EMC Replication Manager for Virtualized Environments

A Detailed Review

Abstract

Today’s IT organization is constantly looking for ways to increase the efficiency of valuable computing resources. Increased efficiency allows companies to meet their vital computing needs and at the same time save resources, and lower costs associated with power consumption, cooling, and footprint. One class of technology that has contributed greatly to increased efficiency is that of virtualization. This white paper offers an in-depth look at how EMC® Replication Manager interoperates with certain best in-class-virtualization solutions, namely VMware and Microsoft Hyper-V.

June 2011
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Executive summary

As more customers look to virtualization technologies to meet the ever-increasing demands of the industry for efficiency in computing resources, it becomes more and more important to be able to protect these virtualized environments with backup solutions and provide ways to offer quick recovery or repurposing for production data deployed within virtualized environments.

EMC® Replication Manager interoperates with virtualized environments such as VMware ESX Server, vCenter, and vSphere technologies as well as Microsoft Windows Server 2008 Hyper-V solutions. Replication Manager can help customers quickly create replicas of the virtualized environments and can allow for rapid recovery of VMware and Hyper-V environments deployed on EMC storage arrays (CLARiiON®, Symmetrix®, Celerra®, or RecoverPoint®).

This paper discusses the ease-of-use benefits of deploying Replication Manager in virtualized environments. Some of the benefits enjoyed by Replication Manager customers include:

- Nondisruptive replication of virtualized environments
- Automated discovery of existing storage environments
- Application-aware and integrated replication technologies
- Reduced recovery time objectives (RTO) through disk-based replication of virtualized environments
- Improved recovery point objectives (RPO) with more frequent, nondisruptive replicas
- Reduced complexity by automating critical storage replication, mount, and restore procedures and integrating them simultaneously with the virtualization layer and business-critical applications.
- Enhanced restore capability that lets the Replication Manager user perform a more granular restore, down to the file and folder levels.

With the best practices outlined in this paper, you can leverage the advanced features of Replication Manager and your EMC storage to create a robust solution to meet service level agreements and maximize the efficiencies of your virtualized infrastructure.

Introduction

EMC Replication Manager provides a single management console that allows customers to manage replication of virtualized environments deployed on a wide range of EMC storage technologies. Selected virtualization technologies are supported on Symmetrix, CLARiiON, Celerra, and RecoverPoint storage solutions. In addition, Replication Manager offers deep integration with many applications that reside in these environments, including Oracle, Microsoft SQL Server, Microsoft SharePoint and Microsoft Exchange application integration.

This paper offers a detailed review of Replication Manager operating in each of the following environments:

- VMware
  - Virtual Machine Files System (VMFS) volumes
  - Virtual Disks (vDisks based on VMDKs)
  - Raw Device Mapping (RDMs)
  - iSCSI Initiated LUNs
  - NFS Datastores
- Microsoft Hyper-V
  - Microsoft iSCSI Initiator
  - iSCSI-attached pass-through disks
  - Fibre-attached pass-through disks

The paper explores, in general, which storage arrays and applications are supported with each of these technologies and describes best practices for configuring the environment to interoperate with Replication Manager.
Note: For the most up-to-date support information, you should consult the Replication Manager Support Matrix, found on Powerlink® in the E-Lab™ Interoperability Navigator section. Powerlink is available at http://powerlink.EMC.com.

**Audience**

This white paper has been prepared for EMC customers, partners, and service personnel involved in planning, architecting, or administering a virtualized environment that includes VMware or Hyper-V solutions or who have either implemented or are considering implementation of Replication Manager to create replicas for backup, repurposing, or data mining in virtualized environments. This paper assumes the reader is familiar with Replication Manager and VMware, and/or Hyper-V technologies. The “References” section has a list of overview documents that discuss these topics and can provide further information about them if necessary.

**Terminology**

In an effort to level-set readers and establish a common understanding of the terminology used in this paper, the following definitions have been included to clarify terms used throughout the paper.

- **Celerra Replicator™** — A Celerra feature that Replication Manager uses to create a read-only, point-in-time replica of a production Celerra file system on a target (remote) Celerra.

- **Celerra SnapSure™ snapshot** — A point-in-time representation of the data stored on an iSCSI LUN. As with all snapshot technologies, the snapshot is not necessarily a complete copy and therefore should not be relied on as a data backup replacement.

- **Guest operating system** — An operating system running on a VMware virtual machine.

- **Hyper-V** — A virtualization system offered by Microsoft based on hypervisor virtualization software that allows multiple operating systems to run on a host computer concurrently. This system is available for x64 systems shipped with certain x64 editions of Windows Server 2008.

- **Hypervisor** — Also called virtual machine monitor (VMM), a computer software/hardware platform that allows multiple operating systems to run on a host computer concurrently. Replication Manager works with VMware and Hyper-V systems that run in conjunction with hypervisor software written for Intel x86 instruction-set machines, including traditional desktop PCs.

- **NFS datastore** — ESX Server 3i can access a designated NFS volume located on a NAS server, mount this volume, and use it for its storage needs. The volume is called an NFS Datastore. You can use NFS datastores to store and boot virtual machines in the same way you use VMFS datastores.

- **Proxy host** — Host used to connect to the VMware vCenter in order to perform VMware operations. This physical or virtual machine hosts Replication Manager agent software.

- **SnapView™ clone (CLARiiON)** — A LUN that is a point-in-time copy of a specified source LUN. The state of the clone determines if it is a byte-for-byte copy of its source. Replication Manager can make SnapView clones available to another host through mount commands or restore using the restore capabilities of the product.

- **SnapView snapshot (CLARiiON)** — An instantaneous point-in-time copy of a CLARiiON LUN created by SnapView software. A snapshot LUN occupies no disk space but appears like a normal LUN to secondary servers. Replication Manager can make SnapView snapshots available to another host through mount commands or a restore operation.

- **TimeFinder/Clone (Symmetrix)** — Copies of data on a source device made available on multiple target devices. The source and target devices can be either standard devices or BCV devices as long as they are all
of the same size and emulation type. Once activated, the copy can be instantly accessed by a target’s host, even before the data is fully copied to the target device.

**TimeFinder/Snap (Symmetrix)** — A host-accessible device with address pointers to the locations of copy session data on the physical storage. TimeFinder/Snapshot operations provide instant snapshot device copies by using virtual devices (VDEVs).

**Virtual disk** — Virtual disks, stored as files on the host computer or on a remote storage device, appear to the guest operating systems as standard disk drives in a VMware environment. The files are VMDK files.

**Virtual machine** — A virtualized machine on which a guest operating system and application software can run. Multiple virtual machines can run concurrently on the same physical machine.

**VMware ESX Server** — An enterprise-level virtualization system offered by VMware, Inc. that runs on top of hypervisor. ESX runs on bare metal. In contrast to other VMware products, it does not run within a third-party operating system, but instead includes its own kernel. The vmkernel offers an interface to guest systems that simulate hardware. This takes place in such a way that a guest system itself can run unmodified atop the hypervisor.

**VMware vCenter Server** — Also called VMware VirtualCenter, a virtualization management platform that facilitates management of the VMware vSphere environment, allowing IT administrators to control the virtual environment.

**VMware VMFS** — Also known as a Virtual Machine File System, the VMware VMFS is used to store virtual machine disk images, including snapshots. Multiple servers can read/write the same filesystem simultaneously, while individual virtual machine files are locked. VMFS volumes can be logically "grown" (non-destructively increased in size) by spanning multiple VMFS volumes together.

**VMware VMotion** — Process by which a running virtual machine is migrated from one ESX host to another without incurring downtime. Replication Manager is tolerant of VMotion activities. Note that Replication Manager is not supported when using Storage VMotion to migrate the virtual machines storage from one array to another.

**VMware vSphere** — VMware’s next generation infrastructure internal cloud solution offering virtualized environments that require little or no provisioning to deliver computing resources to users.

**Virtualization technology overview**

Replication Manager can integrate with VMware and Hyper-V technology configured in many different ways, thus offering customers flexibility in how they configure production environments, while still offering world-class protection for those environments. Replication Manager can integrate with each of the following configurations.
VMware VMFS Datastores

The technology
VMware VMFS can serve a resource pool of multiple VMware ESX servers, offering virtual machines simultaneous access to the same shared storage. This architecture allows customers to virtualize shared storage across multiple ESX servers running multiple virtual machines.

Supported storage
VMware VMFS is supported on the following EMC storage:
- CLARiiON
- Symmetrix
- Celerra
- RecoverPoint

For the underlying replication technologies supported, refer to the use cases described later in this paper.

Replication Manager integration
When those VMFS volumes reside on the storage described above, Replication Manager can replicate the storage where those VMFS volumes reside. Integration with VMware’s vCenter Suite, formerly known as Virtual Center, provides information about where the VMFS volumes reside on the storage arrays and allows Replication Manager to isolate the storage devices and replicate them. This type of replication generates virtual machine consistent replicas for both application data and system data stored within the virtual machines on the VMFS that you are replicating.

VMware NFS Datastores

The technology
VMware NFS datastores can serve a resource pool of multiple VMware ESX servers, offering virtual machines simultaneous access to the same shared storage. This architecture allows customers to virtualize shared storage across multiple ESX Servers running multiple virtual machines.

Supported storage
VMware NFS datastores are supported on Celerra storage only. For the underlying replication technologies supported, refer to the use cases described later in this paper.

Replication Manager integration
When those NFS datastores reside on the storage described above, Replication Manager can replicate the storage where those NFS datastores reside. Integration with VMware’s vCenter Suite, formerly known as Virtual Center, provides information about where the NFS datastores reside.
datastores reside on the storage arrays and allows Replication Manager to isolate the storage devices and replicate them. This type of replication generates virtual machine consistent replicas. For the underlying replication technologies supported, refer to the use cases described later in this paper.

**VMware virtual disks (vDisks based on VMDKs)**

The technology

VMware virtual disks (vDisks based on VMDKs) are disks attached to a virtual machine that resides on a VMFS within an ESX server. It is possible to install a Replication Manager Agent directly on the virtual machine to make it possible to create a replica of a vDisk if the environment meets certain configuration requirements.

Supported storage

VMware virtual disk replication is supported on the following EMC storage:
- CLARiiON
- RecoverPoint
- Celerra
- Symmetrix

For the underlying replication technologies supported, refer to the use cases described later in this paper.

**Replication Manager Integration**

When the target virtual disk / VMFS resides on the storage described above, Replication Manager can replicate the storage where the VMFS volume resides. Replication Manager can provide application consistent replicas of the virtual machine as long as the appropriate configuration requirements are met. For the underlying replication technologies supported, refer to the use cases described later in this paper.

**VMware Raw Device Mapping (RDMs)**

The technology

VMware Raw Device Mappings (RDMs) are storage devices that are directly attached to the virtual machine through one of the following interfaces:
- VMware iSCSI Initiator
- Fibre connections

It is possible to install the Replication Manager Agent directly on the virtual machine to make it possible to create replicas of RDM devices.

Supported storage

VMware RDM replication is supported on the following EMC storage:
- CLARiiON
- RecoverPoint
- Celerra
- Symmetrix

Both Windows and Linux platforms are supported with
RDMs. For the underlying replication technologies supported, refer to the use cases described later in this paper.

Replication Manager integration
When the RDM resides on the storage described above, Replication Manager can replicate the storage where the RDM resides. The *EMC Replication Manager Administrator’s Guide* provides details on how to configure RDMs for use with Replication Manager.

**Hyper-V with iSCSI Initiator attached virtual machines**

The technology
Hyper-V can be configured using iSCSI initiator to connect external storage to host the virtual machines that exist within the Hyper-V configuration. It is possible to include multiple iSCSI-attached virtual machines, each acting as an independent host. Replication Manager can reside on each iSCSI attached virtual machine.

Supported storage
Hyper-V iSCSI attached virtual machines are supported on the following EMC storage:

- CLARiiON
- Celerra

For the underlying replication technologies supported, refer to the use cases described later in this paper.

Replication Manager integration
Replication Manager can replicate the storage where the virtual machines reside. The *EMC Replication Manager Administrator’s Guide* provides details of how to configure Hyper-V with Replication Manager.
**Hyper-V with iSCSI-attached pass-through disks**

**The technology**
Hyper-V can be configured using iSCSI-attached pass-through disks. It is possible to include multiple iSCSI-attached pass-through disks.

**Supported storage**
Hyper-V iSCSI attached pass-through disks are supported on Windows 2008 R2 with the following EMC storage:

- CLARiiON
- Celerra

For the underlying replication technologies supported, refer to the use cases described later in this paper.

**Replication Manager integration**
Replication Manager can replicate the RDM storage. The EMC Replication Manager Administrator’s Guide provides details of how to configure Hyper-V with Replication Manager.

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**Hyper-V with fibre-attached pass-through disks**

**The technology**
Hyper-V can be configured using fibre-attached pass-through disks within the Hyper-V configuration. It is possible to include multiple fibre-attached pass-through disks.

**Supported storage**
Hyper-V iSCSI attached pass-through disks are supported on Windows 2008 R2 with the following EMC storage:

- CLARiiON
- Symmetrix

For the underlying replication technologies supported, refer to the use cases described later in this paper.

**Replication Manager integration**
Replication Manager can replicate the RDM storage. The EMC Replication Manager Administrator’s Guide provides details of how to configure Hyper-V with Replication Manager.
Use Cases: Replicating VMware environments

This section describes the prerequisites of this replication use cases and the environments in which it is supported.

Use Case: Replicating VMware VMFS volumes

Replication Manager supports replication of VMware VMFS volumes in the environments described in this section.

Configuration prerequisites

General configuration prerequisites for VMFS replication are as follows:

- VMware VirtualCenter must be configured for the environment.
- A Replication Manager Proxy Agent must be configured on a physical or virtual host. The Replication Manager Proxy Agent must be able to connect to the VMware VirtualCenter over port 443 and it must have the Replication Manager client installed.
- The Replication Manager Proxy Agent must have access to the storage via a storage processor (CLARiiON) or a Data Mover (Celerra).
- The VMware Tools must be present on the Replication Manager Proxy host if it is a virtual host, and may be present on the virtual machines if VSS integration is desired.
- ESX Server 3.5 update 2 or later must be in use in order to create VSS replicas.
- LVM Resignature must be enabled in the case of ESX server 3.5.x.
- Federated application sets (application sets with data that spans multiple production hosts) are not supported with VMFS replicas.
- To restore files and directories in a VM on the VMFS, the Replication Manager proxy host should be a Windows virtual machine.

The following table lists what storage environments and technologies are supported and provides important configuration information specific to the supported storage environments.

<table>
<thead>
<tr>
<th>Storage Arrays</th>
<th>Technologies</th>
<th>Operating Systems</th>
<th>Configuration requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLARiiON</td>
<td>SnapView Clones, SnapView Snaps, CLARiiON-to-CLARiiON SAN Copy™, SnapView on MirrorView/A or MirrorView/S targets</td>
<td>Replication Manager-Proxy license runs on Windows</td>
<td>Replication Manager Proxy Agent must be able to access one placeholder LUN on the CLARiiON where the VMFS data resides.</td>
</tr>
</tbody>
</table>
| Celerra iSCSI  | SnapSure Celerra Replicator | Replication Manager-Proxy license runs on Windows | Replication Manager Proxy Agent must have IP access to the Celerra Data Movers on the Celerra where the VMFS data resides.  
  All Celerra LUNs with VMFS data must reside on a single Celerra and must share the same target IQN. |
| RecoverPoint   | CDP/CRR/CLR  | Replication Manager-Proxy license runs on Windows | Replication Manager Proxy Agent must be able to access the RecoverPoint Appliance (RPA) through the network. |
### Configuration

The VMware VMFS environment, integrated with Replication Manager, is shown in Figure 1.

![Figure 1. Replicating VMFS in a VMware environment](image)

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Symmetrix</td>
<td>TimeFinder Clones TimeFinder Snaps (local/remote) TimeFinder Mirror (local/remote) SRDF/S SAN Copy</td>
<td>Replication Manager-Proxy license runs on Windows</td>
<td>• Replication Manager Proxy Agent must be zoned to at least four six-cylinder gatekeeper on the Symmetrix where the VMFS data resides.</td>
</tr>
</tbody>
</table>
Mount and restore considerations

Once you have created a replica of a VMFS, you can mount that replica back to the production ESX server, mount it to an alternate ESX server, or restore it to the original production environment. This section describes the configuration prerequisites and supported configurations as they relate to mounting and restoring a VMFS replica.

Backup Acceleration

All the steps involved in performing a backup of your virtual machines is beyond the scope of this paper. However, if you are performing backup acceleration, you do not need to deploy or power on the virtual machines you plan to backup. For backup acceleration in the ESX console Replication Manager would mount the replica, kick off a backup job and unmount the replica without the need to power on the virtual machines or add them to inventory.

Mounting a VMFS replica

- When mounting a VMFS replica, the selected mount host is a VMware ESX server.
- When mounting to an ESX server which is running vSphere and above, Replication Manager resignatures the snapshot VMFS volume at the time of mount. To retain the signature and name of the production VMFS on the snapshot volume, the resignaturing option provided in the mount panel of Replication Manager console needs to be disabled. This will also require the mount ESX to be registered in a different datacenter in the vCenter server inventory than the production VMFS datacenter.
- When you use Replication Manager to mount a VM-consistent VMFS replica, there are additional steps that you must perform to deploy the virtual machines once the Replication Manager mount is complete:

  1. Add all the virtual machines that you want to deploy to the VirtualCenter inventory panel.
  2. Deploy the virtual machines from the VMFS replica to the ESX inventory only using VirtualCenter. Failure to use VirtualCenter can result in stale entries in the ESX upon unmount.
  3. Power on the virtual machines in VirtualCenter. Your virtual machines will now be available for whatever processing you wish to perform on the virtual machines.

  **Note:** If the source virtual machine is powered on while you are trying to deploy and power on the replicated virtual machine from a mounted VMFS replica, the power on may fail if the replicated virtual machine has disks visible to it other than system disk that share visibility with the source virtual machine. In this case, remove the non-system disks from the replicated virtual machine before deploying and powering on the replicated virtual machine.

Unmounting a VMFS replica

- Once you have performed the steps above to deploy virtual machines in a mounted VM-consistent VMFS replica, you must complete the following steps prior to unmounting that replica:

  1. Power off the virtual machines in VirtualCenter.
  2. Remove the virtual machines from the VirtualCenter inventory.

Restoring a VMFS replica

- Before restoring a VM-consistent VMFS replica you should perform the following steps:

  1. Power off the virtual machines that:
- are hosted within the VMFS, or
- own any virtual disks within the VMFS

2. Remove those virtual machines from the VirtualCenter inventory.
3. Restore the replica from Replication Manager.
4. Once the restore is complete, add the virtual machines into the VirtualCenter inventory.
5. Manually power on each virtual machine.
Use Case: Replicating a VMware NFS datastore

Replication Manager version 5.2.2 supports replication of VMware NFS datastores in the environments described in this section.

Configuration prerequisites

General configuration prerequisites for NFS datastore replication are as follows:

- VMware vCenter must be configured for the environment.
- An Replication Manager Proxy Agent must be configured on a physical or virtual host. The Replication Manager Proxy Agent must be able to connect to the VMware vCenter over port 443 and it must have the Replication Manager client installed.
- The VMware Tools must be present on the Replication Manager Proxy host if it is a virtual host.
- The VMware Tools must be present on the virtual machines on the NFS datastore.
- ESX Server 3.5 update 2 or later and the VMware Tools must be present on the virtual machine in order to create VSS snapshot copies.
- Partitioned Celerra filesystems are not supported with NFS datastores. Whole filesystems must be used.
- Federated application sets (application sets with data that spans multiple production hosts) are not supported with NFS datastore replicas.
- Mounting to an ESX server requires IP connectivity to the data mover with the NFS datastore snap replica.

The following table lists what storage environments and technologies are supported and provides important configuration information specific to the supported storage environments.

<table>
<thead>
<tr>
<th>Storage Arrays</th>
<th>Technologies</th>
<th>Operating Systems</th>
<th>Configuration requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celerra (NFS)</td>
<td>SnapSure</td>
<td>Replication Manager proxy is supported on Linux and Windows (5.3 and higher) for VMware NFS datastores</td>
<td>Replication Manager Proxy Agent must have IP access to the Celerra Control Station on the Celerra where the NFS datastore resides.</td>
</tr>
<tr>
<td></td>
<td>Celerra Replicator</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Configuration

The VMware NFS datastore environment, integrated with Replication Manager, is shown in Figure 2.

![Diagram showing Replication Manager and NFS datastore in a VMware environment]

**Figure 2.** Replicating a NFS datastore in a VMware environment

Mount and restore considerations

Once you have created a replica of a NFS datastore, you can mount that replica back to the production ESX server, mount it to an alternate ESX server, mount it to a Linux server using NFS, or restore it to the original production environment. This section describes the configuration prerequisites and supported configurations as they relate to mounting and restoring an NFS replica.

**Mounting an NFS replica**

- When mounting an NFS replica, the selected mount host is either a VMware ESX server or a Linux host. If you mount to a Linux host the VMware Proxy information is ignored and NFS is used to perform the mount.
- When you use Replication Manager to mount a VM-consistent NFS replica to an ESX server, there are additional steps that you must perform to deploy the virtual machines once the Replication Manager mount is complete:
1. Add all the virtual machines that you want to deploy to the VirtualCenter inventory panel.
2. Deploy the virtual machines from the NFS replica to the ESX inventory only using VirtualCenter. Failure to use VirtualCenter can result in stale entries in the ESX upon unmount.
3. Power on the virtual machines in VirtualCenter. Your virtual machines will now be available for whatever processing you wish to perform on the virtual machines.

**Note:** If the source virtual machine is powered on while you are trying to deploy and power on the replicated virtual machine from a mounted NFS replica, the power on may fail if the replicated virtual machine has disks visible to it other than system disk that share visibility with the source virtual machine. In this case, remove the non-system disks from the replicated virtual machine before deploying and powering on the replicated virtual machine.

**Unmounting an NFS replica**

- Once you have performed the steps above to deploy virtual machines in a mounted VM-consistent NFS replica, you must complete the following steps prior to unmounting that replica:
  1. Power off the virtual machines in VirtualCenter.
  2. Remove the virtual machines from the VirtualCenter inventory.

**Restoring an NFS replica**

- Before restoring a VM-consistent NFS replica you should perform the following steps:
  1. Power off the virtual machines that:
     - are hosted within the NFS, or
     - own any virtual disks within the NFS
  2. Remove those virtual machines from the VirtualCenter inventory.
  3. Restore the replica from Replication Manager.
  4. Once the restore is complete, add the virtual machines into the VirtualCenter inventory.
  5. Manually power on each virtual machine.

**Use Case: File level restore support with VMFS and NFS Datastore**

Replication Manager 5.3.1 enables file and directory level restore of a virtual machine data from a VMFS or NFS replica. Replication Manager mounts the virtual disk of a virtual machine stored inside NFS or VMFS datastores replica on to a VM proxy host.

To perform the actual file or directory level recovery, manually copy the required files or folders from location where the virtual disk is mounted.

Only vDisks stored inside the datastore which is replicated can be used for granular recovery. RDM recovery is not supported.

**Configuration prerequisites**

General configuration prerequisites for file level restore are as follows:

- VMware vCenter must be configured for the environment.
- An Replication Manager Proxy Agent must be configured on virtual host (physical host is not supported for file level restore). The Replication Manager Proxy Agent must be able to connect to the VMware vCenter over port 443 and it must have the Replication Manager client installed.
The VMware Tools must be present and running on the Replication Manager Proxy host.

File level restore is supported for Windows virtual machines only.

Windows virtual machines running Windows Server 2003 and 2008 is supported for file level restore.

All storage platforms supported by Replication Manager for VMFS and NFS datastores use cases are supported for file level restore.


Replication Manager does not support virtual disks with multiple partitions.

Replication Manager does not support virtual disks configured as dynamic disks inside the Windows OS.

Replication Manager proxy should have enough free unique SCSI target IDs available across the controllers while mounting the virtual disk to the proxy (same restrictions as Replication Manager virtual disk feature).

Enabling file level restore

File level restore support is enabled using the Mount wizard in the Replication Manager console.
Performing file level restore

You can select one or multiple virtual disks in the mount wizard and perform file level restore. The wizard asks you to select a proxy host and specify a mount location on the selected proxy host.

Select disk to perform file level recovery
Location on the proxy host where the disk will be mounted.
You can also perform file level restore by browsing the property of the replica and then selecting the virtual disk tab.

Select virtual disk and click Mount.
Ending file level restore
You can selectively end the file level restore process by selecting unmount for a specific virtual disk.

You can also end all filelevel restores performed for a specific replica by selecting unmount for the replica. As part of replica unmount process, all mounted virtual disks are also unmounted.

Use Case: Replicating VMware virtual disks (vDisks based on VMDKs)

Replication Manager supports replication of VMware virtual disks (vDisks based on VMDKs) in the environments described in this section.

Configuration prerequisites
General configuration prerequisites for virtual disk replications are as follows:

- The virtual disk being replicated must be the only virtual disk on the VMFS. Failure to adhere to this restriction will prevent you from mounting or restoring the resulting replica.
- Each VMFS must be assigned only one physical LUN. Failure to adhere to this restriction will prevent you from mounting or restoring the resulting replica.
- Replication Manager supports the following SCSI adapters:
  - LSI Logic Parallel
  - LSI Logic SAS
- Paravirtual SCSI
- BusLogic

- VMware Tools must be installed in the environment.
- Replication Manager must be provided with the credentials for the VirtualCenter that manages the virtual machine you are attempting to replicate.
- Replication Manager is tolerant of vMotion of data stored on the production host only.
- LVM Resignature must be enabled in the ESX server. In ESX 4.x you can enable resignature using the esxcfg-advcfg CLI.
- Replication Manager does not support VSS replicas in the virtual disk configuration, so Exchange and SharePoint replicas are not supported with virtual disks. Replicas of SQL Server, Oracle, and filesystem are supported.

The following table lists supported storage environments and technologies and provides important configuration information.

<table>
<thead>
<tr>
<th>Storage Arrays</th>
<th>Technologies</th>
<th>Operating Systems</th>
<th>Configuration requirements</th>
</tr>
</thead>
</table>
| CLRiiON        | SnapView Clones SnapView Snaps CLRiiON-to-CLRiiON SAN Copy SnapView on MirrorView/A or MirrorView/S targets | Windows | - A virtual machine must be able to access at least one RDM or virtual disk on the target remote CLRiiON if you are using SAN Copy to a remote array in order for a Replication Manager Agent to discover the remote CLRiiON.
- Replication Manager requires a unique SCSI target across all SCSI controllers on the virtual machine. The target of the virtual disk you are replicating must not be used on other SCSI controllers |
| Celerra        | SnapSure Celerra Replicator | Windows | - The virtual machine must have IP access to the Celerra Data Movers on the Celerra.
- Virtual machines located on a VMFS created on Celerra DART 5.5 iSCSI LUNs are not supported for virtual disk replication.
- Replication Manager requires a unique SCSI target across all SCSI controllers on the virtual machine. The target of the virtual disk you are replicating must not be used on other SCSI controllers |
EMC Replication Manager and Virtualization Technologies
A Detailed Review

<table>
<thead>
<tr>
<th>Storage Arrays</th>
<th>Technologies</th>
<th>Operating Systems</th>
<th>Configuration requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symmetrix</td>
<td>TimeFinder Clones</td>
<td>Windows</td>
<td>- The virtual machine must be zoned to at least four six-cylinder gatekeepers on the Symmetrix.</td>
</tr>
<tr>
<td></td>
<td>TimeFinder Snaps</td>
<td></td>
<td>- To support successful mounts, the target storage must be zoned to the ESX server of the mount host.</td>
</tr>
<tr>
<td></td>
<td>(local/remote)</td>
<td></td>
<td>- Replication Manager requires a unique SCSI target across all SCSI controllers on the virtual machine. The target of the virtual disk you are replicating must not be used on other SCSI controllers.</td>
</tr>
<tr>
<td></td>
<td>TimeFinder Mirror</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(local/remote)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SRDF/S</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SAN Copy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Configuration
The VMware virtual disk environment, integrated with Replication Manager, is shown in Figure 3.

![Figure 3. Replicating a virtual disk in a VMware environment](image)
Mount and restore configurations

A replica of a virtual disk (vDisk based on VMDKs) offers application consistency because the Replication Manager client has been installed within the virtual machine environment, affording Replication Manager access to the application in order to quiesce the environment before creating the replica. This section describes the configuration prerequisites and supported configurations as they relate to mounting and restoring a virtual disk replica.

Mounting an virtual disk replica

Choose a virtual machine as the mount host. No proxy host is needed for virtual disk replicas. Production mount of virtual disk replicas is not supported, but you can mount the replica to an alternate virtual machine.

If your replica is stored on a virtual disk on Celerra iSCSI, the ESX server that is the target of the mounted replica must have the IP address and port of the remote Data Mover stored in its ESX iSCSI dynamic discovery panel. Additionally, make sure the appropriate ports are open to communicate between the mount host (ESX server) and the Celerra target or mount operations will fail.

If your replica is stored on a virtual disk on Symmetrix, storage must be made visible to the ESX servers that host the mount VM prior to running the mount job from Replication Manager.

Restoring a virtual disk replica

Restoring a virtual disk replica is no different than restores of disks in a physical environment. Steps like those outlined above for VMFS replicas are not necessary. Remember the following guidelines when restoring a virtual disk replica:

- When using Replication Manager, EMC recommends that you use independent virtual disks on each virtual machine instead of sharing disks across virtual machines.
- If the virtual machines that you replicate and plan to restore have shared virtual disks the virtual machines may fail to power on after a restore.
- If this happens remove the shared virtual disks from the virtual machine and add them back into the virtual machine. This operation makes it possible to power on the shared virtual machines that were restored.

Use Case: Replicating VMware RDMs or iSCSI Initiators

Replication Manager version 5.2.2 supports replication of VMware Raw Device Mapping (RDM) in the environments described in this section.

Configuration prerequisites

A general configuration prerequisites for RDM replications is that RDMs must be configured using physical compatibility mode.

The following table lists what storage environments and technologies are supported and provides important configuration information specific to the supported storage environments.

<table>
<thead>
<tr>
<th>Storage Arrays</th>
<th>Technologies</th>
<th>Operating Systems</th>
<th>Configuration requirements</th>
</tr>
</thead>
</table>
| CLARiiON       | SnapView Clones SnapView Snaps CLARiiON-to-CLARiiON SAN Copy SnapView on MirrorView/A or MirrorView/S targets | Windows/Linux | • With VMware iSCSI Initiator on the ESX Server or through Fibre.  
  1. Do not install Naviagent on VM.  
  2. Do not install PowerPath® on VM.  
  3. Do not install MS iSCSI Init.  
  • With Microsoft iSCSI Initiator  
  4. Install PowerPath (single |
<table>
<thead>
<tr>
<th>Storage Arrays</th>
<th>Technologies</th>
<th>Operating Systems</th>
<th>Configuration requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>NIC/SP failover only)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5. Do not install Naviagent on VM.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6. Manually register the VMs name with CLARiiON using Navisphere®.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• For RDMs, manually place the replication LUN into the ESX Storage Group and make the LUN visible to the virtual machine as an RDM prior to replication.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Likewise, make the LUN visible to the mount VM prior to mount.</td>
</tr>
<tr>
<td>Celerra</td>
<td>SnapSure</td>
<td>Windows</td>
<td>RDM devices are not supported for Windows 2000 virtual machines on Celerra.</td>
</tr>
<tr>
<td></td>
<td>Celerra Replicator</td>
<td></td>
<td>See the first two main bullets of the configuration requirements for CLARiiON above. Those apply to Celerra as well.</td>
</tr>
<tr>
<td></td>
<td>TimeFinder Clones</td>
<td>Windows/Linux</td>
<td>For Celerra the MS iSCSI Initiator is required.</td>
</tr>
<tr>
<td></td>
<td>TimeFinder Snaps (local/remote)</td>
<td></td>
<td>Must be logged in to the IQN.</td>
</tr>
<tr>
<td></td>
<td>TimeFinder Mirror (local/remote)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SRDF/S</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SAN Copy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symmetrix</td>
<td>TimeFinder Clones</td>
<td>Windows/Linux</td>
<td>Replication Manager does not support iSCSI LUNs with Symmetrix. Only RDMs are supported.</td>
</tr>
<tr>
<td></td>
<td>TimeFinder Snaps (local/remote)</td>
<td></td>
<td>The virtual machine must be zoned to at least four six-cylinder gatekeepers on the Symmetrix.</td>
</tr>
<tr>
<td></td>
<td>TimeFinder Mirror (local/remote)</td>
<td></td>
<td>Export the gatekeepers in physical compatibility mode.</td>
</tr>
<tr>
<td></td>
<td>SRDF/S</td>
<td></td>
<td>To support successful mounts, the target storage must be zoned to the ESX Server of the mount host.</td>
</tr>
<tr>
<td></td>
<td>SAN Copy</td>
<td></td>
<td>Likewise, target storage must be visible to the mount host.</td>
</tr>
<tr>
<td>RecoverPoint</td>
<td>Replication set/ Snapshot</td>
<td>Windows</td>
<td>RDM devices must be statically visible to mount hosts.</td>
</tr>
</tbody>
</table>

**Mount and restore configurations**

A replica of an RDM or iSCSI Initiated LUN offers application consistency because the Replication Manager client has been installed within the virtual machine environment, affording Replication Manager access to the application in order to quiesce the environment before creating the replica. This section describes the configuration prerequisites and supported configurations as they relate to mounting and restoring an RDM or iSCSI-initiated environment.
Mounting an RDM or iSCSI initiated replica
Choose either a virtual or a physical machine as a mount host. No proxy host is needed for RDM or iSCSI-initiated replicas. If your CLARiiON replica is a snap or a clone of an RDM volume, the replica LUNs must first be pre-exposed to the mount host before the mount (dynamic mounts in this environment are not supported).

Restoring an RDM or iSCSI-initiated replica
Restoring a virtual disk replica is no different than restores of disks in a physical environment. Steps like those outlined above for VMFS replicas are not necessary.

Use cases: Replicating Hyper-V environments
This section provides an overview, with illustrations, of Hyper-V support.

Use case: replicating Hyper-V via Microsoft iSCSI Initiator
Replication Manager version 5.2.2 supports replication of LUNs visible to a Hyper-V child partition through the iSCSI initiator in the child partition.

Configuration prerequisites
General configuration prerequisites for Hyper-V via Microsoft iSCSI Initiator:

- Replication Manager must be configured using physical compatibility mode.
- All iSCSI NICs should have registry setting TcpAckFrequency=1.
The following table lists what storage environments and technologies are supported and provides important configuration information specific to the supported storage environments.

<table>
<thead>
<tr>
<th>Storage Arrays</th>
<th>Technologies</th>
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<th>Configuration requirements</th>
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<tbody>
<tr>
<td>CLARiiON</td>
<td>SnapView Clones</td>
<td>Windows 2008*</td>
<td>▪ Install PowerPath (single NIC/SP failover only)</td>
</tr>
<tr>
<td></td>
<td>SnapView Snaps</td>
<td></td>
<td>▪ The Microsoft iSCSI Initiator setting for the Load Balance</td>
</tr>
<tr>
<td></td>
<td>CLARiiON-to-CLARiiON SAN</td>
<td></td>
<td>Policy must be set to Round Robin; this is not a default setting.</td>
</tr>
<tr>
<td></td>
<td>Copy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SnapView on MirrorView/A or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MirrorView/S targets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symmetrix</td>
<td>TimeFinder Clones</td>
<td>Windows 2008*</td>
<td>▪ Same as CLARiiON</td>
</tr>
<tr>
<td></td>
<td>TimeFinder Snaps (local/remote)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TimeFinder Mirror (local/remote)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SRDF/S</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SAN Copy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Replication Manager is supported on Windows 2003 and Windows 2008 guest operating systems installed on a Windows 2008 server.

Mount and restore configurations

A Hyper-V iSCSI Initiated replica offers application consistency because the Replication Manager client has been installed within the virtual machine environment, affording Replication Manager access to the application in order to quiesce the environment before creating the replica. Mounting and restoring an Hyper-V iSCSI-initiated environment does not impose any special restrictions to mounting and restoring over and above the standard mount and restore restrictions for physical machines.

**Use case: Replicating Hyper-V with iSCSI- or fibre-attached pass-through disks**

Replication Manager version 5.2.2 supports replication of Hyper-V pass-through disks visible through iSCSI or Fibre.

Configuration prerequisites

General configuration prerequisites for Hyper-V pass-through disks visible via iSCSI or Fibre:

**Prerequisites for iSCSI-attached pass-through disks**

- Replication Manager must be configured using physical compatibility mode.
- All iSCSI NICs should have registry setting TcpAckFrequency=1.

**Prerequisites for fibre-attached pass-through disks**

- Replication Manager mount hosts must be zoned to have visibility to the target disks where the replica resides.
The following table lists what storage environments and technologies are supported and provides important configuration information specific to the supported storage environments.

<table>
<thead>
<tr>
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<th>Operating Systems</th>
<th>Configuration requirements</th>
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<tbody>
<tr>
<td>CLARiiON</td>
<td>SnapView Clones SnapView Snaps CLARiiON-to-CLARiiON SAN Copy SnapView on MirrorView/A or MirrorView/S targets</td>
<td>Windows 2008*</td>
<td>• Install PowerPath (single NIC/SP failover only)</td>
</tr>
<tr>
<td>Celerra</td>
<td>SnapSure Celerra Replicator</td>
<td>Windows 2008*</td>
<td>• Same as CLARiiON</td>
</tr>
</tbody>
</table>

* Replication Manager is supported on Windows 2003 and Windows 2008 guest operating systems installed on a Windows 2008 server.

**Mount and restore configurations**

A Hyper-V pass-through replica offers application consistency because the Replication Manager client has been installed within the pass-through disk environment, affording Replication Manager access to the application in order to quiesce the environment before creating the replica. Mounting and restoring a Hyper-V pass-through disk does not impose any special restrictions to mounting and restoring over and above the standard mount and restore restrictions for physical machines.

**Conclusion**

EMC Replication Manager provides a single management console that allows customers to manage replication of virtualized environments deployed on a wide range of EMC storage technologies. Selected virtualization technologies are supported on Symmetrix, CLARiiON, Celerra, and RecoverPoint storage solutions. In addition, Replication Manager offers deep integration with many applications that reside in these environments, including Oracle, Microsoft SQL Server, Microsoft SharePoint and Microsoft Exchange application integration.