.
- 2 Select **vCenter > Manage > Permissions** and assign to this user the **VRM virtual machine replication user** role with the propagate option.
- 3 Assign the same privilege on the target replication site.
- 4 On the target site, select the datastore to store your replica files, and select **Manage > Permissions**.
- 5 Edit the assigned permission and assign the **VRM target datastore user** role.
- 6 Log in as that user on the source site, select the virtual machine, and click **Configure Replication** to start the configuration wizard.
- 7 Select the target site and enter the same user credentials.
- 8 Accept the default selections until **Target Location**.
- 9 For the target location, select the datastore to which you granted permission.

Selecting a datastore for which the user lacks the **Target datastore user** role results in the error message **Permission to perform this operation was denied**.

Assign VRM Virtual Machine Recovery User Role

In this example, you create a vSphere Replication user who can perform recovery operations only if the source site is not available.

Prerequisites

- Verify that you have two sites connected and replication configured between them.
- Verify that you have another user account for the target site.

Procedure

- 1 Log in as the Administrator user on the target site.
- 2 Select **vCenter > Manage > Permissions** and assign to this user the **VRM virtual machine recovery user** role with the propagate option.
- 3 Log in as that user on the target site.
- 4 Select **Monitor > vSphere Replication > Incoming Replications**, select the replication, and start recovery.
- 5 Select **Recover with latest available data** and follow the prompts to finish the recovery.

Clone Existing VRM Administrator Role and Modify Privileges

In this example, you create a vSphere Replication user who cannot modify the replication infrastructure. The user cannot register additional vSphere Replication servers.

Prerequisites

- Verify that you have a replication site.
- Verify that you have another user account.

Procedure

- 1 Log in as the Administrator user and clone the **VRM Administrator** role.
- 2 In the cloned role, remove the **Manage VR** privileges.
- 3 Select **vCenter > Manage > Permissions** and assign the cloned user with **Propagate** privilege.
- 4 Log in as the cloned user and select **Manage > vSphere Replication > Replication Servers**.

Trying to register a vSphere Replication server results in the error message *Permission to perform this operation was denied*.

vSphere Replication Roles Reference

vSphere Replication includes a set of roles. Each role includes a set of privileges, which enable users with those roles to complete different actions.

For information about how to assign roles, see *Assigning Roles in the vSphere Web Client* in *vSphere Security*.

NOTE When assigning permissions with no propagation, make sure that you have at least Read-only permission on all parent objects.

Table 2-1. vSphere Replication Roles

Role	Actions that this Role Permits	Privileges that this Role Includes	Objects in vCenter Server Inventory that this Role Can Access
VRM replication viewer	<ul style="list-style-type: none"> ■ View replications. ■ Cannot change replication parameters. 	VRM remote.View VR VRM remote.View VRM VRM datastore mapper.View Host.vSphere Replication.Manage replication Virtual machine.vSphere Replication.Monitor replication	vCenter Server root folder with propagation, at source site (outgoing replications) and target site (incoming replications). Alternatively, vCenter Server root folder without propagation on both sites and virtual machine without propagation on the source site.
VRM virtual machine replication user	<ul style="list-style-type: none"> ■ View replications. ■ Manage datastores. ■ Configure and unconfigure replications. ■ Manage and monitor replications. <p>Requires a corresponding user with the same role on the target site and additionally vSphere Replication target datastore user role on the target datacenter, or datastore folder or each target datastore.</p>	Datastore.Browse Datastore VRM remote.View VR VRM remote.View VRM VRM datastore mapper.Manage VRM datastore mapper.View Host.vSphere Replication.Manage replication Virtual machine.vSphere Replication.Configure replication Virtual machine.vSphere Replication.Manage replication Virtual machine.vSphere Replication.Monitor replication	vCenter Server root folder with propagation on both sites. Alternatively, vCenter Server root folder without propagation on both sites, virtual machine without propagation on the source site, source datastores without propagation on the source site.

Table 2-1. vSphere Replication Roles (Continued)

Role	Actions that this Role Permits	Privileges that this Role Includes	Objects in vCenter Server Inventory that this Role Can Access
VRM administrator	Incorporates all vSphere Replication privileges.	VRM remote.Manage VR VRM remote.View VR VRM remote.Manage VRM VRM remote.View VRM VRM datastore mapper.Manage VRM datastore mapper.View VRM diagnostics .Manage VRM session .Terminate Datastore.Browse datastore Datastore.Low level file operations Host.vSphere Replication.Manage replication Resource.Assign virtual machine to resource pool Virtual machine.Configuration.Add existing disk Virtual machine.Configuration.Add or remove device Virtual machine.Interaction.Power On Virtual machine.Interaction.Device connection Virtual machine.Inventory.Register Virtual machine.vSphere Replication.Configure replication Virtual machine.vSphere Replication.Manage replication Virtual machine.vSphere Replication.Monitor replication	vCenter Server root folder with propagation on both sites. Alternatively, vCenter Server root folder without propagation on both sites, virtual machine without propagation on the source site, target datastore, target virtual machine folder with propagation on the target site, target host or cluster with propagation on the target site.
VRM diagnostics	Generate, retrieve, and delete log bundles.	VRM remote.View VR VRM remote.View VRM VRM diagnostics .Manage	vCenter Server root folder on both sites.

Table 2-1. vSphere Replication Roles (Continued)

Role	Actions that this Role Permits	Privileges that this Role Includes	Objects in vCenter Server Inventory that this Role Can Access
VRM target datastore user	Configure and reconfigure replications. Used on target site in combination with the VRM virtual machine replication user role on both sites.	Datastore.Browse datastore Datastore.Low level file operations	Datastore objects on target site, or datastore folder with propagation at target site, or target datacenter with propagation.
VRM virtual machine recovery user	Recover virtual machines.	Datastore.Browse datastore Datastore.Low level file operations Host.vSphere Replication.Manage replication Virtual machine.Configuration.Add existing disk Virtual machine.Configuration.Add or remove device Virtual machine.Interaction.Power On Virtual machine.Interaction.Device connection Virtual machine.Inventory.Register Resource.Assign virtual machine to resource pool	Secondary vCenter Server root folder with propagation. Alternatively, secondary vCenter Server root folder without propagation, target datastore without propagation, target virtual machine folder with propagation, target host or cluster with propagation.

vSphere Replication System Requirements

3

The environment in which you run the vSphere Replication virtual appliance must meet certain hardware requirements.

vSphere Replication is distributed as a 64-bit virtual appliance packaged in the .ovf format. It has a dual core CPU, a 10GB and a 2GB hard disk, and 4GB of RAM. Additional vSphere Replication Servers require 512MB of RAM.

You must deploy the virtual appliance in a vCenter Server environment by using the OVF deployment wizard on an ESXi host.

vSphere Replication consumes negligible CPU and memory on the source host ESXi and on the guest OS of the replicated virtual machine.

This chapter includes the following topics:

- [“vSphere Replication Licensing,”](#) on page 21
- [“vSphere Replication Network Ports,”](#) on page 22
- [“Operational Limits of vSphere Replication,”](#) on page 22
- [“Compatibility of vSphere Replication with Other vSphere Features,”](#) on page 22
- [“vSphere Replication Compatibility with Other Software,”](#) on page 23
- [“Bandwidth Requirements for vSphere Replication,”](#) on page 23

vSphere Replication Licensing

You can use vSphere Replication with certain editions of vSphere that include vSphere Replication in the license.

vSphere Replication does not have a separate license as it is a feature of certain vSphere license editions.

- vSphere Essentials Plus
- vSphere Standard
- vSphere Enterprise
- vSphere Enterprise Plus

If you have the correct vSphere license, there is no limit on the number of virtual machines that you can replicate by using vSphere Replication.

You cannot use vSphere Replication to replicate virtual machines on ESXi hosts that do not have the correct vSphere license. If you install vSphere Replication on an ESXi host that does not have the correct license and try to configure replication for virtual machines on that host, the replication fails with a licensing error.

If you configure a virtual machine for replication on a host with the correct vSphere license and move it to a host with an unsupported license, vSphere Replication stops replication of that virtual machine. You can disable vSphere Replication on a configured virtual machine on the unlicensed host.

vSphere Replication Network Ports

vSphere Replication uses default network ports for intrasite communication between hosts at a single site and intersite communication between hosts at the protected and recovery sites.

For a list of all the ports that must be open for vSphere Replication, see <http://kb.vmware.com/kb/1009562>.

For the list of default ports that all VMware products use, see <http://kb.vmware.com/kb/1012382>.

Operational Limits of vSphere Replication

vSphere Replication has certain operational limits.

To ensure successful virtual machine replication, you must verify that your virtual infrastructure respects certain limits before you start the replication.

- You can only deploy one vSphere Replication appliance on a vCenter Server instance. When you deploy another vSphere Replication appliance, during the boot process vSphere Replication detects another appliance already deployed and registered as an extension to vCenter Server. You have to confirm if you want to proceed with the new appliance and recreate all replications or shut it down and reboot the old appliance to restore the original vSphere Replication extension thumbprint in vCenter Server.
- Each vSphere Replication management server can manage a maximum of 500 replications.

See <http://kb.vmware.com/kb/2034768> for more information.

Compatibility of vSphere Replication with Other vSphere Features

vSphere Replication is compatible with certain other vSphere management features.

You can safely use vSphere Replication in combination with certain vSphere features, such as vSphere vMotion. Some other vSphere features, for example vSphere Distributed Power Management, require special configuration for use with vSphere Replication.

Table 3-1. Compatibility of vSphere Replication with Other vSphere Features

vSphere Feature	Compatible with vSphere Replication	Description
vSphere vMotion	Yes	You can migrate replicated virtual machines by using vMotion. Replication continues at the defined recovery point objective (RPO) after the migration is finished.
vSphere Storage vMotion	Yes	You can move the disk files of a replicated virtual machine on the source site using Storage vMotion with no impact on the ongoing replication.
vSphere High Availability	Yes	You can protect a replicated virtual machine by using HA. Replication continues at the defined RPO after HA restarts a virtual machine. vSphere Replication does not perform any special HA handling. You can protect the vSphere Replication appliance itself by using HA.
vSphere Fault Tolerance	No	vSphere Replication cannot replicate virtual machines that have fault tolerance enabled. You cannot protect the vSphere Replication appliance itself with FT.
vSphere DRS	Yes	Replication continues at the defined RPO after resource redistribution is finished.
vSphere Storage DRS	Yes	You can move the disk files of a replicated virtual machine on the source site using Storage DRS with no impact on the ongoing replication.

Table 3-1. Compatibility of vSphere Replication with Other vSphere Features (Continued)

vSphere Feature	Compatible with vSphere Replication	Description
VMware Virtual SAN datastore	Fully supported in vSphere Replication 5.5.1. Experimental support in vSphere Replication 5.5.	You can use VMware Virtual SAN datastores as the source and target datastores when configuring replications. NOTE VMware Virtual SAN is a fully supported feature of vSphere 5.5u1. <ul style="list-style-type: none"> You can use Virtual SAN in production environments with vSphere Replication 5.5.1 and vSphere 5.5u1. Virtual SAN is an experimental feature in vSphere 5.5. You can perform testing with Virtual SAN with vSphere Replication 5.5.0 and vSphere 5.5, but it is not supported for use in production environments. See the release notes for the vSphere Replication 5.5.0 release for information about how to enable Virtual SAN in vSphere 5.5.
vSphere Distributed Power Management	Yes	vSphere Replication coexists with DPM on the source site. vSphere Replication does not perform any special DPM handling on the source site. Disable DPM on the target site to allow enough hosts as replication targets.
VMware vSphere Flash Read Cache	Yes	
vCloud APIs	Not applicable	No interaction with vSphere Replication.
vCenter Chargeback	Not applicable	No interaction with vSphere Replication
VMware Data Recovery	Not applicable	No interaction with vSphere Replication.

vSphere Replication Compatibility with Other Software

vSphere Replication is compatible with versions of ESXi Server, vCenter Server, Site Recovery Manager, databases, and Web browsers.

vSphere Replication is compatible with the same versions as vCenter Server, except for ESXi: vSphere Replication requires ESXi 5.0 or greater. See:

- VMware Product Interoperability Matrixes at http://partnerweb.vmware.com/comp_guide2/sim/interop_matrix.php
- For vSphere Replication interoperability with backup software when using VSS, see <http://kb.vmware.com/kb/2040754>.
- VMware Compatibility Guide at http://partnerweb.vmware.com/comp_guide2/search.php?testConfig=16&deviceCategory=software
- Browser compatibility at vSphere Client and vSphere Web Client Software Requirements in *vSphere Installation and Setup*
- Browser compatibility of the VAMI depends on browsers supported by VMware Studio. See https://www.vmware.com/support/developer/studio/studio25/release_notes.html

Bandwidth Requirements for vSphere Replication

Before configuring replications, VMware recommends that determine storage and network bandwidth requirements for vSphere Replication to replicate virtual machines efficiently.

Storage and network bandwidth requirements can increase when using vSphere Replication. The following factors play a role in the amount of network bandwidth vSphere Replication requires for efficient replication.

Network Based Storage

Network bandwidth requirements increase if all storage is network-based because data operations between the host and the storage also use network. When you plan your deployment, be aware of the following levels of traffic:

- Between the host running the replicated virtual machine and the vSphere Replication server.
- Between the vSphere Replication server and a host with access to the replication target datastore.
- Between the host and storage.
- Between storage and the host during redo log snapshots.

Network based storage is a concern when you are replicating virtual machines within a single vCenter Server instance that shares the network for the levels of traffic listed. When you have two sites with a vCenter Server instance on each site, the link speed between the two sites is the most important as it can slow down replication traffic between the two sites.

Dataset Size

vSphere Replication might not replicate every virtual machine nor every VMDK file in the replicated virtual machines. To evaluate the dataset size that vSphere Replication replicates, calculate the percentage of the total storage used for virtual machines, then calculate the number of VMDKs within that subset that you have configured for replication.

For example, you might have 2TB of virtual machines on the datastores and use vSphere Replication to replicate half of these virtual machines. You might only replicate a subset of the VMDKs and assuming all the VMDKs are replicated, the maximum amount of data for replication is 1TB.

Data Change Rate and Recovery Point Objective

The data change rate is affected by the recovery point objective (RPO). To estimate the size of the data transfer for each replication, you must evaluate how many blocks change in a given RPO for a virtual machine. The data change rate within the RPO period provides the total number of blocks that vSphere Replication transfers. This number might vary throughout the day, which alters the traffic that vSphere Replication generates at different times.

vSphere Replication transfers blocks based on the RPO schedule. If you set an RPO of one hour, vSphere Replication transfers any block that has changed in that hour to meet that RPO. vSphere Replication only transfers the block once in its current state at the moment that vSphere Replication creates the bundle of blocks for transfer. vSphere Replication only registers that the block has changed within the RPO period, not how many times it changed. The average daily data change rate provides an estimation of how much data vSphere Replication transfers or how often the transfers occur.

If you use volume shadow copy service (VSS) to quiesce the virtual machine, replication traffic cannot be spread out in small sets of bundles throughout the RPO period. Instead, vSphere Replication transfers all the changed blocks as one set when the virtual machine is idle. Without VSS, vSphere Replication can transfer smaller bundles of changed blocks on an ongoing basis as the blocks change, spreading the traffic throughout the RPO period. The traffic changes if you use VSS and vSphere Replication handles the replication schedule differently, leading to varying traffic patterns.

If you change the RPO, vSphere Replication transfers more or less data per replication to meet the new RPO.

Link Speed

If you have to transfer an average replication bundle of 4GB in a one hour period, you must examine the link speed to determine if the RPO can be met. If you have a 10Mb link, under ideal conditions on a completely dedicated link with little overhead, 4GB takes about an hour to transfer. Meeting the RPO saturates a 10Mb WAN connection. The connection is saturated even under ideal conditions, with no overhead or limiting factors such as retransmits, shared traffic, or excessive bursts of data change rates.

You can assume that only about 70% of a link is available for traffic replication. This means that on a 10Mb link you obtain a link speed of about 3GB per hour. On a 100Mb link you obtain a speed of about 30GB per hour.

To calculate the bandwidth, see [“Calculate Bandwidth for vSphere Replication,”](#) on page 25.

Calculate Bandwidth for vSphere Replication

To determine the bandwidth that vSphere Replication requires to replicate virtual machines efficiently, you calculate the average data change rate within an RPO period divided by the link speed.

If you have groups of virtual machines that have different RPO periods, you can determine the replication time for each group of virtual machines. For example, you might have four groups with RPO of 15 minutes, one hour, four hours, and 24 hours. Factor in all the different RPOs in the environment, the subset of virtual machines in your environment that is replicated, the change rate of the data within that subset, the amount of data changes within each configured RPO, and the link speeds in your network.

Prerequisites

Examine how data change rate, traffic rates, and the link speed meet the RPO. Then look at the aggregate of each group.

Procedure

- 1 Identify the average data change rate within the RPO by calculating the average change rate over a longer period then dividing it by the RPO.
- 2 Calculate how much traffic this data change rate generates in each RPO period.
- 3 Measure the traffic against your link speed.

For example, a data change rate of 100GB requires approximately 200 hours to replicate on a T1 network, 30 hours to replicate on a 10Mbps network, 3 hours on a 100Mbps network.

Installing vSphere Replication

vSphere Replication uses the replication technologies included in ESXi with the assistance of virtual appliances to replicate virtual machines between source and target sites.

To use vSphere Replication, you must deploy the vSphere Replication appliance on an ESXi host using the vSphere Web Client.

The vSphere Replication appliance registers with the corresponding vCenter Server instance. For example, on the source site, the vSphere Replication appliance registers with the vCenter Server instance on the source site. Only one vSphere Replication appliance is allowed per vCenter Server.

The vSphere Replication appliance contains a vSphere Replication server that manages the replication process. To meet the load balancing needs of your environment, you might need to deploy additional vSphere Replication servers at each site. Additional vSphere Replication servers that you deploy are themselves virtual appliances. You must register any additional vSphere Replication servers with the vSphere Replication appliance on the corresponding site.

The vSphere Replication appliance provides a virtual appliance management interface (VAMI). You can use this interface to reconfigure the vSphere Replication database, network settings, public-key certificates, and passwords for the appliances.

This chapter includes the following topics:

- [“Deploy the vSphere Replication Virtual Appliance,”](#) on page 27
- [“Configure vSphere Replication Connections,”](#) on page 28
- [“Uninstall vSphere Replication,”](#) on page 29
- [“Unregister vSphere Replication from vCenter Server if the Appliance Was Deleted,”](#) on page 30

Deploy the vSphere Replication Virtual Appliance

vSphere Replication is distributed as an OVF virtual appliance.

You deploy the vSphere Replication appliance by using the standard vSphere OVF deployment wizard.

Prerequisites

- Verify that you have vSphere and vSphere Web Client installations for the source and target sites.
- Download the vSphere Replication package to a local directory or obtain its online URL.
- Download and install the Client Integration Plug-in from the login page of the vSphere Web Client. If the plug-in is already installed, the link does not appear.
- In the vSphere Web Client, select the vCenter Server instance on which you are deploying vSphere Replication and click **Manage > Settings > Advanced Settings**. Verify that the `VirtualCenter.FQDN` value is set to a fully-qualified domain name or a literal address.

Procedure

- 1 Log in to the vSphere Web Client on the source site.
- 2 Select **vCenter > Hosts and Clusters**.
- 3 Right-click a host and select **Deploy OVF template**.
- 4 Provide the location of the OVF file from which to deploy the vSphere Replication appliance, and click **Next**.
 - Select **URL** and provide the URL to deploy the appliance from an online URL.
 - Select **Local file > Browse** to locate the .ovf file if you downloaded the zip file to a local machine.
- 5 Review the virtual appliance details and click **Next**.
- 6 Accept the end user license agreements (EULA) and click **Next**.
- 7 Accept the default name and destination folder or datacenter, or provide a new name and select a folder or datacenter for the virtual appliance, and click **Next**.
- 8 Select a cluster, host, vApp, or resource pool where you want to run the deployed template, and click **Next**.
- 9 Select a destination datastore and disk format for the virtual appliance and click **Next**.
- 10 Select a network from the list of available networks, IP protocol, IP allocation, and click **Next**.
vSphere Replication supports both DHCP and static IP addresses. You can also change network settings by using the virtual appliance management interface (VAMI) after installation.
- 11 Set the password for the root account for the customized template, and click **Next**.
Password must be eight characters minimum.
- 12 Review the binding to the vCenter Extension vService and click **Next**.
- 13 Review the settings, select the check box to power on the virtual appliance after deployment, and click **Finish**.
The vSphere Replication appliance is deployed.
- 14 Log out of the vSphere Web Client, close the browser, then log back in.
vSphere Replication is present on the **Home** tab in the vSphere Web Client.
- 15 Repeat the procedure to install vSphere Replication on the target site.

vSphere Replication is ready for use immediately after you deploy the appliance. No manual configuration or registration is required.

What to do next

Perform optional reconfiguration of the vSphere Replication appliance by using the virtual appliance management interface (VAMI). You can install a certificate, change the appliance root password, change the trust policy, or configure vSphere Replication to use an external database.

Configure vSphere Replication Connections

To use vSphere Replication between two sites managed by different vCenter Server instances, you need to configure a connection between the two vSphere Replication appliances.

You can complete this process on either site on which you have installed a vSphere Replication appliance. If you are using an untrusted certificate, certificate warnings might appear during the process.

You can also configure connection between the two sites when you configure a replication.

Alternatively, you can use vSphere Replication to replicate virtual machines between different ESXi hosts that the same vCenter Server manages. In this case, you deploy only one vSphere Replication appliance and you do not need to connect the source and target sites.

Prerequisites

Procedure

- 1 Click **vSphere Replication** on the **Home** tab of the vSphere Web Client.
- 2 Click the **Summary** tab.
- 3 In the Local sites pane, click the name of the site on the source site.
- 4 Right-click the site in the left pane, select **All vSphere Replication Actions > Connect to target site**, type the IP address or name of the remote site vCenter Server and the username and password for the target site.

Option	Description
To select an existing target site	Click Select a target site and select a site from the list.
To configure a new remote site	Click Connect to remote site and type the IP address or name of the remote site vCenter Server, and provide the user name and password for the target site.

- 5 Click **OK**.

Uninstall vSphere Replication

You uninstall vSphere Replication by unregistering the appliance from vCenter Server and removing it from your environment.

Prerequisites

- Verify that the vSphere Replication virtual appliance is powered on.
- Stop all existing outgoing or incoming replications to the site.
- Disconnect any connections to other vSphere Replication sites.

Procedure

- 1 Connect to the VAMI of the vSphere Replication appliance in a Web browser.
The URL for the VAMI is `https://vr-appliance-address:5480`.
- 2 Select the **Configuration** tab.
- 3 Click **Unregister from vCenter Server**.
- 4 In the vSphere Web Client, power off and delete the vSphere Replication appliance.
The vSphere Replication plug-in is uninstalled automatically.

You removed vSphere Replication from your environment.

Unregister vSphere Replication from vCenter Server if the Appliance Was Deleted

If the vSphere Replication appliance virtual machine does not exist because it was deleted, you cannot use the virtual appliance management interface (VAMI) to unregister vSphere Replication from vCenter Server. Instead, you can use the Managed Object Browser (MOB) to delete the vSphere Replication extension.

Prerequisites

Log in to https://<vCenter_Server_address>/mob/?moid=ExtensionManager with vCenter Server credentials.

Procedure

- 1 In the extensionList property, click the corresponding link for the com.vmware.vcHms extension key to check the key details.
- 2 Verify that the displayed data is for a vSphere Replication appliance that is already lost.
- 3 In ExtensionManager, click **unregisterExtension**.
- 4 Type **com.vmware.vcHms** for the extension key value, and click **Invoke Method**.
- 5 Verify that the result displays void and not an error message.
An error message might appear if the specified extension is not registered, or if an unexpected runtime error occurs.
- 6 Close the window.
- 7 Refresh the ExtensionManager page and verify that the extensionList entry does not include com.vmware.vcHms.

What to do next

Deploy a new vSphere Replication appliance and perform any optional configuration.

Deploying Additional vSphere Replication Servers

5

Depending on replication traffic, you might need to deploy one or more additional vSphere Replication servers.

This chapter includes the following topics:

- [“Deploy an Additional vSphere Replication Server,”](#) on page 31
- [“Register an Additional vSphere Replication Server,”](#) on page 32
- [“Reconfigure vSphere Replication Server Settings,”](#) on page 32
- [“Unregister and Remove a vSphere Replication Server,”](#) on page 33
- [“Disable the Embedded vSphere Replication Server,”](#) on page 33

Deploy an Additional vSphere Replication Server

The vSphere Replication appliance includes a vSphere Replication server. However, you might need to deploy multiple vSphere Replication servers to meet your load balancing needs.

You can deploy multiple vSphere Replication servers to route traffic from source hosts to target datastores without traveling between different sites managed by the same vCenter Server.

For information about the loads that a vSphere Replication management server and a vSphere Replication server can support, see <http://kb.vmware.com/kb/2034768>.

Prerequisites

- Deploy vSphere Replication appliances on the source and target sites.
- Deploy vSphere Replication servers on a network that allows them to communicate with the vSphere Replication appliances on the source and target sites.
- Verify that the vSphere Replication servers can communicate with the ESXi Server instances on the source site that hosts the replicated virtual machines.

Procedure

- 1 In the vSphere Web Client, start the OVF deployment wizard from **Manage > vSphere Replication > Replication Servers**.
- 2 Browse for the `vSphere_Replication_AddOn_OVF10.ovf` file, select it, and click **Next**.
- 3 Review the virtual appliance details and click **Next**.
- 4 Follow the prompts to select a destination host, datastore, and disk format for the virtual appliance.
- 5 Enter a password for the appliance that is at least eight characters long.

- 6 Set the network properties. Select DHCP or set a static IP address.
You can change network settings after deployment in the VAMI.
- 7 Review your settings and select **Power on after deployment** to start the appliance immediately after deployment completes.
- 8 Click **Finish**.

What to do next

When the OVF file has deployed, register the vSphere Replication server with the vSphere Replication appliance.

Register an Additional vSphere Replication Server

If you deploy additional vSphere Replication servers, you must register these servers with the vSphere Replication appliance to enable them as traffic handlers at the recovery site.

Prerequisites

Verify that the vSphere Replication appliance is deployed and configured.

Verify that the additional vSphere Replication server is deployed.

Procedure

- 1 In **Manage > vSphere Replication > Replication Servers**, click **Register a virtual machine as vSphere Replication Server**.
- 2 Select a virtual machine in the inventory that is a working vSphere Replication server, and click **OK**.

The newly registered vSphere Replication server appears in the list.

Reconfigure vSphere Replication Server Settings

The vSphere Replication appliance contains a vSphere Replication server. If you deploy additional vSphere Replication servers, the server settings are established during deployment. You can modify the settings after you deploy the server.

A vSphere Replication server does not require additional configuration through the virtual appliance management interface (VAMI) after deployment. To increase security, you can change the root password of the vSphere Replication server and install a new certificate. Using a self-signed certificate provides the benefit of public-key based encryption and authentication, although using such a certificate does not provide the level of assurance offered when you use a certificate signed by a certificate authority.

You can also reconfigure the network settings for the vSphere Replication server virtual appliance.

Prerequisites

You deployed an optional vSphere Replication server in addition to the vSphere Replication appliance, and the server is powered on.

Procedure

- 1 Log into the VAMI of the vSphere Replication server in a Web browser. A sample address might be `https://<vr_server_address>:5480`.
- 2 Log in to the vSphere Replication server configuration interface as **root**.
Use the root password you set when you deployed the vSphere Replication server.
- 3 Click the **VRS** tab.

- 4 (Optional) Click **Configuration** to generate or upload a new certificate.

Option	Action
Generate and install a self-signed certificate	Click Generate and Install .
Upload an existing SSL certificate	Click Browse next to the Upload PKCS#12 (*.pfx) file text box to browse for an existing certificate, and click Upload and Install .

- 5 (Optional) Click **Security** to change the Super User password for the vSphere Replication server.
root is the Super User.
- 6 (Optional) Click the **Network** tab to change the network settings.

Option	Action
View current network settings	Click Status .
Set static or DHCP IPv4 or IPv6 addresses	<ul style="list-style-type: none"> ■ Click Address, and select DHCP, Static, or None for IPv4 addresses. ■ Select Auto or Static for IPv6 addresses. If you select Static, type the default gateway and DNS server addresses to use.
Configure proxy server	Click Proxy , select the Use a proxy server check box, and type the proxy server address and port number.
Save Settings	If you do not click Save Settings , changes are discarded.

- 7 (Optional) Select **VRS > Configuration > Restart** to restart the vSphere Replication service.
- 8 (Optional) Select **System > Reboot** to reboot the vSphere Replication server appliance.

Unregister and Remove a vSphere Replication Server

If you deployed additional vSphere Replication server instances that you no longer require, you must unregister them from the vSphere Replication appliance before you delete them.

Prerequisites

You deployed and registered a vSphere Replication server that you no longer require. Make sure it does not serve any replications, otherwise the operations will fail.

Procedure

- 1 In **Manage > vSphere Replication**, click the **Replication Servers** tab and find the vSphere Replication server in the list.
- 2 Select the server and click **Unregister the selected vSphere Replication Server**.
- 3 In the Hosts and Clusters view, power off and delete the vSphere Replication server virtual machine.

Disable the Embedded vSphere Replication Server

vSphere Replication includes an embedded vSphere Replication Server by default. If you want to disable the embedded vSphere Replication server, you can do so using ssh.

Prerequisites

Make sure no replications are using the embedded server. Stop the replications or move them to a different server.

Procedure

- 1 Use ssh into the vSphere Replication appliance and type:

```
# /opt/vmware/hms/hms-configtool -cmd reconfig -property  
hms-embedded-hbr=false
```
- 2 Restart the HMS service.

```
# service hms restart
```

You can now unregister the embedded vSphere Replication server from the vSphere Replication user interface.

What to do next

Rebooting vSphere Replication does not automatically register the embedded server. To restore the default behavior to automatically register the embedded vSphere Replication server, type

```
# /opt/vmware/hms/hms-configtool -cmd reconfig -property  
hms-embedded-hbr=true  
# service hms restart
```

Upgrading vSphere Replication

You can upgrade vSphere Replication appliance and the vSphere Replication server using a downloaded ISO image.

You cannot downgrade to a previous version of vSphere Replication.

This chapter includes the following topics:

- [“Upgrade vSphere Replication by Using the Downloadable ISO Image,”](#) on page 35
- [“Update vCenter Server IP Address in vSphere Replication Management Server,”](#) on page 36
- [“Update vSphere Replication By Using vSphere Update Manager,”](#) on page 36
- [“Update vSphere Replication by Using the VAMI,”](#) on page 37

Upgrade vSphere Replication by Using the Downloadable ISO Image

You upgrade the vSphere Replication appliance and the vSphere Replication server by using a downloadable ISO image.

Prerequisites

- Upgrade the vCenter Server instance that vSphere Replication extends.
- Download the `VMware-vSphere_Replication-5.5.x.x-build_number.iso` ISO image from the vSphere downloads page. Copy the ISO image file to a datastore that is accessible from the vCenter Server instance that you use with vSphere Replication.
- Power off the vSphere Replication virtual machine.

Procedure

- 1 Right-click the vSphere Replication virtual machine and select **Edit Settings**.
- 2 In **Virtual Hardware**, select **CD/DVD Drive > Datastore ISO File**.
- 3 Navigate to the ISO image in the datastore.
- 4 For **File Type**, select **ISO Image** and click **OK**.
- 5 Check the box to connect at power on and follow the prompts to add the CD/DVD Drive to the vSphere Replication virtual machine.
- 6 Restart the vSphere Replication virtual machine.
- 7 In a Web browser, log in to the virtual appliance management interface (VAMI).
If you are updating vSphere Replication 5.1, go to `https://vr_appliance_address:5480`.
- 8 Click the **Update** tab.

- 9 Click **Settings** and select **Use CDROM Updates**, then click **Save**.
- 10 Click **Status** and click **Check Updates**.
The appliance version appears in the list of available updates.
- 11 Click **Install Updates** and click **OK**.
- 12 After the updates install, click the **System** tab and click **Reboot** to complete the upgrade.
- 13 Log out of the vSphere Web Client and log in again to see the upgraded appliance.

What to do next

If your infrastructure uses more than one vSphere Replication server, you must upgrade all of the vSphere Replication servers to 5.5. Repeat these steps to upgrade each vSphere Replication server.

Update vCenter Server IP Address in vSphere Replication Management Server

After you upgrade vCenter Server and the vSphere Replication appliance, if the vCenter Server certificate or the IP address changed during the upgrade, you must perform additional steps.

To update the vCenter Server certificate, see [“vSphere Replication is Inaccessible After Changing vCenter Server Certificate,”](#) on page 85.

If vCenter Server uses a static IP address, it preserves the IP address by default after upgrade. If the vCenter Server uses a DHCP address that changed during the upgrade, and the vSphere Replication management server is configured to use the vCenter Server IP address and not FQDN, update the IP address in the vSphere Replication management server.

Procedure

- 1 Upgrade vCenter Server to the new appliance.
- 2 Upgrade vSphere Replication.
- 3 Power off the vSphere Replication appliance and power it on to retrieve the OVF environment.
- 4 On the vSphere Replication VAMI **Configuration** tab, type the new IP address of the vCenter Server.
- 5 Click **Save and Restart**.

Update vSphere Replication By Using vSphere Update Manager

You can update vSphere Replication from version 5.5.x to a later 5.5.x update release by using vSphere Update Manager.

Update Manager 5.5.x contains the update information for vSphere Replication 5.5.x update releases. Using Update Manager is the easiest way to update vSphere Replication, especially for large environments that contain multiple vSphere Replication servers. You can update multiple vSphere Replication servers at the same time.

Prerequisites

- You installed vSphere Replication 5.5.x or upgraded vSphere Replication to version 5.5.x by using the downloadable ISO file. If you are running an older version of vSphere Replication, you must upgrade to version 5.5.x before you can use Update Manager to install a later 5.5.x update release.
- You updated vCenter Server to the corresponding 5.5.x update release.
- Verify that you installed Update Manager 5.5.x and installed the Update Manager client plug-in on the vCenter Server instance that you use with vSphere Replication.

Procedure

- 1 In the Update Manager interface, click the **Configuration** tab, click **Download Settings**, and select the **VMware VAs** download source.

You can deselect all other download sources.

- 2 Click **Apply** and click **Download Now** to download the latest updates.
- 3 Click the **Baselines and Groups** tab, select **VMs/VAs**, and click **Create** to create an update baseline for virtual appliances.
- 4 Type a name and a description for this update baseline, and select **VA Upgrade** as the baseline type.
- 5 Click **Add Multiple Rules** and set the update rules to create the update baseline.

Option	Description
Vendor	Select VMware Inc.
Appliances	Select vSphere Replication Appliance and vSphere Replication Server
Upgrade To	Select Latest

- 6 Click **OK**, click **Next**, and click **Finish**.
The update baseline is created.
- 7 In the VMs and Templates view, select the vSphere Replication appliance and click the **Update Manager** tab.
- 8 Click **Attach**, select the baseline that you created, and click **Attach** to attach the baseline to the vSphere Replication appliance.
- 9 Click **Scan** to discover the update version available.
- 10 Click **Remediate** and follow the prompts to start the update of the vSphere Replication appliance.
You can monitor the progress of the update in the Recent Tasks panel and verify that the appliance is updated after the task finishes.
- 11 Select a vSphere Replication server in the Inventory and click the **Update Manager** tab.
- 12 Click **Attach**, select the baseline that you created, and click **Attach** to attach the baseline to the vSphere Replication server.
- 13 Click **Remediate** and follow the prompts to start the update of the vSphere Replication server.
- 14 Repeat [Step 11](#) to [Step 13](#) for all vSphere Replication servers.

What to do next

If you configured vSphere Replication to accept only certificates that are signed by a trusted certificate authority, after an update you must reconnect the vSphere Replication appliances.

Update vSphere Replication by Using the VAMI

You can update vSphere Replication from version 5.5.x to a later 5.5.x update release by using the virtual appliance management interface (VAMI) of the vSphere Replication management server.

IMPORTANT Do not select the option in **Update > Settings** in the VAMI to automatically update vSphere Replication. If you select automatic updates, the VAMI updates vSphere Replication to the latest version, which might be incompatible with vCenter Server 5.5.x. Leave the update setting set to **No automatic updates**.

Prerequisites

- You installed vSphere Replication 5.5.x or upgraded vSphere Replication to version 5.5.x by using the downloadable ISO file. If you are running an older version of vSphere Replication, you must upgrade to version 5.5.x before you can update to a 5.5.x update release.
- You updated vCenter Server to the corresponding 5.5.x update release.

Procedure

- 1 Connect to the VAMI of the vSphere Replication appliance in a Web browser.
The URL for the VAMI of the vSphere Replication appliance is `https://vrms-address:5480`.
- 2 Type the root user name and password for the vSphere Replication appliance.
You configured the root password during the OVF deployment of the vSphere Replication management server.
- 3 Click the **Update** tab.
- 4 Click **Check Updates**.
By default, the VAMI shows the most recently available version. If you want to update to an older update release when the next update release is already available, you must manually change the update URL:
 - a Click **Settings**.
 - b Select **Use Specified Repository** and paste the update URL into the **Repository URL** text box.
See the release notes of the update release for the exact URL.
 - c Click **Save Settings**.
 - d Click **Status**.
 - e Click **Check Updates**.
The update checker shows that a new version is available.
- 5 Click **Install Updates** and click **OK**.
- 6 When the update finishes, select the **System** tab, and click **Reboot**.
- 7 Repeat the process on the target site.

What to do next

If you configured vSphere Replication to accept only certificates that are signed by a trusted certificate authority, after an update you must reconnect the vSphere Replication appliances.

If your infrastructure uses more than one vSphere Replication server, update the vSphere Replication server appliances.

Update vSphere Replication Servers by Using the VAMI

If your infrastructure uses more than one vSphere Replication server, you must update all of the vSphere Replication servers to the same update release version as the vSphere Replication appliance.

Prerequisites

- You installed vSphere Replication 5.5.x or upgraded vSphere Replication and the additional vSphere Replication servers to version 5.5.x by using the downloadable ISO file. If you are running an older version of vSphere Replication, you must upgrade the vSphere Replication appliance and the additional vSphere Replication servers to version 5.5.x before you can update to a later 5.5.x update release.

- You updated vCenter Server to the corresponding 5.5.x update release.

Procedure

- 1 In a Web browser, connect to the VAMI of the vSphere Replication server to update.

The URL for the VAMI of the vSphere Replication server is `https://vr-server-address:5480`.

- 2 Type the root user name and password for the vSphere Replication server appliance.
- 3 Click the **Update** tab.
- 4 Click **Check Updates**.

By default, the VAMI shows the most recently available version. If you want to update to an older update release when the next update release is already available, you must manually change the update URL:

- a Click **Settings**.
- b Select **Use Specified Repository** and paste the update URL into the **Repository URL** text box.
See the release notes of the update release for the exact URL.
- c Click **Save Settings**.
- d Click **Status**.
- e Click **Check Updates**.

The update checker shows that a new version is available.

- 5 Click **Install Updates** and click **OK**.
- 6 When the update finishes, select the **System** tab, and click **Reboot**.
- 7 Repeat the procedure to update any other vSphere Replication server instances.

Reconfigure the vSphere Replication Appliance

7

If necessary, you can reconfigure the vSphere Replication appliance settings by using the virtual appliance management interface (VAMI).

You provide the settings for the vSphere Replication appliance in the Deploy OVF wizard when you deploy the appliance. If you selected automatic configuration of the appliance using an embedded database, you can use the vSphere Replication appliance immediately after deployment. If necessary you can modify the configuration settings of the vSphere Replication appliance after you deploy it.

- [Reconfigure General vSphere Replication Settings](#) on page 42
You can use vSphere Replication immediately after you deploy the vSphere Replication appliance. If necessary, you can reconfigure the general settings after deployment in the virtual appliance management interface (VAMI).
- [Change the SSL Certificate of the vSphere Replication Appliance](#) on page 42
vSphere Replication appliance uses certificate-based authentication for all connections that it establishes with vCenter Server and remote site vSphere Replication appliances.
- [Change the Password of the vSphere Replication Appliance](#) on page 45
You set the password of the vSphere Replication appliance when you deploy the appliance. You can change the password after installation by using the virtual appliance management interface (VAMI).
- [Change Keystore and Truststore Passwords of the vSphere Replication Appliance](#) on page 45
To increase security, you can change the default passwords of the vSphere Replication appliance keystore and truststore. If you copy the keystores from the appliance to another machine, VMware recommends that you change the passwords before the copy operation.
- [Configure vSphere Replication Network Settings](#) on page 46
You can review current network settings and change address and proxy settings for vSphere Replication. You might make these changes to match network reconfigurations.
- [Configure vSphere Replication System Settings](#) on page 47
You can view the vSphere Replication system settings to gather information about the vSphere Replication appliance. You can also set the system time zone, and reboot or shut down the appliance.
- [Reconfigure vSphere Replication to Use an External Database](#) on page 48
The vSphere Replication appliance contains an embedded vPostgreSQL database that you can use immediately after you deploy the appliance, without any additional database configuration. If necessary, you can reconfigure vSphere Replication to use an external database.
- [Use the Embedded vSphere Replication Database](#) on page 51
If you configured vSphere Replication to use an external database, you can reconfigure vSphere Replication to use the embedded database.

Reconfigure General vSphere Replication Settings

You can use vSphere Replication immediately after you deploy the vSphere Replication appliance. If necessary, you can reconfigure the general settings after deployment in the virtual appliance management interface (VAMI).

The general settings of the vSphere Replication appliance include the name and IP address of the vSphere Replication appliance, the address and port of the vCenter Server instance to which it connects, and an administrator email address. You can change the general settings from the default values in the virtual appliance management interface (VAMI).

For example, you can reconfigure the address of the vSphere Replication appliance if you did not specify a fixed IP address when you deployed the appliance, and DHCP changes the address after deployment. Similarly, you can update the address of the vCenter Server instance if the address changes after deployment.

Prerequisites

- Verify that the vSphere Replication appliance is powered on.
- You must have administrator privileges to configure the vSphere Replication appliance.
- You updated vCenter Server to the corresponding 5.5.x update release.

Procedure

- 1 Connect to the VAMI of the vSphere Replication appliance in a Web browser.
The URL for the VAMI is `https://vr-appliance-address:5480`.
- 2 Review and confirm the browser security exception, if applicable, to proceed to the login page.
- 3 Type the root user name and password for the appliance.
You configured the root password during the OVF deployment of the vSphere Replication appliance.
- 4 Select the **VR** tab and click **Configuration**.
- 5 Type the address of the vSphere Replication appliance or click **Browse** to select an IP address from a list.
- 6 Type the address of the vCenter Server instance to use with this installation.
You must use the same address format that you used when you installed vCenter Server.
For example, if you used a fully qualified domain name during installation, you must use that FQDN. If you used an IP address, you must use that IP address.
- 7 Type an administrator email address.
- 8 Click **Save and Restart Service** to apply the changes.

You reconfigured the general settings of the vSphere Replication appliance.

Change the SSL Certificate of the vSphere Replication Appliance

vSphere Replication appliance uses certificate-based authentication for all connections that it establishes with vCenter Server and remote site vSphere Replication appliances.

vSphere Replication does not use username and password based authentication. vSphere Replication generates a standard SSL certificate when the appliance first boots and registers with vCenter Server. The default certificate policy uses trust by thumbprint.

You can change the SSL certificate, for example if your company's security policy requires that you use trust by validity and thumbprint or a certificate signed by a certification authority. You change the certificate by using the virtual appliance management interface (VAMI) of the vSphere Replication appliance. For information about the SSL certificates that vSphere Replication uses, see [“vSphere Replication Certificate Verification,”](#) on page 43 and [“Requirements When Using a Public Key Certificate with vSphere Replication,”](#) on page 44.

Prerequisites

- Verify that the vSphere Replication appliance is powered on.
- You must have administrator privileges to configure the vSphere Replication appliance.
- You updated vCenter Server to the corresponding 5.5.x update release.

Procedure

- 1 Connect to the VAMI of the vSphere Replication appliance in a Web browser.
The URL for the VAMI is `https://vr-appliance-address:5480`.
- 2 Type the root user name and password for the appliance.
You configured the root password during the OVF deployment of the vSphere Replication appliance.
- 3 (Optional) Click the **VR** tab and click **Security** to review the current SSL certificate.
- 4 Click **Configuration**.
- 5 (Optional) To enforce verification of certificate validity, select the **Accept only SSL certificates signed by a trusted Certificate Authority** check box.
See [“vSphere Replication Certificate Verification,”](#) on page 43 for details of how vSphere Replication handles certificates.
- 6 Generate or install a new SSL certificate.

Option	Action
Generate a self-signed certificate	Click Generate and Install . Using a self-signed certificate provides trust by thumbprint only and might not be suitable for environments that require high levels of security. You cannot use a self-signed certificate if you selected Accept only SSL certificates signed by a trusted Certificate Authority .
Upload a certificate	Click Browse to select a PKCS#12 certificate and click Upload and Install . Public key certificates must meet certain requirements. See “Requirements When Using a Public Key Certificate with vSphere Replication,” on page 44.

- 7 Click **Save and Restart Service** to apply the changes.

You changed the SSL certificate and optionally changed the security policy to use trust by validity and certificates signed by a certificate authority.

NOTE If you change a certificate on one of the source or target sites, its status changes to **Disconnected**. You can reconnect the source and target sites manually. Alternatively, the sites reconnect when you run an operation between them.

vSphere Replication Certificate Verification

vSphere Replication verifies the certificates of vCenter Server and remote vSphere Replication servers.

All communication between vCenter Server, the local vSphere Replication appliance, and the remote vSphere Replication appliance goes through a vCenter Server proxy at port 80. All SSL traffic is tunnelled.

vSphere Replication can trust remote server certificates either by verifying the validity of the certificate and its thumbprint or by verifying the thumbprint only. The default is to verify by thumbprint only. You can activate the verification of the certificate validity in the virtual appliance management interface (VAMI) of the vSphere Replication appliance by selecting the option **Accept only SSL certificates signed by a trusted Certificate Authority** when you upload a certificate.

Thumbprint Verification

vSphere Replication checks for a thumbprint match. vSphere Replication trusts remote server certificates if it can verify the the thumbprints through secure vSphere platform channels or, in some rare cases, after the user confirms them. vSphere Replication only takes certificate thumbprints into account when verifying the certificates and does not check certificate validity.

Verification of Thumbprint and Certificate Validity

vSphere Replication checks the thumbprint and checks that all server certificates are valid. If you select the **Accept only SSL certificates signed by a trusted Certificate Authority** option, vSphere Replication refuses to communicate with a server with an invalid certificate. When verifying certificate validity, vSphere Replication checks expiration dates, subject names and the certificate issuing authorities.

In both modes, vSphere Replication retrieves thumbprints from vCenter Server. vSphere Replication refuses to communicate with a server if the automatically determined thumbprint differs from the actual thumbprint that it detects while communicating with the respective server.

You can mix trust modes between vSphere Replication appliances at different sites. A pair of vSphere Replication appliances can work successfully even if you configure them to use different trust modes.

Requirements When Using a Public Key Certificate with vSphere Replication

If you enforce verification of certificate validity by selecting **Accept only SSL certificates signed by a trusted Certificate Authority** in the virtual appliance management interface (VAMI) of the vSphere Replication appliance, some fields of the certificate request must meet certain requirements.

vSphere Replication can only import and use certificates and private keys from a file in the PKCS#12 format. Sometimes these files have a .pfx extension.

- The certificate must be issued for the same server name as the value in the **VRM Host** setting in the VAMI. Setting the certificate subject name accordingly is sufficient, if you put a host name in the **VRM Host** setting. If any of the certificate Subject Alternative Name fields of the certificate matches the **VRM Host** setting, this will work as well.
- vSphere Replication checks the issue and expiration dates of the certificate against the current date, to ensure that the certificate has not expired.
- If you use your own certificate authority, for example one that you create and manage with the OpenSSL tools, you must add the fully qualified domain name or IP address to the OpenSSL configuration file.
 - If the fully qualified domain name of the appliance is `VR1.example.com`, add `subjectAltName = DNS: VR1.example.com` to the OpenSSL configuration file.
 - If you use the IP address of the appliance, add `subjectAltName = IP: vr-appliance-ip-address` to the OpenSSL configuration file.
- vSphere Replication requires a trust chain to a well-known root certificate authority. vSphere Replication trusts all the certificate authorities that the Java Virtual Machine trusts. Also, you can manually import additional trusted CA certificates in `/opt/vmware/hms/security/hms-truststore.jks` on the vSphere Replication appliance.

- vSphere Replication accepts MD5 and SHA1 signatures, but VMware recommends that you use SHA256 signatures.
- vSphere Replication does not accept RSA or DSA certificates with 512-bit keys. vSphere Replication requires at least 1024-bit keys. VMware recommends using 2048-bit public keys. vSphere Replication shows a warning if you use a 1024-bit key.

Change the Password of the vSphere Replication Appliance

You set the password of the vSphere Replication appliance when you deploy the appliance. You can change the password after installation by using the virtual appliance management interface (VAMI).

Prerequisites

- Verify that the vSphere Replication appliance is powered on.
- You must have administrator privileges to configure the vSphere Replication appliance.
- You updated vCenter Server to the corresponding 5.5.x update release.

Procedure

- 1 Connect to the VAMI of the vSphere Replication appliance in a Web browser.
The URL for the VAMI is `https://vr-appliance-address:5480`.
- 2 Type the root user name and password for the appliance.
You configured the root password during the OVF deployment of the vSphere Replication appliance.
- 3 Click the **VR** tab and click **Security**.
- 4 Type the current password in the **Current Password** text box.
- 5 Type the new password in the **New Password** and the **Confirm New Password** text boxes.
The password must be a minimum of eight characters. vSphere Replication does not support blank passwords.
- 6 Click **Apply** to change the password.

Change Keystore and Truststore Passwords of the vSphere Replication Appliance

To increase security, you can change the default passwords of the vSphere Replication appliance keystore and truststore. If you copy the keystores from the appliance to another machine, VMware recommends that you change the passwords before the copy operation.

The keystore and truststore passwords might be stored in an access restricted config file. vSphere Replication has the following keystores:

- `/opt/vmware/hms/security/hms-keystore.jks`, which contains the vSphere Replication appliance private key and certificate.
- `/opt/vmware/hms/security/hms-truststore.jks`, which contains additional CA certificates besides the ones that Java already trusts.

Procedure

- 1 To change the `hms-keystore.jks` password, log in as root.

- 2 Obtain the current hms-keystore password.

```
# /opt/vmware/hms/hms-configtool -cmd list | grep keystore
```

Example of the output hms-keystore-password = old_password
- 3 Change the hms-keystore password.

```
# /usr/java/default/bin/keytool -storepasswd -storepass old_password -new new_password -keystore /opt/vmware/hms/security/hms-keystore.jks
```
- 4 Change the vSphere Replication appliance private key password.

```
# /usr/java/default/bin/keytool -keypasswd -alias jetty -keypass old_password -new new_password -storepass new_password -keystore /opt/vmware/hms/security/hms-keystore.jks
```
- 5 Update the configuration with the new password.

```
/opt/vmware/hms/hms-configtool -cmd reconfig -property 'hms-keystore-password=new_password'
```
- 6 Reboot the appliance for the changes to take effect.

```
# reboot
```
- 7 To change the hms-truststore.jks password, log in as root.
- 8 Obtain the current hms-truststore password.

```
# /opt/vmware/hms/hms-configtool -cmd list | grep truststore
```

Example of the output: hms-truststore-password = old_password
- 9 Change the hms-truststore password.

```
# /usr/java/default/bin/keytool -storepasswd -storepass old_password -new new_password -keystore /opt/vmware/hms/security/hms-truststore.jks
```
- 10 Update the configuration with the new password.

```
/opt/vmware/hms/hms-configtool -cmd reconfig -property 'hms-truststore-password=new_password'
```
- 11 Restart the vSphere Replication service.

```
# service hms restart
```

Configure vSphere Replication Network Settings

You can review current network settings and change address and proxy settings for vSphere Replication. You might make these changes to match network reconfigurations.

Prerequisites

- Verify that the vSphere Replication appliance is powered on.
- You must have administrator privileges to configure the vSphere Replication appliance.
- You updated vCenter Server to the corresponding 5.5.x update release.

Procedure

- 1 Connect to the VAMI of the vSphere Replication appliance in a Web browser.

The URL for the VAMI is `https://vr-appliance-address:5480`.

- 2 Type the root user name and password for the appliance.
You configured the root password during the OVF deployment of the vSphere Replication appliance.
- 3 Click the **Network** tab.
- 4 Click **Status** to review current network settings.
- 5 Click **Address** to review or modify IPv4 and IPv6 address settings.

IP Address Type	Option	Description
IPv4	DHCP	DHCP is not recommended if the IP address of the appliance might change if it reboots.
IPv4	Static	With a static IPv4 address, you can modify the IP settings, DNS settings, netmask, and host name information.
IPv4	None	Deactivates IPv4 addresses.
IPv6	Auto	Automatic assignment of IPv6 addresses is not recommended if the IP address of the appliance might change if it reboots.
IPv6	Static	With a static IPv6 address, you can modify the IP address and the address prefix.

- 6 Click **Save Settings**.
If you do not click **Save Settings**, changes are discarded.
- 7 Click **Proxy** to review or modify proxy settings.
 - a Select **Use a proxy server** to use a proxy server.
 - b Type a proxy server name in the **HTTP Proxy Server** text box.
 - c Type a proxy port in the **Proxy Port** text box.
 - d (Optional) Type a proxy server user name and password.
- 8 Click **Save Settings**.
If you do not click **Save Settings**, changes are discarded.

What to do next

A network address change might require you to reconnect the source and target sites and might also require a change of certificate if you have activated verification of certificate validity.

Configure vSphere Replication System Settings

You can view the vSphere Replication system settings to gather information about the vSphere Replication appliance. You can also set the system time zone, and reboot or shut down the appliance.

Prerequisites

- Verify that the vSphere Replication appliance is powered on.
- You must have administrator privileges to configure the vSphere Replication appliance.
- You updated vCenter Server to the corresponding 5.5.x update release.

Procedure

- 1 Connect to the VAMI of the vSphere Replication appliance in a Web browser.
The URL for the VAMI is `https://vr-appliance-address:5480`.
- 2 Type the root user name and password for the server.

- 3 Click the **System** tab.
- 4 Click **Information**.

You can review information about vSphere Replication, and reboot or shutdown the appliance.

Option	Description
Vendor	Vendor name
Appliance Name	vSphere Replication appliance name
Appliance Version	vSphere Replication version
Hostname	Hostname of the appliance
OS Name	Operating system name and version
OVF Environment: View	Displays information about the OVF environment
Reboot	Reboots the virtual appliance
Shutdown	Shuts down the virtual appliance

Shutting down the vSphere Replication appliance stops configured replications and prevents you from configuring replication of new virtual machines as well as modifying existing replication settings.

- 5 Click **Time Zone**.

Option	Description
System Time Zone	Time zones are available from the drop-down list
Save Settings	Saves settings
Cancel Changes	Discards changes

Reconfigure vSphere Replication to Use an External Database

The vSphere Replication appliance contains an embedded vPostgreSQL database that you can use immediately after you deploy the appliance, without any additional database configuration. If necessary, you can reconfigure vSphere Replication to use an external database.

Each vSphere Replication appliance requires its own database. If the database at either site is corrupted, vSphere Replication does not function. vSphere Replication cannot use the vCenter Server database because it has different database schema requirements. However, if you do not use the embedded vSphere Replication database you can use the vCenter database server to create and support an external vSphere Replication database.

You might need to use an external database to improve performance or load balancing, for easier backup, or to meet your company's database standards.

NOTE vSphere Replication server inside the vSphere Replication appliance uses its own embedded database and config files. Configuring VRMS to use external database does not provide protection of losing the vSphere Replication appliance or any Additional vSphere Replication Server appliance.

If you reinitialize the database after you deploy vSphere Replication, you must go to the vSphere Replication virtual appliance management interface (VAMI) to reconfigure vSphere Replication to use the new database connection.

Prerequisites

- Verify that the vSphere Replication appliance is powered on.
- You must have administrator privileges to configure the vSphere Replication appliance.

- You must create and configure the external database before you connect it to vSphere Replication. See [“Databases that vSphere Replication Supports,”](#) on page 49 for the configuration requirements for each supported type of database.

Procedure

- 1 Connect to the VAMI of the vSphere Replication appliance in a Web browser.
The URL for the VAMI is `https://vr-appliance-address:5480`.
- 2 Type the root user name and password for the appliance.
You configured the root password during the OVF deployment of the vSphere Replication appliance.
- 3 Select the **VR** tab and click **Configuration**.
- 4 Select **Manual configuration** to specify a configuration or select **Configure from an existing VRM database** to use a previously established configuration.
- 5 In the DB text boxes, provide information about the database for vSphere Replication to use.

Option	Setting
DB Type	Select SQL Server or Oracle .
DB Host	IP address or fully qualified domain name of the host on which the database server is running.
DB Port	Port on which to connect to the database.
DB Username	Username for the vSphere Replication database user account that you create on the database server.
DB Password	Password for the vSphere Replication database user account that you create on the database server.
DB Name	Name of the vSphere Replication database instance.
DB URL	Auto-generated and hidden by default. Advanced users can fine-tune other database properties by modifying the URL, for example if you use a named instance of SQL Server.

- 6 Click **Save and Restart Service** to apply the changes.

You configured vSphere Replication to use an external database instead of the database that is embedded in the vSphere Replication appliance.

Databases that vSphere Replication Supports

The vSphere Replication virtual appliance includes the VMware standard embedded vPostgreSQL database. You can also configure vSphere Replication to use an external database.

Automated migration between the embedded database and any external databases is not supported in any direction. If you must configure an external database, you must manually migrate the data or manually recreate all replications.

You can configure vSphere Replication to use one of the supported external databases.

- Microsoft SQL
- Oracle

External vPostgreSQL databases are not supported. vSphere Replication supports the same database versions as vCenter Server. For supported database versions, see the *VMware Product Interoperability Matrixes* at http://partnerweb.vmware.com/comp_guide2/sim/interop_matrix.php?.

- [Configure Microsoft SQL Server for vSphere Replication](#) on page 50

When you create a Microsoft SQL Server database, you must configure it correctly to support vSphere Replication.

- [Configure Oracle Server for vSphere Replication](#) on page 51

You must configure an Oracle Server database correctly to support vSphere Replication.

Configure Microsoft SQL Server for vSphere Replication

When you create a Microsoft SQL Server database, you must configure it correctly to support vSphere Replication.

You use SQL Server Management Studio to create and configure an SQL Server database for vSphere Replication.

This information provides the general steps that you must perform to configure an SQL Server database for vSphere Replication. For instructions about how to perform the relevant steps, see the SQL Server documentation.

Prerequisites

Verify that the SQL Server Browser service is running.

Procedure

- 1 Select **Mixed Mode Authentication** when you create the database instance.

The vSphere Replication appliance and the database server run on different hosts, so you must use mixed mode authentication and not Windows Authentication.

- 2 Use either a named instance or the default instance of SQL Server.

If you intend to use dynamic TCP ports, you must use a named instance of SQL Server.

- 3 Enable TCP on the database instance.

- 4 Set a TCP port.

Option	Action
Static TCP port	Set the TCP port to the default of 1433.
Dynamic TCP port	<ol style="list-style-type: none"> a Use a named instance of SQL Server. You can only use dynamic ports with a named instance of SQL Server. b Select the Show DB URL check box in the virtual appliance management interface (VAMI) of the vSphere Replication appliance. c Modify the DB URL value. Replace <code>port=port_number</code> with <code>instanceName=instance_name</code> in the URL. d Use the PortQuery command from a remote machine to check that the port on which the SQL Server Browser service runs is not blocked by a firewall. The SQL Server Browser runs on port 1434. Type the PortQuery command in a terminal window. <pre>PortQry.exe -n Machine_Name -p UDP -e 1434</pre>

- 5 Verify that the firewall on the database server permits inbound connections on the TCP port.

- 6 Create the vSphere Replication security login.

- 7 Create the vSphere Replication database and set the vSphere Replication security login as the database owner.

- 8 Keep the dbo user and dbo schema settings.

Because the vSphere Replication security login is the database owner, it maps to the database user dbo and uses the dbo schema.

Configure Oracle Server for vSphere Replication

You must configure an Oracle Server database correctly to support vSphere Replication.

You create and configure an Oracle Server database for vSphere Replication by using the tools that Oracle Server provides.

This information provides the general steps that you must perform to configure an Oracle Server database for vSphere Replication. For instructions about how to perform the relevant steps, see the Oracle documentation.

Procedure

- 1 When creating the database instance, specify UTF-8 encoding.
- 2 Create the vSphere Replication database user account.
- 3 If they are not selected already, select the **CONNECT** and **RESOURCE** roles.

These roles provide the privileges that vSphere Replication requires.

Use the Embedded vSphere Replication Database

If you configured vSphere Replication to use an external database, you can reconfigure vSphere Replication to use the embedded database.

The vSphere Replication appliance includes an embedded vPostgreSQL database. The embedded database is preconfigured for use with vSphere Replication and is enabled if you accept the default **Performs initial configuration of the appliance using an embedded database** option when you deploy the vSphere Replication appliance. If you reconfigured vSphere Replication to use an external database after deployment, you can switch to the embedded database. After switching databases, you must manually configure replications again as the replication management data is not migrated to the database. You can use the reset feature in the embedded database to drop replications, site connections and external vSphere Replication registrations.

Prerequisites

- Verify that the vSphere Replication appliance is powered on.
- You must have administrator privileges to configure the vSphere Replication appliance.
- You must have reconfigured vSphere Replication to use an external database.

Procedure

- 1 Connect to the VAMI of the vSphere Replication appliance in a Web browser.
The URL for the VAMI is `https://vr-appliance-address:5480`.
- 2 Type the root user name and password for the appliance.
You configured the root password during the OVF deployment of the vSphere Replication appliance.
- 3 Select the **VR** tab and click **Configuration**.
- 4 Select **Configure using the embedded database**.
- 5 (Optional) Click **Reset Embedded Database** to reset the database.
- 6 Click **Save and Restart Service** to apply the changes.

You configured vSphere Replication to use the embedded vSphere Replication database.

Replicating Virtual Machines

With vSphere Replication you can replicate virtual machines from a source site to a target site.

You can set a recovery point objective (RPO) to a certain time interval depending on your data protection needs. vSphere Replication applies all changes made to virtual machines configured for replication at the source site to their replicas at the target site. This process reoccurs at the RPO interval that you set.

To replicate a virtual machine using vSphere Replication, you must deploy the vSphere Replication appliance at the source and target sites. A vSphere Replication infrastructure requires one vSphere Replication appliance at each site.

The source and target sites must be connected for you to be able to configure replications. If one of the sites is unreachable from the other site, is offline, if authentication fails, or if the certificates have changed, it shows the disconnected state in the vSphere Replication interface. You cannot perform replications if one of the sites is in the disconnected state due to these reasons. The sites can also appear in the disconnected state if you log in to the vSphere Web Client when a previous login session has expired. In this case, scheduled replications continue as normal. See [“vSphere Replication Sites Appear in the Disconnected State,”](#) on page 79.

vSphere Replication does not support the recovery of multiple virtual machines from the same workflow. Each recovery workflow is for an individual virtual machine.

You cannot replicate powered-off virtual machines. Replication begins when the virtual machine is powered on. You cannot use vSphere Replication to replicate virtual machine templates.

This chapter includes the following topics:

- [“How the Recovery Point Objective Affects Replication Scheduling,”](#) on page 54
- [“Replicating a Virtual Machine and Enabling Multiple Point in Time Instances,”](#) on page 54
- [“Using vSphere Replication with Virtual SAN Storage,”](#) on page 55
- [“Replicating Virtual Machines Using Replication Seeds,”](#) on page 57
- [“Replicating a Virtual Machine in a Single vCenter Server Instance,”](#) on page 57
- [“Configure Replication for a Single Virtual Machine,”](#) on page 57
- [“Configure Replication for Multiple Virtual Machines,”](#) on page 59
- [“Move a Virtual Machine to a New vSphere Replication Server,”](#) on page 60
- [“Stop Replicating a Virtual Machine,”](#) on page 60
- [“Reconfiguring Replications,”](#) on page 61

How the Recovery Point Objective Affects Replication Scheduling

When you set a Recovery Point Objective (RPO) value during replication configuration, you determine the maximum data loss that you can tolerate. The RPO value affects replication scheduling, but vSphere Replication does not adhere to a strict replication schedule.

For example, when you set the RPO to 15 minutes, you instruct vSphere Replication that you can tolerate losing the data for up to 15 minutes. This does not mean that data is replicated every 15 minutes.

If you set an RPO of x minutes, the latest available replication instance can never reflect a state that is older than x minutes. A replication instance reflects the state of a virtual machine at the time the replication starts.

Assume that during replication configuration you set the RPO to 15 minutes. If the replication starts at 12:00 and it takes five minutes to transfer to the target site, the instance becomes available on the target site at 12:05, but it reflects the state of the virtual machine at 12:00. The next replication can start no later than 12:10. This replication instance is then available at 12:15 when the first replication instance that started at 12:00 expires.

If you set the RPO to 15 minutes and the replication takes 7.5 minutes to transfer an instance, vSphere Replication transfers an instance all the time. If the replication takes more than 7.5 minutes, the replication encounters periodic RPO violations. For example, if the replication starts at 12:00 and takes 10 minutes to transfer an instance, the replication finishes at 12:10. You can start another replication immediately, but it finishes at 12:20. During the time interval 12:15-12:20, an RPO violation occurs because the latest available instance started at 12:00 and is too old.

The replication scheduler tries to satisfy these constraints by overlapping replications to optimize bandwidth use and might start replications for some virtual machines earlier than expected.

To determine the replication transfer time, the replication scheduler uses the duration of the last few instances to estimate the next one.

Replicating a Virtual Machine and Enabling Multiple Point in Time Instances

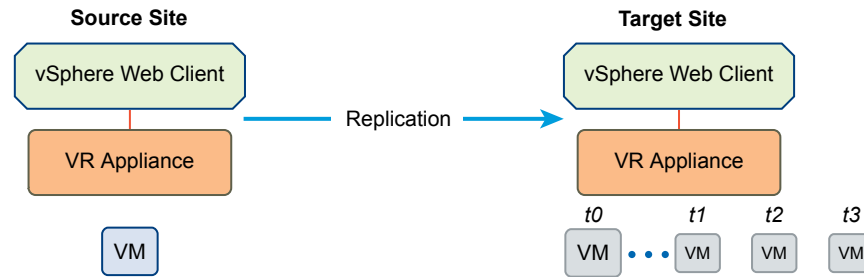
You can recover virtual machines at specific points in time (PIT) such as the last known consistent state.

When you configure replication of a virtual machine, you can enable multiple point in time (PIT) instances in the recovery settings in the Configure Replication wizard. vSphere Replication retains a number of snapshot instances of the virtual machine on the target site based on the retention policy that you specify. vSphere Replication supports maximum of 24 snapshot instances. After you recover a virtual machine, you can revert it to a specific snapshot.

During replication, vSphere Replication replicates all aspects of the virtual machine to the target site, including any potential viruses and corrupted applications. If a virtual machine suffers from a virus or corruption and you have configured vSphere Replication to keep PIT snapshots, you can recover the virtual machine and then revert it to a snapshot of the virtual machine in its uncorrupted state.

You can also use the PIT instances to recover the last known good state of a database.

NOTE vSphere Replication does not replicate virtual machine snapshots.

Figure 8-1. Recovering a Virtual Machine at Points in Time (PIT)

Using vSphere Replication with Virtual SAN Storage

You can use VMware Virtual SAN datastores as the source and target datastores when configuring replications. Follow the guidelines when using vSphere Replication with Virtual SAN storage.

NOTE VMware Virtual SAN is a fully supported feature of vSphere 5.5u1.

- You can use Virtual SAN in production environments with vSphere Replication 5.5.1 and vSphere 5.5u1.
- Virtual SAN is an experimental feature in vSphere 5.5. You can perform testing with Virtual SAN with vSphere Replication 5.5.0 and vSphere 5.5, but it is not supported for use in production environments. See the release notes for the vSphere Replication 5.5.0 release for information about how to enable Virtual SAN in vSphere 5.5.

vSphere Replication does not support replicating or recovering virtual machines to the root folders with user-friendly names on Virtual SAN datastores. These names can change, which causes replication errors. When selecting Virtual SAN datastores, always select folders with UUID names, which do not change.

Configuring Replications

When configuring replications for a single virtual machine, vSphere Replication creates the destination folder that you choose, obtains the UUID reference for that folder, and then uses the UUID name rather than the user-friendly name. The UUID name is visible when vSphere Replication displays the target folders when reconfiguring replications.

When configuring replication for multiple virtual machines, create a root folder in the Virtual SAN datastore, obtain its UUID name, and use the folder that is identified by the UUID in the replication wizard.

Configure vSphere Replication on batches of a maximum of 30 virtual machines at a time.

Configuring Replications by Using Replication Seeds

When copying replication seed files to the target datastore, you can use the vSphere Web Client to create a new root folder on a Virtual SAN datastore, or place the files in an existing folder. When you configure replications that use replication seeds, you must select the folder by using its UUID name. Selecting the user-friendly folder names is not supported.

Reconfiguring Replications

If you want to change the destination folder for a disk or the virtual machine config files, you must use the following options:

- Select the UUID name of an existing folder.
- Allow vSphere Replication to create a new folder and obtain its UUID name.

Limits of Using vSphere Replication with Virtual SAN Storage

For reasons of load and I/O latency, Virtual SAN storage is subject to limits in terms of the numbers of hosts that you can include in a Virtual SAN cluster and the number of virtual machines that you can run on each host. See the Limits section in the *VMware Virtual SAN Design and Sizing Guide* at <http://www.vmware.com/products/virtual-san/resources.html>.

Using vSphere Replication adds to the load on the storage. Every virtual machine generates regular read and write operations. Configuring vSphere Replication on those virtual machines adds another read operation to the regular read and write operations, which increases the I/O latency on the storage. The precise number of virtual machines that you can replicate to Virtual SAN storage by using vSphere Replication depends on your infrastructure. If you notice slower response times when you configure vSphere Replication for virtual machines in Virtual SAN storage, monitor the I/O latency of the Virtual SAN infrastructure. Potentially reduce the number of virtual machines that you replicate in the Virtual SAN datastore.

Retaining Point-in-Time Snapshots when Using Virtual SAN Storage

Virtual SAN storage stores virtual machine disk files as a set of objects and components. Each disk object in Virtual SAN storage has mirror and witness objects. In the default Virtual SAN storage policy, a disk object has 2 mirrors and one witness. The number of mirror components is determined by the size of the virtual machine disk and the number of failures to tolerate that you set in your Virtual SAN storage policy. A mirror object is divided into components of a maximum size of 256 GB each.

- If a virtual machine has one 256 GB disk and you use the default Virtual SAN storage policy, the disk object will have 2 mirror components of 256 GB each and 1 witness, to make a total of 3 components.
- If a virtual machine has one 512 GB disk and you use the default Virtual SAN storage policy, the disk object will have 4 mirror components of 256 GB each and 1 witness, to make a total of 5 components.

See the *VMware Virtual SAN Design and Sizing Guide* at <http://www.vmware.com/products/virtual-san/resources.html> for explanations of objects, components, mirrors, witnesses, and Virtual SAN storage policies.

If you enable multiple point-in-time (PIT) snapshots, you must make allowances for the additional components that each snapshot creates in the Virtual SAN storage, based on the number of disks per virtual machine, the size of the disks, the number of PIT snapshots to retain, and the number of failures to tolerate. When retaining PIT snapshots and using Virtual SAN storage, you must calculate the number of extra components that you require for each virtual machine:

Number of disks x number of PIT snapshots x number of mirror and witness components

Examples of using this formula demonstrate that retaining PIT snapshots rapidly increases the number of components in the Virtual SAN storage for every virtual machine that you configure for vSphere Replication:

- You have a virtual machine with two 256 GB disks for which you retain 10 MPIT snapshots, and you set the default Virtual SAN storage policy:
 - $2 \text{ (number of disks)} \times 10 \text{ (number of PIT snapshots)} \times 3 \text{ (2 mirror components + 1 witness)} = 60$ components for this one virtual machine.
- You have a virtual machine with two 512 GB disks for which you retain 10 PIT snapshots, and you set the default Virtual SAN storage policy:
 - $2 \text{ (number of disks)} \times 10 \text{ (number of PIT snapshots)} \times 5 \text{ (4 mirror components of 256 GB each + 1 witness)} = 100$ components for this one virtual machine.

The number of PIT snapshots that you retain can increase I/O latency on the Virtual SAN storage.

Replicating Virtual Machines Using Replication Seeds

You can use replication seeds if a duplicate file is found for the virtual machine on the destination datastore. vSphere Replication compares differences and replicates only the changed blocks.

To avoid network bandwidth consumption for the amount of data that has to be replicated on initial full synchronization, vSphere Replication allows you to copy your virtual disk files to the remote datacenter and point those as replication seeds during configuring replication. vSphere Replication compares the differences and replicates only the changed blocks.

When configuring replication for a virtual machine, vSphere Replication looks for a disk with the same filename in the target datastore. If a file with the same name exists, vSphere Replication prompts you with a warning and offers you the option to use the target disk as a seed for replication. If you accept the option, vSphere Replication compares the differences and replicates only the changed blocks after the virtual machine replication is fully configured and enabled. If you do not accept the prompt, then you must change the target location for your replication.

NOTE The source virtual machine must be powered off before downloading the vmdk files that are used as seeds for the replication.

Replicating a Virtual Machine in a Single vCenter Server Instance

You can use vSphere Replication to replicate a virtual machine in a single vCenter Server even if the vCenter Server instance has only one host in its inventory.

When you configure replication in a single vCenter Server instance, you can select the source site as the target site for replication. You then configure replication in the same way as for an infrastructure with a source and a target site. For example, you can replicate a virtual machine to a different datastore attached to the same host or another host. vSphere Replication prevents you from using the source or replicated virtual machine's vmdk files as the target of the replication.

The virtual machine name must be unique in the same folder in the vCenter Server inventory. In the recovery wizard, vSphere Replication does not allow you to select a folder if there is already a virtual machine with the same name registered to it. During recovery if there is a virtual machine with the same name, you might see an error message. See [“Error Recovering Virtual Machine in a Single vCenter Server Instance,”](#) on page 80 for more information.

NOTE If you install vSphere Replication as part of a vCenter Site Recovery Manager (SRM) deployment, any replications that you configure in the same vCenter Server instance are not visible in the SRM user interface. You can still monitor and manage these replications in the vSphere Replication user interface in the vSphere Web Client.

Configure Replication for a Single Virtual Machine

vSphere Replication can protect individual virtual machines and their virtual disks by replicating them to another location.

When you configure replication, you set a recovery point objective (RPO) to determine the period of time between replications. For example, an RPO of 1 hour seeks to ensure that a virtual machine loses no more than 1 hour of data during the recovery. For smaller RPOs, less data is lost in a recovery, but more network bandwidth is consumed keeping the replica up to date.

Every time that a virtual machine reaches its RPO target, vSphere Replication records approximately 3800 bytes of data in the vCenter Server events database. If you set a low RPO period, this can quickly create a large volume of data in the database. To avoid creating large volumes of data in the vCenter Server events database, limit the number of days that vCenter Server retains event data. See *Configure Database Retention Policy* in the *vCenter Server and Host Management Guide*. Alternatively, set a higher RPO value.

vSphere Replication guarantees crash consistency amongst all the disks that belong to a virtual machine. If you use VSS quiescing, you might obtain a higher level of consistency. The available quiescing types are determined by the virtual machine's operating system. See [Compatibility Matrixes for vSphere Replication 5.5](#) for Microsoft Volume Shadow Copy Service (VSS) quiescing support for Windows virtual machines.

You can use vSphere Replication with a Virtual SAN datastore on the source and target sites. See [“Using vSphere Replication with Virtual SAN Storage,”](#) on page 55 for the limitations when using vSphere Replication with Virtual SAN.

NOTE VMware Virtual SAN is a fully supported feature of vSphere 5.5u1.

- You can use Virtual SAN in production environments with vSphere Replication 5.5.1 and vSphere 5.5u1.
 - Virtual SAN is an experimental feature in vSphere 5.5. You can perform testing with Virtual SAN with vSphere Replication 5.5.0 and vSphere 5.5, but it is not supported for use in production environments. See the release notes for the vSphere Replication 5.5.0 release for information about how to enable Virtual SAN in vSphere 5.5.
-

Prerequisites

Verify that you have deployed a vSphere Replication appliance at both sites.

Procedure

- 1 On the vSphere Web Client Home page, click **VMs and Templates**.
- 2 Browse the inventory to find the single virtual machine to replicate using vSphere Replication.
- 3 Right-click the virtual machine and select **All vSphere Replication Actions > Configure replication**.
- 4 Select the target site.
 - If you have already connected the source and target sites, select the target site from the list.
 - If you have not connected the source and target sites, and the target site is local, select the target site from the list.
 - If you have not connected the source and target sites, and the target site is remote, click **Add Remote Site** and enter the IP or name, and credentials to connect to the site.
- 5 Accept the automatic assignment of a vSphere Replication server or select a particular server on the target site.
- 6 Select the target location datastore. Optionally, you can select the virtual machine storage policy.
- 7 If you select **Advanced disk configuration**, you can configure the virtual machine's individual disks one at a time.

For each disk you can select its virtual format, storage policy, and specify a datastore where it is replicated. Disable replication of the disk by deselecting **Enable disk replication**.
- 8 Select a Guest OS Quiescing configuration, if applicable to the source virtual machine operating system.
- 9 Use the RPO slider or enter a value to configure the maximum amount of data that can be lost in the case of a site failure. Optionally, enable point in time instances and specify instance retention policy.

The available RPO range is from 15 minutes to 24 hours.
- 10 Review the settings and click **Finish** to establish replication.

vSphere Replication starts an initial full synchronization of the virtual machine files to the designated datastore on the target site.

Configure Replication for Multiple Virtual Machines

You can configure replication for multiple virtual machines using the multi-VM configure replication wizard.

When you configure replication, you set a recovery point objective (RPO) to determine the period of time between replications. For example, an RPO of 1 hour seeks to ensure that a virtual machine loses no more than 1 hour of data during the recovery. For smaller RPOs, less data is lost in a recovery, but more network bandwidth is consumed keeping the replica up to date.

Every time that a virtual machine reaches its RPO target, vSphere Replication records approximately 3800 bytes of data in the vCenter Server events database. If you set a low RPO period, this can quickly create a large volume of data in the database. To avoid creating large volumes of data in the vCenter Server events database, limit the number of days that vCenter Server retains event data. See *Configure Database Retention Policy* in the *vCenter Server and Host Management Guide*. Alternatively, set a higher RPO value.

vSphere Replication guarantees crash consistency amongst all the disks that belong to a virtual machine. If you use VSS quiescing, you might obtain a higher level of consistency. The available quiescing types are determined by the virtual machine's operating system. See [Compatibility Matrixes for vSphere Replication 5.5](#) for Microsoft Volume Shadow Copy Service (VSS) quiescing support for Windows virtual machines.

You can use vSphere Replication with a Virtual SAN datastore on the source and target sites. See [“Using vSphere Replication with Virtual SAN Storage,”](#) on page 55 for the limitations when using vSphere Replication with Virtual SAN.

NOTE VMware Virtual SAN is a fully supported feature of vSphere 5.5u1.

- You can use Virtual SAN in production environments with vSphere Replication 5.5.1 and vSphere 5.5u1.
 - Virtual SAN is an experimental feature in vSphere 5.5. You can perform testing with Virtual SAN with vSphere Replication 5.5.0 and vSphere 5.5, but it is not supported for use in production environments. See the release notes for the vSphere Replication 5.5.0 release for information about how to enable Virtual SAN in vSphere 5.5.
-

Configuring vSphere Replication on a large number of virtual machines simultaneously when using Virtual SAN storage can cause the initial full synchronization of the virtual machine files to run very slowly. Initial full synchronization operations generate heavy I/O traffic and configuring too many replications at the same time can overload the Virtual SAN storage. Configure vSphere Replication on batches of a maximum of 30 virtual machines at a time.

Prerequisites

To replicate virtual machines using vSphere Replication, you must deploy the vSphere Replication appliance at the source and target sites. You must power on the virtual machines to begin replication.

Procedure

- 1 On the vSphere Web Client Home page, click **VMs and Templates**.
- 2 Select a datacenter, click the **Related Objects** tab, then click the **Virtual Machines** tab.
A list of virtual machines appears in the right pane.
- 3 Select the virtual machines to replicate using the Ctrl or Shift keys.
- 4 Right-click the virtual machines and click **All vSphere Replication Actions > Configure replication**.
- 5 Acknowledge the number of virtual machines to replicate.
- 6 Verify the virtual machine validation and click **Next**.

- 7 Select the target site.
 - If you have already connected the source and target sites, select the target site from the list.
 - If you have not connected the source and target sites, and the target site is local, select the target site from the list.
 - If you have not connected the source and target sites, and the target site is remote, click **Add Remote Site** and enter the IP or name, and credentials to connect to the site.
- 8 Accept the automatic assignment of a vSphere Replication server or select a particular server on the target site.
- 9 Select the target location datastore. Optionally, you can select the virtual machine storage policy.
- 10 Select a Guest OS Quiescing configuration, if applicable to the source virtual machine operating system.
- 11 Use the RPO slider or enter a value to configure the maximum amount of data that can be lost in the case of a site failure. Optionally, enable point in time instances and specify instance retention policy.
The available RPO range is from 15 minutes to 24 hours.
- 12 Choose whether or not to use replication seeds.
This option searches the selected target datastore for replication seeds. If candidate files are found, confirm whether to use the found files as seeds.
- 13 Review the settings and click **Finish** to establish replication.
vSphere Replication starts an initial full synchronization of the virtual machine files to the designated datastore on the target site.

Move a Virtual Machine to a New vSphere Replication Server

After configuring vSphere Replication, you can move replications to other vSphere Replication servers. You might do this to complete maintenance tasks on existing servers or to balance the load on the servers if one server becomes overloaded with replications.

Prerequisites

Other than the embedded vSphere Replication server, you must have an additional vSphere Replication server deployed and registered.

Procedure

- 1 Select a replication from **Outgoing Replications** or **Incoming Replications**.
- 2 Right-click a replication and select **Move to**.
- 3 Select a vSphere Replication server from the list, and click **OK**.

The newly assigned server is updated in the vSphere Replication server column.

Stop Replicating a Virtual Machine

If you do not need to replicate a virtual machine, you can stop the replication of that virtual machine.

Prerequisites

You have configured replication on a virtual machine that you no longer need to replicate.

Procedure

- 1 In the vSphere Replication Home page, go to the **Monitor** tab and click **Incoming Replications** or **Outgoing Replications**.

- 2 Right-click a replication and select **Stop**.

vSphere Replication asks you if you want to permanently stop the replication for the selected virtual machine. The hosts and vSphere Replication server used by the replication must be accessible.

NOTE You can force stop the replication by selecting **Force stop replication**. If you force stop the replication from **Incoming Replications** you must also force stop the corresponding replication from **Outgoing Replications** if the source site is available. If you force stop the replication from **Outgoing Replications**, you can only recover or force stop the corresponding replication from **Incoming Replications**.

- 3 Click **Yes** to confirm that you want to stop replicating this virtual machine.

The virtual machine does not replicate to the target site.

Reconfiguring Replications

You can reconfigure a replication to modify its settings.

For example, you can reconfigure the replication to enable or disable a virtual machine disk file for replication, modify replication options, such as RPO, MPIT retention policy, or quiescing method. You can also specify a different target datastore for replica configuration and disk files.

To reconfigure replication parameters, select the replication from **Outgoing Replications** or **Incoming Replications**, and select **Reconfigure**.

Reconfigure Recovery Point Objectives (RPO) in Replications

You can modify the settings for already configured replications to specify different recovery point objectives (RPOs).

Procedure

- 1 Select a replication from **Outgoing Replications** or **Incoming Replications**.
- 2 Right-click a replication and select **Reconfigure**.
You might be prompted to provide login credentials for the target site.
- 3 Click **Next** until you reach **Recovery settings**.
- 4 Modify the RPO settings for this replication.
- 5 Click **Finish** to save your changes.

Resize Virtual Machine Disk Files During Replication Using Replication Seeds

vSphere Replication prevents you from resizing the virtual machine disk file during replication. If you used replication seeds for the target disk, you can resize the disk manually.

Procedure

- 1 Unconfigure replication on the virtual machine.
- 2 Resize the disk on the source site.
- 3 Resize the target disk that is left over after you unconfigure replication.
- 4 Reconfigure replication on the virtual machine.

Resize Virtual Machine Disk Files During Replication Without Using Replication Seeds

vSphere Replication prevents you from resizing the virtual machine disk file during replication. If you did not use replication seeds during configuration of the target disk, vSphere Replication deletes the target disk when you stop the replication.

To resize a virtual machine disk if you did not initially use replication seeds, you must perform a recovery and reconfigure the disk manually using replication seeds.

Procedure

- 1 Perform a recovery.
- 2 Unconfigure the replication.
- 3 Resize the disk on the source site.
- 4 Resize the disk on the recovered virtual machine on the target site.
- 5 Unregister the recovered virtual machine on the target site, but do not delete the disks.
- 6 Enable replication by using the disks of the recovered virtual machine as seeds.

Change the Target Datastore Location

Changing the target location of an already configured replication requires vSphere Replication to unconfigure and then reconfigure the replication.

All replication instances are lost and vSphere Replication performs an initial full sync to the new location for all virtual machine disks. If a replication seed was used for some of these disks, vSphere Replication uses the seed again.

If the source host goes offline after vSphere Replication unconfigures the replication, the virtual machine is not configured for replication.

The source host must remain online during the reconfiguration and stay online during the full sync period so that replication is in the OK state as it was prior to moving the disks to a different location. The sync can take a long time if there are no replication seeds.

Performing a Recovery with vSphere Replication

9

With vSphere Replication, you can recover successfully replicated virtual machines at the target site.

vSphere Replication performs a sequence of steps to recover replicated virtual machines.

- If you perform a synchronization of the latest changes, vSphere Replication checks that the source site is available and source virtual machine is powered off before recovering the virtual machine on the target site. Then vSphere Replication synchronizes the changes from the source to the target site.
- If you skip synchronization and recover with the latest data available (e.g. if the source site is not available), vSphere Replication uses the latest available data at the target site.
- Rebuilds the replicated .vmdk files.
- Reconfigures the newly replicated virtual machine with the correct disk paths.
- Registers the virtual machine with vCenter Server at the target site.

You can recover one virtual machine at a time on the replicated site on the **Incoming Replications** tab. Optionally, you can power on the recovered virtual machine. The recovered virtual machine's network devices are disconnected. You might need to modify a recovered virtual machine to render it fully operational.

This chapter includes the following topics:

- [“Recover Virtual Machines by Using vSphere Replication,”](#) on page 63
- [“Failback of Virtual Machines in vSphere Replication,”](#) on page 65

Recover Virtual Machines by Using vSphere Replication

With vSphere Replication you can recover successfully replicated virtual machines at the target site, one at a time.

Prerequisites

Verify that the virtual machine at the source site is powered off.

Procedure

- 1 Log in to the vSphere Web Client for the target site.
- 2 On the **Incoming Replications** tab, right-click the virtual machine to recover and select **Recover**.

- 3 Select whether to recover the virtual machine with all the latest data, or to recover the virtual machine with the most recent data from the target site.

Option	Description
Recover with recent changes	Performs a full synchronization of the virtual machine from the source site to the target site before recovering the virtual machine. Selecting this option avoids data loss, but it is only available if the data of the source virtual machine is accessible. You can only select this option if the virtual machine is powered off.
Recover with latest available data	Recovers the virtual machine by using the data from the most recent replication on the target site, without performing synchronization. Selecting this option results in the loss of any data that has changed since the most recent replication. Select this option if the source virtual machine is inaccessible or if its disks are corrupted.

- 4 Select the recovery folder and click **Next**.
- 5 Select the target compute resource and click **Next**.
- 6 If the virtual machine contains hard disks for which you have not enabled replication, select a target destination to attach an existing disk or detach the disk, and click **Next**.

This page only appears if the virtual machine contains hard disks for which you have not enabled replication.

- To select a target destination, click **Browse** and navigate to a folder on a datastore in which disk file is placed.
- To detach the disk and exclude disk files from the recovery, click **Detach**.

- 7 (Optional) Select **Power on after recovery**.
- 8 Click **Finish**.

vSphere Replication validates the provided input and recovers the virtual machine. If successful, the virtual machine status changes to **Recovered**. The virtual machine appears in the inventory of the target site.

If you enabled multiple point in time instances when you configured replication for the virtual machine, vSphere Replication presents the retained instances as standard snapshots after a successful recovery. You can select one of these snapshots to revert the virtual machine. vSphere Replication does not preserve the memory state when you revert to a snapshot.

If the recovery fails, the replication of the virtual machines reverts to the replication state before the attempted recovery. For more information about the failed recovery attempt, check the last recovery error message in the replication details pane or check vCenter Server tasks.

The recovery might also fail if you use the same name for the virtual machine in a scenario where you use vSphere Replication to replicate a virtual machine in a single vCenter Server and the vCenter Server instance has only one host in its inventory. See [“Error Recovering Virtual Machine in a Single vCenter Server Instance,”](#) on page 80 for more information.

After a successful recovery, vSphere Replication disables the virtual machine for replication if the source site is still available. When the virtual machine is powered on again it does not send replication data to the recovery site. To unconfigure the replication, select **Stop replication**.

When the source virtual machine is no longer in the vCenter Server inventory, the replication is unconfigured. Unconfigured replications do not appear in the **Summary** tab nor in the **Incoming Replications** or **Outgoing Replications** tabs. Check vCenter Server task history for information on performed recoveries.

If a replicated virtual machine is attached to a distributed virtual switch and you attempt to perform a recovery in an automated DRS cluster, the recovery operation succeeds but the resulting virtual machine cannot be powered on. Edit the recovered virtual machine settings to attach it to the correct network.

vSphere Replication disconnects virtual machine network adapters to prevent damage in the production network. After recovery, you must connect the virtual network adapters to the correct network. If target host or cluster has no access to the DVS the virtual machine was configured with at the source site, manually connect the virtual machine to a network or other DVS to successfully power on the virtual machine.

Failback of Virtual Machines in vSphere Replication

Failback of virtual machines is a manual task in vSphere Replication.

After performing a successful recovery from the source site to the target site, you can perform failback. You manually configure a new replication in the reverse direction, that is, from the target site to the source site. The disks on the source site are used as replication seeds, so that vSphere Replication only synchronizes the changes made to the .vmdk files. Before you configure the reverse replication, you must manually unregister the virtual machine from the inventory on the source site. See [“Replicating Virtual Machines Using Replication Seeds,”](#) on page 57.

Automated failback is not available in vSphere Replication.

Monitoring and Managing Replications in vSphere Replication

10

vSphere Replication provides a management interface where you can monitor and manage virtual machine replication and connectivity states for local and remote sites.

The **Home** tab in vSphere Replication lists all vCenter Servers that are joined in the same SSO server and the status of each vSphere Replication appliance with the total number of replications.

When you select a vCenter Server and go to the **Summary** tab, you can see vSphere Replication portlet with a summary of the target sites, and outgoing and incoming replications for the vSphere Replication appliance associated with that vCenter Server.

This chapter includes the following topics:

- [“View the Replication Summary for a Site,”](#) on page 67
- [“Identifying Replication Problems in the Issues Tab,”](#) on page 69
- [“Manage Target Sites,”](#) on page 69
- [“Manage Replication Servers,”](#) on page 69

View the Replication Summary for a Site

You can view summarized information for the target sites and the status of incoming and outgoing replications for each site at the **Summary** tab of the vCenter Server to which vSphere Replication is registered.

You can view the following information about a site:

- The target sites and their current status.
- A graphical representation of all incoming and outgoing replications with color-coded states of the replicated virtual machines.

Prerequisites

Verify that vSphere Replication is running.

Procedure

- 1 Log in to the vSphere Web Client.
- 2 Select the vCenter Server root folder.
- 3 Click the **Summary** tab.

Replication States for Virtual Machines

vSphere Replication shows the replication states of virtual machines that you configured for replication.

State	Details for Each State
OK	OK, Moving, Recovering
Warning	Paused, OK(RPO violation), Not Active, Not Active(RPO violation), FullSync(RPO violation), Sync(RPO violation)
In Progress	FullSync, Sync, Initial Full Sync, Configuring
Error	Error, Error(RPO violation)
Recovered	Recovered

NOTE If a replication is in the Not Active replication state, you might have connected the source and target sites using network address translation (NAT). vSphere Replication does not support NAT. Use credential-based authentication and network routing without NAT when connecting the sites. Another cause for a Not Active replication state might be that the source virtual machine is powered off. Automatic replication works only on virtual machines that are powered on.

Monitor Replication for Virtual Machines

You can monitor the replication status and view information for virtual machines configured for replication.

For more information about how to identify replication errors, see [“Identifying Replication Problems in the Issues Tab,”](#) on page 69.

Prerequisites

- Verify that vSphere Replication is running.
- Verify that the virtual machines are configured for replication.

Procedure

- 1 Log in to the vSphere Web Client.
- 2 Select the vCenter Server to which the vSphere Replication appliance is registered.
- 3 Click **Monitor**, then click vSphere Replication.
- 4 Select **Outgoing Replications** to see details of the virtual machines replicated from this site.
- 5 Select **Incoming Replications** to see details of the virtual machines replicated to this site.

According to the status of a selected replication, you can perform different actions on the replication.

Identifying Replication Problems in the Issues Tab

You can view and troubleshoot possible vSphere Replication problems that might occur during replication at the **Issues** tab of the corresponding vCenter Server.

Table 10-1. Possible Replication Problems

Problem	Cause	Solution
Not Active	The replication is not active because the virtual machine is powered off and a warning icon appears. Replication is not running for that virtual machine.	Power on the virtual machine to resume replication.
Paused	If you paused the replication, a warning icon appears.	Resume the paused replication from the Issues tab.
Error	If you added a disk on a virtual machine which is already configured for replication, the replication pauses and goes to an error state.	Reconfigure the replication and enable or disable the newly added disk.
Error	While configuring replication, the replication fails with the incorrect UUID. For example, the replication seed found and intended for use has a different UUID from the original hard disk.	Reconfigure the replication.
Error	You do not use replication seeds during configuration, but a disk with the same name is found during configuration.	Reconfigure the replication.
RPO Violation	A replication contains an RPO violation.	See “Reconfigure Recovery Point Objectives (RPO) in Replications,” on page 61.

Manage Target Sites

You can reconnect and disconnect target replication sites. You can also connect new sites to the currently selected site.

To connect to a remote site, see [“Configure vSphere Replication Connections,”](#) on page 28.

Prerequisites

Verify that vSphere Replication is running.

Procedure

- 1 Log in to the vSphere Web Client.
- 2 Select the vCenter Server to which the vSphere Replication appliance is registered.
- 3 Click **Manage** and click **vSphere Replication**.
- 4 In **Target Sites**, right-click a site and select **Disconnect** or **Reconnect**.

Manage Replication Servers

You can register new vSphere Replication servers in addition to the embedded one that is included with the vSphere Replication appliance by default.

Prerequisites

Verify that vSphere Replication is running.

Procedure

- 1 Log in to the vSphere Web Client.
- 2 Select the vCenter Server to which the vSphere Replication appliance is registered.
- 3 Click **Manage** and click the **vSphere Replication** tab.
- 4 In **Replication Servers**:
 - a Click **Deploy new vSphere Replication Server from an OVF template** to deploy a new vSphere Replication server. For more information see [Chapter 5, “Deploying Additional vSphere Replication Servers,”](#) on page 31
 - b Click **Register a virtual machine as vSphere Replication Server** to register virtual machine as a vSphere Replication server. For more information see [“Register an Additional vSphere Replication Server,”](#) on page 32
 - c Select a vSphere Replication server from the list.
 - d Click **Configure the selected vSphere Replication Server** to access its VAMI.
 - e Click **Reconnect** button if its status is Disconnected.
 - f Click **Unregister the selected vSphere Replication Server** to unregister the selected vSphere Replication server. For more information see [“Unregister and Remove a vSphere Replication Server,”](#) on page 33

Troubleshooting vSphere Replication

Known troubleshooting information can help you diagnose and correct problems that occur while replicating and recovering virtual machines with vSphere Replication.

If you have problems with deploying vSphere Replication, replicating or recovering virtual machines, or connecting to databases, you can troubleshoot them. To help identify the problem, you might need to collect and review vSphere Replication logs and send them to VMware Support.

See [Chapter 10, “Monitoring and Managing Replications in vSphere Replication,”](#) on page 67 to learn about replication states and how to identify replication issues.

You can also search for solutions to problems in the VMware knowledge base at <http://kb.vmware.com>.

This chapter includes the following topics:

- [“vSphere Replication Limitations,”](#) on page 71
- [“Access the vSphere Replication Logs,”](#) on page 72
- [“vSphere Replication Events and Alarms,”](#) on page 73
- [“Solutions for Common vSphere Replication Problems,”](#) on page 76

vSphere Replication Limitations

vSphere Replication is subject to some limitations when replicating virtual machines.

Replicating Large Volumes

vSphere Replication can replicate virtual machines greater than 2TB with the following limitations:

- If you move a virtual machine with replicated disks over 2032GB back to a machine on an older release, vSphere Replication cannot replicate or power on the virtual machine.
- Full sync of very large disks can take days.
- vSphere Replication must track changed blocks and consumes more memory on larger disks.
- vSphere Replication tracks larger blocks on disks over 2TB. Replication performance on a disk over 2TB might be different on a disk over 2TB for the same workload depending on how much of the disk goes over the network for a particular set of changed blocks.
- Replication might consume more or less bandwidth depending on the workload and how it changes blocks on the disk during the RPO interval.

Shared Disk Support

vSphere Replication cannot replicate virtual machines that share vmdk files in this release.

Raw Device Mapping (RDM)

vSphere Replication supports replicating RDMs in Virtual Compatibility Mode. RDMs in Physical Compatibility Mode cannot be configured for replication.

Snapshots

vSphere Replication does not replicate virtual machine snapshot hierarchy at the target site.

Powered off Virtual Machines

You can configure virtual machines that are powered off for replication. However, actual replication traffic begins when the virtual machine is powered on.

Access the vSphere Replication Logs

You can use the vSphere Replication logs for system monitoring and troubleshooting. A VMware support engineer might request these logs during a support call.

To access and download the vSphere Replication logs, you need access to the vSphere Replication virtual appliance management interface (VAMI). vSphere Replication rotates its logs when the log file reaches 50MB and keeps at most 12 compressed log files.

To manually copy log files, see [“Manually Access the vSphere Replication Logs,”](#) on page 72.

Prerequisites

- Verify that the vSphere Replication appliance is powered on.

Procedure

- 1 Connect to the VAMI of the vSphere Replication appliance in a Web browser.

The URL for the VAMI is `https://vr-appliance-address:5480`.

- 2 Click the **VRM** tab and click **Support**.
- 3 Click **Generate** to generate a .zip package of the current vSphere Replication logs.

A link to the package containing the replication and system logs appears. Log files from the vSphere Replication appliance and all connected Additional vSphere Replication Servers are included in the same package.

- 4 Click the link to download the package.
- 5 (Optional) Click **Delete** next to existing log packages to delete them individually.

Manually Access the vSphere Replication Logs

You can copy and use the vSphere Replication logs for system monitoring and troubleshooting. A VMware support engineer might request these logs during a support call.

Use SCP or Win SCP to copy log folders and files from the vSphere Replication appliance and all Additional vSphere Replication Servers.

- `/opt/vmware/hms/logs/`
- `/opt/vmware/var/log/lighttpd/`
- `/var/log/vmware/`
- `/var/log/boot.msg`

vSphere Replication Events and Alarms

vSphere Replication supports event logging. You can define alarms for each event that can trigger if the event occurs. This feature provides a way to monitor the health of your system and to resolve potential problems, ensuring reliable virtual machine replication.

Configure vSphere Replication Alarms

You can define and edit alarms to alert you when a specific vSphere Replication event occurs.

You can create an alarm that triggers when a specific event occurs, such as after you configure a virtual machine for replication. See *View and Edit Alarm Settings in the vSphere Web Client* in the vSphere Web Client documentation.

List of vSphere Replication Events

vSphere Replication monitors replications and the underlying replication infrastructure, and generates different types of events.

Table 11-1. vSphere Replication Events

Event Name	Event Description	Event Type	Category	Event Target
vSphere Replication configured	Virtual machine is configured for vSphere Replication	com.vmware.vcHms.replicationConfiguredEvent	Info	Virtual Machine
vSphere Replication unconfigured	Virtual machine was unconfigured for vSphere Replication	com.vmware.vcHms.replicationUnconfiguredEvent	Info	Virtual Machine
Host configured for vSphere Replication	Host is configured for vSphere Replication	com.vmware.vcHms.hostConfiguredForHbrEvent	Info	Host System
Host unconfigured for vSphere Replication	Host with managed object id <Host Moid> was unconfigured for vSphere Replication	com.vmware.vcHms.hostUnconfiguredForHbrEvent	Info	Folder
Virtual machine is not configured for vSphere Replication	Virtual machine is experiencing problems with vSphere Replication and must be reconfigured	com.vmware.vcHms.vmMissingReplicationConfigurationEvent	Error	Virtual Machine
VM cleaned up from vSphere Replication	Virtual machine cleaned up from vSphere Replication configuration	com.vmware.vcHms.vmReplicationConfigurationRemovedEvent	Info	Virtual Machine
RPO violated	Virtual machine vSphere Replication RPO is violated by <x> minutes	com.vmware.vcHms.rpoViolatedEvent	Error	Virtual Machine
RPO restored	Virtual machine vSphere Replication RPO is not longer violated	com.vmware.vcHms.rpoRestoredEvent	Info	Virtual Machine

Table 11-1. vSphere Replication Events (Continued)

Event Name	Event Description	Event Type	Category	Event Target
Remote vSphere Replication site is disconnected	Connection to the remote vSphere Replication site <siteName> is down	com.vmware.vcHms.remoteSiteDownEvent	Error	Folder
Remote vSphere Replication site is connected	Connection to the remote vSphere Replication site <siteName> is established	com.vmware.vcHms.remoteSiteUpEvent	Info	Folder
VR Server disconnected	vSphere Replication server <VR Server> disconnected	com.vmware.vcHms.hbrDisconnectedEvent	Info	Folder
VR Server reconnected	vSphere Replication server <VR Server> reconnected	com.vmware.vcHms.hbrReconnectedEvent	Info	Folder
Invalid vSphere Replication cleaned up	Virtual machine <VM name> was removed from vCenter Server and its vSphere Replication state was cleaned up	com.vmware.vcHms.replicationCleanedUpEvent	Info	Folder
Virtual machine recovered from replica	Recovered virtual machine <VM Name> from vSphere Replication image	com.vmware.vcHms.vmRecoveredEvent	Info	Virtual Machine
vSphere Replication cannot access datastore	Datastore is not accessible for vSphere Replication Server	com.vmware.vcHms.datastoreInaccessibleEvent	Error	Datastore
vSphere Replication handled a disk addition on a virtual machine	vSphere Replication detected and handled the addition of a disk to virtual machine <VM name>. Disks added are <Disk name>	com.vmware.vcHms.handledVmDiskAddEvent	Info	Virtual Machine
vSphere Replication handled a disk removal on a virtual machine	vSphere Replication detected and handled the addition of a disk to virtual machine <VM name>. Disks added are <Disk name>	com.vmware.vcHms.handledVmDiskRemoveEvent	Info	Virtual Machine

Table 11-1. vSphere Replication Events (Continued)

Event Name	Event Description	Event Type	Category	Event Target
Failed to resolve storage policy	Failed to resolve a specific storage policy for the provided storage profile ID <profile ID> and datastore with managed object ID <Moid>	com.vmware.vcHms.failedResolvingStoragePolicyEvent	Error	Datastore
vSphere Replication paused	vSphere Replication was paused as a result of a configuration change, such as a disk being added or reverting to a snapshot where disk states are different	hbr.primary.SystemPausedReplication	Error	Virtual Machine
Invalid vSphere Replication configuration	Invalid vSphere Replication configuration	hbr.primary.InvalidVmReplicationConfigurationEvent	Error	Virtual Machine
Sync started	Sync started	hbr.primary.DeltaStartedEvent	Info	Virtual Machine
Application consistent sync completed	Application consistent sync completed	hbr.primary.AppQuiescedDeltaCompletedEvent	Info	Virtual Machine
File-system consistent sync completed	File-system consistent sync completed	hbr.primary.FSQuiescedDeltaCompletedEvent	Warning	Virtual Machine
Unquiesced crash consistent sync completed	Unquiesced crash consistent sync completed. Quiescing failed or virtual machine is powered off.	hbr.primary.UnquiescedDeltaCompletedEvent	Warning	Virtual Machine
Crash consistent sync completed	Crash consistent sync completed	hbr.primary.DeltaCompletedEvent	Info	Virtual Machine
Sync failed to start	Sync failed to start	hbr.primary.FailedToStartDeltaEvent	Error	Virtual Machine
Full-sync started	Full-sync started	hbr.primary.SyncStartedEvent	Info	Virtual Machine
Full-sync completed	Full-sync completed	hbr.primary.SyncCompletedEvent	Info	Virtual Machine
Full-sync failed to start	Full-sync failed to start	hbr.primary.FailedToStartSyncEvent	Error	Virtual Machine
Sync aborted	Sync aborted	hbr.primary.DeltaAbortedEvent	Warning	Virtual Machine
No connection to VR Server	No connection to vSphere Replication Server	hbr.primary.NoConnectionToHbrServerEvent	Warning	Virtual Machine

Table 11-1. vSphere Replication Events (Continued)

Event Name	Event Description	Event Type	Category	Event Target
Connection to VR Server restored	Connection to VR Server has been restored	hbr.primary.ConnectionRestoredToHbrServerEvent	Info	Virtual Machine
vSphere Replication configuration changed	vSphere Replication configuration has been changed	hbr.primary.VmReplicationConfigurationChangedEvent	Info	Virtual Machine

Solutions for Common vSphere Replication Problems

Known troubleshooting information can help you diagnose and correct problems with vSphere Replication.

Error at vService Bindings When Deploying the vSphere Replication Appliance

When you deploy the vSphere Replication appliance, you get an error at vService bindings in the Deploy OVF Template wizard.

Problem

When you deploy the vSphere Replication, an error appears at vService bindings in the Deploy OVF Template wizard.

Unsupported section '{http://www.vmware.com/schema/ovf}vServiceDependencySection' (A vService dependency)

Cause

This error is typically the result of the vCenter Management Web service being paused or stopped.

Solution

Attempt to start the vCenter Management Web service. If vCenter Server is running as a Linux virtual appliance, reboot the appliance.

OVF Package is Invalid and Cannot be Deployed

When you attempt to deploy OVF for the vSphere Replication appliance, an OVF package error might occur.

Problem

The error OVF package is invalid and cannot be deployed might appear while you attempt to deploy the vSphere Replication appliance.

Cause

This problem is due to the vCenter Server port being changed from the default of 80.

Solution

If possible, change the vCenter Server port back to 80.

Connection Errors Between vSphere Replication and SQL Server Cannot be Resolved

You cannot resolve a connection error between the vSphere Replication appliance and SQL Server.

Problem

vSphere Replication might not be able to connect to SQL Server, and you have insufficient information to solve this problem.

Cause

Several issues can cause this problem, and initially available information about the problem is insufficient to affect a resolution.

Solution

- 1 Use a file management tool to connect to the vSphere Replication appliance.
For example, you might use SCP or WinSCP. Connect using the root account, which is the same account used to connect to the VAMI.
- 2 Delete any files you find in `/opt/vmware/hms/logs`.
- 3 Connect to the VAMI and attempt to save the vSphere Replication configuration.
This action recreates the SQL error.
- 4 Connect to the vSphere Replication appliance again and find the `hms-configtool.log` file which is in `/opt/vmware/hms/logs`.

This log file contains information about the error that just occurred. Use this information to troubleshoot the connection issue, or provide the information to VMware for further assistance. See [“Reconfigure vSphere Replication to Use an External Database,”](#) on page 48.

Application Quiescing Changes to File System Quiescing During vMotion to an Older Host

vSphere Replication can create an application quiesced replica for virtual machines with Windows Server 2008 and Windows 8 guest operating systems running on an ESXi 5.1 or newer host.

Problem

The ESXi 5.1 or newer host is in a cluster with hosts from older versions and you use vMotion to move the replicated virtual machine to an older host. vSphere Replication then creates a file system quiesced replica.

Cause

A mix of ESXi 5.1 (or newer) and older hosts in the cluster creates a file system quiesced replica during vMotion to an older host. The process should instead create an application quiesced replica.

Solution

Make sure that all hosts in the cluster are running ESXi 5.1 or newer before you use vMotion to move a Windows Server 2008 and Windows 8 virtual machine with application quiescing.

Configuring Replication Fails for Virtual Machines with Two Disks on Different Datastores

If you try to configure vSphere Replication on a virtual machine that includes two disks that are contained in different datastores, the configuration fails.

Problem

Configuration of replication fails with the error `Multiple source disks, with device keys device_keys, point to the same destination datastore and file path.`

Cause

This problem occurs because vSphere Replication does not generate a unique datastore path or file name for the destination virtual disk.

Solution

If you select different datastores for the VMDK files on the protected site, you must also select different datastores for the target VMDK files on the secondary site.

Alternatively, you can create a unique datastore path by placing the VMDK files in separate folders on a single target datastore on the secondary site.

vSphere Replication Service Fails with Unresolved Host Error

If the address of vCenter Server is not set to a fully qualified domain name (FQDN) or to a literal address, the vSphere Replication service can stop unexpectedly or fail to start after a reboot.

Problem

The vSphere Replication service stops running or does not start after a reboot. The error `unable to resolve host: non-fully-qualified-name` appears in the vSphere Replication logs.

Solution

- 1 In the vSphere Web Client, select the vCenter Server instance and click **Manage > Settings > Advanced Settings** to check that the `VirtualCenter.FQDN` key is set to either a fully qualified domain name or to a literal address.
- 2 Connect to the VAMI of the vSphere Replication appliance in a Web browser.
The URL for the VAMI is `https://vr-appliance-address:5480`.
- 3 Enter the same FQDN or literal address for vCenter Server as you set for the `VirtualCenter.FQDN` key.
- 4 Click **Save and Restart Service** to apply the changes.

Scalability Problems when Replicating Many Virtual Machines with a Short RPO to a Shared VMFS Datastore on ESXi Server 5.0

Performance might be slow if you replicate a large number of virtual machines with a short Recovery Point Objective (RPO) to a single virtual machine file store (VMFS) datastore that is accessible by multiple hosts on the recovery site.

Problem

This problem occurs when running ESXi Server 5.0 on the recovery site. It can result in missed RPO targets.

The number of virtual machines that can successfully replicate to a single, shared VMFS datastore increases if the RPO targets are longer.

Follow the guidelines when calculating the number of virtual machines that you should replicate to a single VMFS volume on the recovery site.

- If all your virtual machines have an RPO of 15 minutes, performance is affected when replicating 50 to 100 virtual machines to the same VMFS datastore.
- If all your virtual machines have an RPO of 30 minutes, performance is affected when replicating 100 to 200 virtual machines to the same VMFS datastore.

If you have heterogeneous RPO targets in a protection group, calculate the harmonic mean of the RPO targets when calculating the number of virtual machines that you can replicate to a single VMFS volume. For example, if you have 100 virtual machines with an RPO of 20 minutes and 50 virtual machines with an RPO of 600 minutes, you calculate the harmonic mean of the RPO as follows:

$$150/(100/20 + 50/600) = \sim 30$$

In this example, the configuration is similar to a setup with 150 virtual machines, each having an RPO of approximately 30 minutes. In this case, performance is affected if these 150 virtual machines replicate to a single VMFS volume.

Cause

This problem affects only VMFS datastores that are shared by multiple hosts. It does not occur on datastores that are local to one host or on other datastore types, such as NFS. This problem affects only installations that are running ESXi Server 5.0.

The number of vSphere Replication servers is not relevant. These limits apply to the number of virtual machines that you can replicate to a single VMFS datastore.

Solution

- 1 Upgrade ESXi Server to version 5.1 or later on the recovery site.
- 2 If you cannot upgrade ESXi Server to version 5.1 or later, redistribute the replicated virtual machines or adjust their RPO.
 - Reduce the number of virtual machines with a short RPO that replicate to a single VMFS volume, for example by using a larger number of smaller datastores.
 - Increase the RPO of the virtual machines replicating to a single VMFS volume to create a longer harmonic mean RPO.

vSphere Replication Sites Appear in the Disconnected State

vSphere Replication sites that you have connected appear in the disconnected state.

Problem

In configurations with two vSphere Replication sites that each include a vCenter Server instance and a vSphere Replication appliance, the vSphere Replication sites can appear in the disconnected state, even if you have successfully connected the sites.

Cause

Sites that you have successfully connected can appear in the disconnected state when you establish a new login session to the vSphere Web Client and the previous login session has timed out. In this case, the disconnected state reflects the connection to the remote site from the vSphere Web Client and not the state of the connection between the sites. If the two sites are running, vSphere Replication still performs replications at the schedules that you have configured. To restore the connected state in the vSphere Web Client, you must provide the login credentials for the remote site.

Solution

- 1 In the vSphere Web Client, select the vCenter Server to which the vSphere Replication is registered.

- 2 Click the **Manage** tab, then vSphere Replication.
- 3 In **Target Sites**, right-click the remote site, select **Reconnect site**, then click **Yes**.
- 4 Enter the login credentials for the remote site, and click **OK**.

Error Recovering Virtual Machine in a Single vCenter Server Instance

You might receive an error message when you are recovering a virtual machine with the same name in a single vCenter Server instance.

Problem

Failed to register the recovered virtual machine 'VM_NAME' with config file <path_to_config_file>.

Cause

You cannot recover virtual machines with the same name in the same source and destination folder in the vCenter inventory.

Solution

Recover the virtual machine in a different VMs and Templates folder in the same datacenter. Optionally, after successful recovery, you can remove the old virtual machine from the vCenter inventory and drag the recovered virtual machine to the required virtual machine folder.

vSphere Replication RPO Violations

You might encounter RPO violations even if vSphere Replication is running successfully at the recovery site.

Problem

When you replicate virtual machines, you might encounter RPO violations.

Cause

RPO violations might occur for one of the following reasons:

- Network connectivity problems between source hosts and vSphere Replication servers at the target site.
- As a result of changing the IP address, the vSphere Replication server has a different IP address.
- The vSphere Replication server cannot access the target datastore.
- Slow bandwidth between the source hosts and the vSphere Replication servers.

Solution

- Search the vmkernel.log at the source host for the vSphere Replication server IP address to see any network connectivity problems.
- Verify that the vSphere Replication server IP address is the same. If it is different, reconfigure all the replications, so that the source hosts use the new IP address.
- Check /var/log/vmware/*hbrsrv* at the vSphere Replication appliance at the target site for problems with the server accessing a target datastore.
- To calculate bandwidth requirements, see KB 2037268 <http://kb.vmware.com/kb/2037268>.

vSphere Replication Appliance Extension Cannot Be Deleted

If you delete the vSphere Replication appliance virtual machine, the virtual appliance management interface (VAMI) is not available to delete the appliance extension that still exists in vCenter Server.

Problem

Deleting the vSphere Replication appliance does not remove the vSphere Replication extension from vCenter Server.

Solution

- 1 Use the Managed Object Browser (MOB) to delete the vSphere Replication extension manually.
- 2 Redeploy the appliance and reconfigure the replications.

See [“Unregister vSphere Replication from vCenter Server if the Appliance Was Deleted,”](#) on page 30

vSphere Replication Does Not Start After Moving the Host

If you move the ESXi Server on which the vSphere Replication appliance runs to the inventory of another vCenter Server instance, vSphere Replication operations are not available. vSphere Replication operations are also unavailable if you reinstall vCenter Server.

Problem

If the ESXi Server instance on which vSphere Replication runs is disconnected from vCenter Server and is connected to another vCenter Server instance, you cannot access vSphere Replication functions. If you try to restart vSphere Replication, the service does not start.

Cause

The OVF environment for the vSphere Replication appliance is stored in the vCenter Server database. When the ESXi host is removed from the vCenter Server inventory, the OVF environment for the vSphere Replication appliance is lost. This action disables the mechanisms that the vSphere Replication appliance uses to authenticate with vCenter Server.

Solution

- 1 (Optional) If possible, redeploy the vSphere Replication appliance and configure all replications and if possible, reuse the existing .vmdk files as initial copies.
 - a Power off the old vSphere Replication appliances.
 - b Remove any temporary hbr* files from the target datastore folders.
 - c Deploy new vSphere Replication appliances and connect the sites.
 - d Configure all replications, reusing the existing replica .vmdk files as initial copies.
- 2 (Optional) If you cannot redeploy the vSphere Replication appliance, use the VAMI to connect vSphere Replication to the original vCenter Server instance.
 - a Reconnect the ESXi host to vCenter Server.
 - b Connect to the VAMI of the vSphere Replication server at `https://vr-server-address:5480`.
 - c Select the **Configuration** tab.
 - d Type `username:password@vcenter_server_address` in **vCenter Server Address**, where username and password are credentials of the vCenter Server administrator.

- e Type the correct managed object id of the appliance VM in **Appliance VM MO value**. Use the vCenter Server MOB to obtain the appliance id.
 - f Click **Save and Restart Service**.
- If you use the VAMI solution, you must repeat the steps each time that you change the vSphere Replication certificate.

Unexpected vSphere Replication Failure Results in a Generic Error

vSphere Replication includes a generic error message in the logs when certain unexpected failures occur.

Problem

Certain unexpected vSphere Replication failures result in the error message `VRM Server generic error`. Please check the documentation for any troubleshooting information..

In addition to the generic error, the message provides more detailed information about the problem, similar to the following examples.

- `VRM Server generic error`. Please check the documentation for any troubleshooting information. The detailed exception is: `'org.apache.http.conn.HttpHostConnectException: Connection to https://vCenter_Server_address refused'`. This error relates to problems connecting to vCenter Server.
- `Error - VR synchronization failed for VRM group virtual machine name. Sync monitoring aborted`. Please verify replication traffic connectivity between source host and target VR server. Sync will automatically resume when connectivity issues are resolved.. This problem relates to a synchronization operation error.
- `Error - Unable to reverse replication for the virtual machine 'virtual machine name'. VRM Server generic error`. Please check the documentation for any troubleshooting information. The detailed exception is: `'org.hibernate.exception.LockAcquisitionException: Transaction (Process ID 57) was deadlocked on lock resources with another process and has been chosen as the deadlock victim. Rerun the transaction`. This problem relates to a deadlock in Microsoft SQL Server.

Cause

vSphere Replication sends this message when it encounters configuration or infrastructure errors. For example, network issues, database connection issues, or host overload.

Solution

Check the detailed exception message for information about the problem. Depending on the details of the message, you can try to retry the failed operation, restart vSphere Replication, or correct the infrastructure.

Increase the Memory of the vSphere Replication Server for Large Deployments

If you deploy an additional vSphere Replication server, you might need to increase the memory of the vSphere Replication server if that server manages large numbers of virtual machines.

Problem

vSphere Replication supports a maximum of 100 virtual machines per vSphere Replication server. Replication of more than 100 virtual machines on a single vSphere Replication server can cause memory swapping on the vSphere Replication server, which affects performance.

Solution

For deployments that exceed 100 virtual machines per vSphere Replication server, increase the RAM of the vSphere Replication server virtual machine from the default of 512MB to 1GB.

Alternatively, deploy additional vSphere Replication servers and balance the replication load accordingly.

Reconnecting Sites Fails If One Of the vCenter Servers Has Changed Its IP Address

When the vCenter Server address of one site changes, the connection status between two sites shows as disconnected and you cannot reconnect the sites.

Problem

If you have two connected sites, and the vCenter Server address of either site changes, the connection status shows as Disconnected and you cannot reconnect the sites.

Solution

- 1 Open the VAMI for the vSphere Replication appliance that is registered to the vCenter Server whose address changed.
- 2 Reconfigure the vSphere Replication appliance with the new vCenter Server address.
- 3 Click **Save and Restart**.
- 4 In the vSphere Web Client, verify that the status of the connection between the two sites is **Disconnected**.
- 5 Select **Connect to target site**.
- 6 Type the new vCenter Server IP address for the changed site.
- 7 Verify that the connection between the two sites is successfully restored and status is **Connected**.

Uploading a Valid Certificate to vSphere Replication Results in a Warning

When you upload a custom certificate to the vSphere Replication appliance, you see a warning even if the certificate is valid.

Problem

When you use the virtual appliance management interface (VAMI) in Internet Explorer to upload certificates to the vSphere Replication appliance, you see a certificate error:

The certificate installed with warnings. Remote VRM systems with the 'Accept only SSL certificate signed by a trusted CA' option enabled may be unable to connect to this site for the following reason: The certificate was not issued for use with the given hostname: *vr_appliance_hostname*.

Solution

Ignore this error, or connect to the VAMI by using a supported browser other than Internet Explorer.

vSphere Replication Server Registration Takes Several Minutes

vSphere Replication server registration might take a long time depending on the number of hosts in the vCenter Server inventory.

Problem

If the vCenter Server inventory contains a few hundred or more hosts, the Register VR Server task takes more than a few minutes to complete.

Cause

vSphere Replication updates each host's SSL thumbprint registry. The vCenter Server Events pane displays Host is configured for vSphere Replication for each host as the vSphere Replication server registration task progresses.

Solution

- 1 Wait for the registration task to complete.
After it finishes, you can use vSphere Replication for incoming replication traffic.
- 2 Alternatively, edit `/opt/vmware/hms/conf/hms-configuration.xml` and change `hms-config-host-at-hbr-threadpool-size` parameter to a higher value to enable parallel processing of more hosts at a time and restart the vSphere Replication management server `/etc/init.d/hms restart`

Generating Support Bundles Disrupts vSphere Replication Recovery

If you generate a vSphere Replication log bundle and at the same time attempt to run a recovery, the recovery might fail.

Problem

In heavily loaded environments, generating log bundles can cause vSphere Replication connection problems during recovery operations. Recovery fails with the error

```
VRM Server generic error. Please check the documentation for any
troubleshooting information. The detailed exception is: 'Failed write-locking
object:
object_ID'.
```

Cause

vSphere Replication server is blocked when the log bundle is generated. This situation occurs if the storage for the vSphere Replication virtual machine is overloaded.

Solution

Rerun the recovery. If the recovery still fails, reevaluate the storage bandwidth requirements of the cluster on which vSphere Replication is running, and the network bandwidth if the storage is NAS.

vSphere Replication Operations Take a Long Time to Complete

Some vSphere Replication operations might take a long time to complete during a heavy load.

Problem

Operations such as recovering virtual machines fail with the following error:

```
Object 'GID-...' is locked by another ongoing operation in VRMS. Please try again later.
```

Cause

When running under heavy load, some vSphere Replication operations might take a longer time to complete and other operations can fail with this error because a background update operation on the replication group is slow and holds a lock on the replication for a long time.

Solution

Retry the failed operation after a few minutes.

vSphere Replication Does Not Display Incoming Replications When the Source Site is Inaccessible

The list of incoming replications between two remote sites fails to populate when the connection to the source site is refused.

Problem

When you refresh the incoming replications list on a remote site soon after the connection to the source site has become unavailable, the replications do not display due to a communication error between the two sites.

Solution

Refresh the vSphere Web Client. Alternatively, log out and log in again.

vSphere Replication is Inaccessible After Changing vCenter Server Certificate

If you change the SSL certificate of vCenter Server, you cannot access vSphere Replication.

Problem

vSphere Replication uses certificate-based authentication to connect to vCenter Server. If you change the vCenter Server certificate, vSphere Replication is inaccessible.

Cause

The vSphere Replication database contains the old vCenter Server certificate.

Solution

- 1 Power off and power on the vSphere Replication appliance.
vSphere Replication obtains the new certificate from vCenter Server when it powers on.
- 2 (Optional) If you configured vSphere Replication to use an external database, log into the virtual appliance management interface (VAMI) of the vSphere Replication appliance and click **Configuration > Save and Restart Service**.

Do not change any configuration information before clicking **Save and Restart Service**.

vSphere Replication restarts with the new vCenter Server certificate.

vSphere Replication Cannot Establish a Connection to the Hosts

Replications fail because vSphere Replication cannot connect to the hosts.

Problem

vSphere Replication needs access to port 80. You might see forbidden HTTP connections in the vSphere Replication logs.

Solution

Make sure the vSphere Replication appliance has access to port 80 on the storage hosts.

For a list of ports that must be open for vSphere Replication, see “[vSphere Replication Network Ports](#),” on page 22.

Anti-virus Agent in Firewall Terminates Virtual Machine Replication

If a virtual machine contains virus information, an anti-virus agent in the firewall might detect the virus data and terminate the connection during replication.

Problem

When you reconfigure the replication and start a full sync, the replication stops in the same data block with the virus information in it unless the virus data has moved on the disk. Clones of the disk fail, but other virtual machines of the same size and configuration from the same host replicating to the same destination datastore replicate successfully.

Solution

Remove the virus information from the replicated guest to avoid replicating virus information.

Make an exception in the anti-virus rules in the firewall to allow the replication to proceed.

Initial Full Synchronization of Virtual Machine Files to VMware Virtual SAN Storage Is Slow

When using VMware Virtual SAN storage and configuring vSphere Replication on multiple virtual machines, the initial full synchronization takes a long time to complete.

Problem

Configuring vSphere Replication on a large number of virtual machines simultaneously when using vSphere Replication with Virtual SAN storage causes the initial full synchronization of the virtual machine files to run very slowly.

Cause

Initial full synchronization operations generate heavy I/O traffic. Configuring too many replications at the same time can overload the Virtual SAN storage.

Solution

Configure vSphere Replication in batches of a maximum of 30 virtual machines at a time.

vSphere Web Client 5.1.x Non-Functioning Option Binds vSphere Replication Traffic to a Specific vmknic

vSphere Web Client 5.1.x contains an option that binds vSphere Replication traffic to a specific vmknic.

Problem

If you use this option in vSphere Replication version 5.1.x and then upgraded to version 5.5.x, replication configuration fails due to the underlying connectivity issue.

Solution

Manually edit the `esx.conf` to remove the incorrect tag value for the specific vmknic or reconfigure the tagged vmknic to be reachable by vSphere Replication. For details, see <http://kb.vmware.com/kb/2066230>.

Configuring Replication Fails After Rebuilding VRMS

If you have two sites and reinstall the vSphere Replication Management Server appliance or reset its database, configuring replications fails.

Problem

The other site contains information on the old appliance and database, and prevents you from configuring new replications. You might see the following error message:

```
Attempt to configure vSphere Replication for already replicated VM '<VM Name>' while creating
group
'<VM Name>'.
There is another virtual machine '<VM Name>' that has the same instance UUID '<UUID>' as the one
that you
try to configure.
```

The existing vSphere Replication is configured for protection site '<Site Name>', please refer to the documentation for troubleshooting options.

Solution

- 1 Reinstall VRMS at the other site or reset its database.
- 2 Connect the sites and register any additional vSphere Replication Server appliances.
- 3 Remove any temporary hbr* files left over from the target datastore folders.
- 4 Configure all replications, reusing the existing replica .vmdk files as replication seeds.

vSphere Replication Operations Run Slowly as the Number of Replications Increases

As you increase the number of virtual machines that you replicate, vSphere Replication operations can run more slowly.

Problem

Response times for vSphere Replication operations can increase as you replicate more virtual machines. You possibly experience recovery operation timeouts or failures for a few virtual machines, and RPO violations.

Cause

Every virtual machine in a datastore generates regular read and write operations. Configuring vSphere Replication on those virtual machines adds another read operation to the regular read and write operations, which increases the I/O load on the storage. The performance of vSphere Replication depends on the I/O load of the virtual machines that you replicate and on the capabilities of the storage hardware. If the load generated by the virtual machines, combined with the extra I/O operations that vSphere Replication introduces, exceeds the capabilities of your storage hardware, you might experience slow response times.

Solution

When running vSphere Replication, if response times are greater than 30 ms, reduce the number of virtual machines that you replicate to the datastore. Alternatively, increase the capabilities of your hardware. If you suspect that the I/O load on the storage is an issue and you are using VMware Virtual SAN storage, monitor the I/O latency by using the monitoring tool in the Virtual SAN interface.

Index

A

- accessing the Summary tab **67**
- Advanced Settings dialog box, vSphere Replication **61**
- alarms **73**
- anti virus agent terminates replication **86**
- Application quiescing during vMotion **77**

C

- calculating bandwidth for vSphere Replication **25**
- causes of RPO violations **80**
- change the target datastore location **62**
- changing keystore password; changing truststore password **45**
- client plug-in **10**
- compatibility with ESXi, compatibility with vCenter Server, compatibility with Site Recovery Manager, compatibility with Web browsers **23**
- compatibility with vSphere features **22**
- configure alarms **73**

D

- deleting vSphere Replication appliance extension **81**
- deleting vSphere Replication using MOB **30**
- disable embedded vSphere Replication Server **33**

E

- events **73**

H

- High Availability **22**

I

- incoming replications do not display **85**
- increase memory of vSphere Replication server **82**
- installing vSphere Replication **27**
- issues tab, identify replication issues **69**

L

- latency, and vSphere Replication **87**
- licensing **21**

M

- manage replication **69**
- manage replication servers **69**
- managing **67**
- manual reProtection, failback **65**
- monitoring **67**

N

- network settings, vSphere Replication appliance **46**
- network ports **22**

O

- operational limits **22**
- overview, introduction to vSphere Replication, vSphere Replication and vCenter Server Appliance, vCenter Server Appliance **9**
- OVF, cannot be deployed **76**

P

- PIT recovery **54**
- public key certificates, vSphere Replication requirements **44**

R

- reconfiguring replication **61**
- reconnecting sites if vCenter Server IP changes **83**
- recover virtual machine **63**
- recover virtual machines **63**
- recovering virtual machines at specific point in time **54**
- recovering virtual machines with same name **80**
- replicate virtual machines, in a single vCenter Server **57**
- replicate virtual machines using vSphere Replication **57**
- replication
 - configuration fails **78**
 - missed RPO target **78**
 - replication seeds **57**
 - scalability issue with VMFS **78**
 - troubleshooting **78, 82**
 - virtual machines with two disks **78**
- replication states **68**

- Replication configuration failure **86**
- Replication fails after rebuilding VRMS **87**
- replication monitoring, monitor replication **68**
- Resize VMDK file, with replication seeds **61**
- Resize VMDK file, without replication seeds **62**
- roles and permissions **15**
- RPO and replication scheduling **54**
- RPO violation **87**

S

- security settings, vSphere Replication
 - appliance **45**
- site
 - source **11**
 - target **11**
- sneakernet, replication **57**
- solutions for common issues **76**
- source site, host compatibility requirements **11**
- SSL certificate
 - change **42**
 - vSphere Replication **42**
- Storage vMotion **22**
- Storage DRS **22**
- supported databases **49**
- system requirements **21**
- system logs, replication logs **72**

T

- target site, host compatibility requirements **11**
- troubleshooting replication, troubleshooting
 - recovery **71**

U

- uninstall vSphere Replication **29**
- updated information **7**
- upgrading vSphere Replication **35**
- upgrading vSphere Replication with ISO
 - image **35**

V

- vCenter Server, change SSL certificate **85**
- virtual appliance, unregister **29**
- Virtual SAN
 - and PIT snapshots **55**
 - I/O latency **55**
 - initial full sync is slow **86**
 - limits **55**
 - root folders **55**
 - supported load **55**
 - using with vSphere Replication **55**
- VSAN **22, 55, 86, 87**
- vSphere features, compatibility with **22**
- vSphere Flash Read Cache **22**

- vSphere Replication
 - certificate warning **83**
 - custom certificates **83**
 - deployment **27**
 - external database **48**
 - features unavailable **76**
 - generic error **82**
 - host moved **81**
 - how it works **11**
 - log bundles **84**
 - remove replication **60**
 - replicate virtual machines **59**
 - sites disconnected **79**
 - SQL Server connection fails **77**
 - stop replication **60**
 - update using Update Manager **36**
- vSphere Replication appliance
 - certificate verification **43**
 - connect **28**
 - contents **10**
 - embedded database **51**
 - general settings **42**
 - network settings **46**
 - pair **28**
 - reboot **47**
 - reconfigure **41**
 - shutdown **47**
 - system settings **47**
 - time zone **47**
 - update using VAMI **37**
 - VAMI **10**
 - virtual appliance management interface **10**
- vSphere Replication roles **17**
- vSphere Replication server
 - change certificate **32**
 - deploy **31**
 - deploy additional **31**
 - move **60**
 - network settings **32**
 - reconfigure **32**
 - register **32**
 - remove **33**
 - restart **32**
 - settings **32**
 - unregister **33**
 - update using VAMI **38**
- vSphere Replication access to port 80 **85**
- vSphere Replication Administration,
 - introduction **5**
- vSphere Replication database
 - configure Oracle Server **51**
 - configure SQL Server **50**

- vSphere Replication limitations, replicating large volumes, shared disk support **71**
- vSphere Replication management server, update using VAMI **37**
- vSphere Replication Modified Administrator Role **17**
- vSphere Replication network bandwidth **23**
- vSphere Replication operations take too long to complete **84**
- vSphere Replication pairing, unresolved host error **78**
- vSphere Replication Recovery User Role **16**
- vSphere Replication Server registration takes several minutes **84**
- vSphere Replication User Role **16**
- vSphere Replication Viewer Role **15**

