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As part of an effort to improve product lines, periodic revisions of software and hardware are released. Therefore, all versions of the software or hardware currently in use might not support some functions that are described in this document. The product release notes provide the most up-to-date information on product features.

If a product does not function correctly or does not function as described in this document, contact a technical support professional.

**Note**

This document was accurate at publication time. To ensure that you are using the latest version of this document, go to the Support website at https://support.emc.com.

**Purpose**

This document includes conceptual and overview information about the ProtectPoint solution.

**Audience**

This document is intended for application administrators, backup administrators, storage administrators, and IT decision-makers that are looking for information about the ProtectPoint solution to determine if it is the right fit for their environments. This document is relevant for both the ProtectPoint file system agent and ProtectPoint application agents.

**Revision history**

The following table presents the revision history of this document.

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>May 19, 2017</td>
<td>Removed references to specific component versions. To view the supported versions of components, go to: <a href="http://compatibilityguide.emc.com:8080/CompGuideApp/getProtectPointCompGuidePage.do">http://compatibilityguide.emc.com:8080/CompGuideApp/getProtectPointCompGuidePage.do</a></td>
</tr>
</tbody>
</table>
| 02       | April 28, 2017 | Added the following sections:
  - Supported replication topologies on page 28 in the ProtectPoint for VMAX chapter.
  - Supported replication topologies on page 44 in the ProtectPoint for XtremIO chapter. |
| 01       | December 21, 2016 | Initial release of the EMC ProtectPoint 3.5 Solutions Guide. |

The ProtectPoint file system agent documentation set includes the following publications:

- **EMC ProtectPoint Solutions Guide**
• EMC ProtectPoint Primary and Protection Storage Configuration Guide
• EMC ProtectPoint File System Agent Installation and Administration Guide
• EMC ProtectPoint File System Agent Release Notes

The following Data Domain Boost for Enterprise Applications and ProtectPoint documents provide additional information:

• EMC Data Domain Boost for Enterprise Applications and EMC ProtectPoint Database Application Agent Installation and Administration Guide
• EMC Data Domain Boost for Enterprise Applications and ProtectPoint Database Application Agent Release Notes
• EMC Data Domain Boost for Enterprise Applications and EMC ProtectPoint Microsoft Application Agent Installation and Administration Guide
• EMC Data Domain Boost for Enterprise Applications and EMC ProtectPoint Microsoft Application Agent Release Notes

For compatibility information, including specific backup software and hardware configurations that ProtectPoint supports, go to the following website:

The following Data Domain system documents provide additional information:

• EMC Data Domain Installation and Setup Guide for the particular Data Domain system
• EMC Data Domain Operating System Release Notes
• EMC Data Domain Operating System Initial Configuration Guide
• EMC Data Domain Operating System Command Quick Reference Guide
• EMC Data Domain Operating System Command Reference Guide
• EMC Data Domain Operating System Administration Guide
• EMC Data Domain Operating System MIB Quick Reference Guide
• EMC Data Domain Operating System Offline Diagnostics Suite User’s Guide
• Hardware overview guide for the system
• Field replacement guides for the system components
• EMC Data Domain System Controller Upgrade Guide
• EMC Data Domain Expansion Shelf Hardware Guide for shelf model ES20, ES30, or DS60
• EMC Data Domain Boost for OpenStorage Administration Guide
• EMC Data Domain Boost for OpenStorage Release Notes
• EMC Data Domain Boost for Oracle Recovery Manager Administration Guide
• EMC Data Domain Boost for Oracle Recovery Manager Release Notes
• EMC Data Domain Boost SDK Programmer’s Guide
• Statement of Volatility for the system

If you have the optional RSA Data Protection Manager (DPM), see the RSA Data Protection Manager Server Administrator’s Guide, available with the RSA DPM product.

The following VMAX system documents provide additional information:

• EMC Solutions Enabler TimeFinder Family CLI User Guide
EMC Solutions Enabler Array Management CLI User Guide

Special notice conventions that are used in this document
The following conventions are used for special notices:

**NOTICE**

Identifies content that warns of potential business or data loss.

---

**Note**

Contains information that is incidental, but not essential, to the topic.

---

Typographical conventions
The following type style conventions are used in this document:

<table>
<thead>
<tr>
<th>Style</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bold</strong></td>
<td>Used for interface elements that a user specifically selects or clicks, for example, names of buttons, fields, tab names, and menu paths. Also used for the name of a dialog box, page, pane, screen area with title, table label, and window.</td>
</tr>
<tr>
<td><em>Italic</em></td>
<td>Used for full titles of publications that are referenced in text.</td>
</tr>
<tr>
<td><strong>Monospace</strong></td>
<td>Used for:</td>
</tr>
<tr>
<td></td>
<td>• System code</td>
</tr>
<tr>
<td></td>
<td>• System output, such as an error message or script</td>
</tr>
<tr>
<td></td>
<td>• Pathnames, file names, file name extensions, prompts, and syntax</td>
</tr>
<tr>
<td></td>
<td>• Commands and options</td>
</tr>
<tr>
<td><strong>Monospace italic</strong></td>
<td>Used for variables.</td>
</tr>
<tr>
<td><strong>Monospace bold</strong></td>
<td>Used for user input.</td>
</tr>
</tbody>
</table>

[ ] Square brackets enclose optional values.

<table>
<thead>
<tr>
<th>Vertical line</th>
<th>Vertical line indicates alternate selections. The vertical line means or for the alternate selections.</th>
</tr>
</thead>
</table>

{ } Braces enclose content that the user must specify, such as x, y, or z.

... Ellipses indicate non-essential information that is omitted from the example.

You can use the following resources to find more information about this product, obtain support, and provide feedback.

**Where to find product documentation**

- https://support.emc.com
- https://community.emc.com

**Where to get support**

The Support website at https://support.emc.com provides access to licensing information, product documentation, advisories, and downloads, as well as how-to and troubleshooting information. This information may enable you to resolve a product issue before you contact Support.
To access a product specific Support page:

1. Go to https://support.emc.com/products.
2. In the Find a Product by Name box, type a product name, and then select the product from the list that appears.
3. Click the following button:

   ![Button]

4. (Optional) To add the product to My Saved Products, in the product specific page, click Add to My Saved Products.

**Knowledgebase**

The Knowledgebase contains applicable solutions that you can search for by solution number, for example, 123456, or by keyword.

To search the Knowledgebase:

2. Click Advanced Search. The screen refreshes and filter options appear.
3. In the Search Support or Find Service Request by Number box, type a solution number or keywords.
4. (Optional) To limit the search to specific products, type a product name in the Scope by product box, and then select the product from the list that appears.
5. In the Scope by resource list box, select Knowledgebase. The Knowledgebase Advanced Search panel appears.
6. (Optional) Specify other filters or advanced options.
7. Click the following button:

   ![Search]

**Live chat**

To participate in a live interactive chat with a support agent:

2. Click Chat with a Support Agent.

**Service requests**

To obtain in-depth help from Support, submit a service request. To submit a service request:

2. Click Create a Service Request.

---

**Note**

To create a service request, you must have a valid support agreement. Contact a sales representative for details about obtaining a valid support agreement or with questions about an account.

To review an open service request:

2. Click Manage service requests.
Online communities
Go to the Community Network at https://community.emc.com for peer contacts, conversations, and content on product support and solutions. Interactively engage online with customers, partners, and certified professionals for all products.

How to provide feedback
Feedback helps to improve the accuracy, organization, and overall quality of publications. You can send feedback to DPAD.Doc.Feedback@emc.com.
Preface
CHAPTER 1

ProtectPoint Family

This chapter includes the following topics:

- ProtectPoint family overview ................................................................. 12
- ProtectPoint and traditional backup .................................................... 13
- Host considerations .............................................................................. 14
- ProtectPoint versions .......................................................................... 14
ProtectPoint family overview

The ProtectPoint family consists of the ProtectPoint file system agent, the ProtectPoint database application agent, and the ProtectPoint Microsoft application agent.

ProtectPoint file system agent

The ProtectPoint file system agent includes the following features:

- Provides a CLI that you can use to trigger the primary storage to Data Domain workflow for backup and restore operations.
- Provides commands for lifecycle management of the backups.
- Triggers backup and restore operations on the primary storage system and Data Domain system through the use of primary storage system features and Data Domain block services for ProtectPoint management libraries, respectively.
- Operates on the device level. ProtectPoint works with primary storage LUNs and Data Domain block services for ProtectPoint devices, not with file system objects.

Use the ProtectPoint file system agent to perform the following operations:

- Create a snapshot of the production application LUNs on the primary storage system.
- Trigger the movement of data that is created from the backups on the primary storage system to the Data Domain devices.
- Create a static image for each LUN in the dataset on the Data Domain system.
- Securely manage the credentials for the Data Domain systems and RecoverPoint cluster.
- Scan the Data Domain system for backups that other ProtectPoint and Enterprise Copy Data Management applications create in addition to backups created by the ProtectPoint file system agent.
- Roll back a specified backup to its source devices.
- Restore a backup to the restore devices.
- Manage the ProtectPoint backup and scan catalog.
- Manage the lifecycles of the data backups by listing and optionally deleting existing backups.
- Display the ProtectPoint version number.
- Validate the content and format of the configuration files.

Configuration file

The ProtectPoint file system agent configuration file specifies information about:

- The ProtectPoint file system agent protected environment, including the Data Domain name and username.
- Backup and restore source devices or groups.
- Restore devices.
- Performing restores and rollbacks.

The ProtectPoint file system agent provides the following template configuration files:

- ProtectPoint for VMAX environments
Select the environment-appropriate template and modify it as required.

When you set up the ProtectPoint file system agent on the application recovery host, modify the configuration file to include the specific details about the devices. Make a copy of the configuration template file, and specify the environment information in the copy.

You can have any number of configuration files. You must also update the lockbox with the Data Domain and optionally the RecoverPoint passwords.

**ProtectPoint database application agent and Microsoft application agent**

The ProtectPoint database application agent includes the following features:

- Provides the ability to perform backups and restores of DB2, Oracle, or SAP with Oracle database data that resides on the primary storage system to protection storage on a Data Domain system.
- Provides an integrated experience by using the database-specific backup and recovery tools, such as DB2 CLI, Oracle RMAN, or BR*Tools.

The ProtectPoint Microsoft application agent includes the following features:

- Provides the ability to perform backups and restores of Microsoft Exchange and Microsoft SQL database data that resides on the primary storage system to protection storage on a Data Domain system.

Both agents include the following features:

- Provide application-consistent ProtectPoint backups without manual intervention by the application administrator.
- Operates on the database level, so the database application agent software automatically discovers the primary storage devices where database objects reside.
- Restores automatically from a replicated backup on a secondary Data Domain system when the primary Data Domain system is unavailable.
- Supports listing and lifecycle management of backups using the native database backup functionality, and deletion of backups that are no longer required.
- Discover corresponding backup devices. To discover the corresponding backup devices, the agents use the backup link that is established with the VMAX primary storage.
- Provides the ability to perform backups and restores over an Ethernet (IP) or Fibre Channel (FC) connection.
- Supports Internet Protocol version 6 (IPv6) for backups and restores.
- Supports the Data Domain IPv6, IPv4, and mixed IPv4 and IPv6 networks.

**ProtectPoint and traditional backup**

The ProtectPoint workflow can provide data protection in situations where more traditional approaches cannot successfully meet the business requirements. The business demands can include small or non-existent backup windows, demanding recovery time objective (RTO) or recovery point objective (RPO) requirements, or a combination of both.

Unlike traditional backup and recovery, ProtectPoint does not rely on a separate process to discover the backup data and additional actions to move that data to backup storage. Instead of using dedicated hardware and network resources,
ProtectPoint uses existing application and storage capabilities to create point-in-time copies of large data sets. The copies are transported across a SAN to Data Domain systems to protect the copies while providing deduplication to maximize storage efficiency. ProtectPoint minimizes the time that is required to protect large data sets, and enables backups to fit into the smallest of backup windows to meet demanding RTO or RPO requirements.

Host considerations

The following host considerations can impact the ProtectPoint implementation:

- For FC multipathing, verify that enough FC ports are available on the primary storage system, the Data Domain system, the host, and the FC switch.

  Note

  The number of paths that are required depends on the I/O load and the environment performance requirements.

- For IP network redundancy, verify that enough Ethernet ports and interfaces are available to create the redundant configuration.

ProtectPoint versions

ProtectPoint for VMAX provides data protection for application data that is hosted on VMAX storage systems.

ProtectPoint for XtremIO uses RecoverPoint to provide data protection for application data hosted on XtremIO storage systems.
CHAPTER 2

ProtectPoint for VMAX

This chapter includes the following topics:

- Overview ................................................................. 16
- Environment ................................................................. 23
- Prerequisites ................................................................. 23
- FAST.X ................................................................. 27
- SnapVX ................................................................. 27
- Solutions Enabler ................................................................. 28
- Supported replication topologies ................................................................. 28
Overview

ProtectPoint for VMAX integrates primary storage and protection storage for backups on a Data Domain system. ProtectPoint provides block movement of the data on application source LUNs to Data Domain LUNs.

ProtectPoint requires both IP network (LAN or WAN) and Fibre Channel (FC) storage area network (SAN) connectivity. The following table lists the required topologies for connecting each component.

Figure 1 ProtectPoint for VMAX environment

Table 3 ProtectPoint topology requirements

<table>
<thead>
<tr>
<th>Connected components</th>
<th>Connection type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary application host to primary storage system</td>
<td>FC SAN</td>
</tr>
<tr>
<td>Primary recovery host to primary storage system</td>
<td>FC SAN</td>
</tr>
<tr>
<td>Primary recovery host to primary Data Domain system</td>
<td>IP LAN and FC SAN</td>
</tr>
<tr>
<td>Primary storage system to primary Data Domain system</td>
<td>FC SAN</td>
</tr>
<tr>
<td>(Optional) Secondary recovery host to secondary storage system</td>
<td>FC SAN</td>
</tr>
<tr>
<td>(Optional) Secondary recovery host to secondary Data Domain system</td>
<td>IP LAN and FC SAN</td>
</tr>
<tr>
<td>(Optional) Secondary storage system to secondary Data Domain system</td>
<td>FC SAN</td>
</tr>
<tr>
<td>(Optional) Primary application host to secondary Data Domain system</td>
<td>IP WAN or FC SAN</td>
</tr>
<tr>
<td>(Optional) Primary Data Domain system to secondary Data Domain system</td>
<td>IP WAN</td>
</tr>
</tbody>
</table>
Table 3 ProtectPoint topology requirements (continued)

The following figure displays a sample primary site topology.

Figure 2 Sample primary site ProtectPoint topology

In this figure the numbers represent the following:

1. Application host
2. Recovery host
3. Primary storage production device 0001A
4. Primary storage production device 0001B
5. Backup device 000BA (Data Domain device that is connected to the primary storage system)
6. Backup device 000BB (Data Domain device that is connected to the primary storage system)
7. Primary storage restore device 0001C
8. Primary storage restore device 0001D
9. Recovery device 000BC (Data Domain device that is connected to the primary storage system)
10. Recovery device 000BD (Data Domain device that is connected to the primary storage system)
11. Data Domain block services for backup device 00BA
12. Data Domain block services for backup device 00BB
13. Data Domain block services for recovery device 00BC
14. Data Domain block services for recovery device 00BD

ProtectPoint works with the features on the Data Domain system and the primary storage system to provide primary storage to Data Domain protection. ProtectPoint uses the following features:
On the Data Domain system:
- Block services for ProtectPoint
- FastCopy

On the VMAX storage array:
- FAST.X
- SnapVX

The following figure displays the data movement from the application recovery host to the VMAX array, and then to the Data Domain system.

**Figure 3 Data movement**

In this figure the numbers represent the following:

1. Application recovery host
   Application recovery host software:
2. Application
3. Host file system
4. Host operating system
5. Solutions Enabler

VMAX system:
6. Primary storage software features that work with Data Domain features
7. Primary storage production device
8. Primary storage backup device
9. Copy changed blocks to the Data Domain system
10. Data Domain block services for ProtectPoint device
11. Data Domain static-image

ProtectPoint enables an application administrator to leverage the ProtectPoint workflow to protect applications and application data. The storage administrator configures the underlying storage resources on the primary storage system and the Data Domain system. With this storage configuration information and the ProtectPoint software executable, the application administrator can trigger the workflow to protect the application. Before triggering the workflow, the application administrator must quiesce the application to ensure that an application-consistent snapshot is preserved on the Data Domain system.
Note
The ProtectPoint database application agent and Microsoft application agent work
with the application to quiesce the application automatically.

In addition to backing up and protecting data, the application administrator must retain
and replicate copies, restore data, and recover applications. The combination of
ProtectPoint and the primary storage to Data Domain workflow enables the
application administrator to complete all these operations.

For restoring data, ProtectPoint enables the application administrator to select a
specific backup and make that backup available on selected primary storage devices.
The operations to mask, mount, and restore the data must be performed manually on
the application recovery host. The ProtectPoint workflow provides a copy of the data,
but not any application intelligence.

Basic backup workflow
In the basic backup workflow, data is transferred from the primary storage system to
the Data Domain system. ProtectPoint manages the data flow, but does not modify
the data.

To create a copy or backup of application data, the application administrator or other
appropriate user must ensure that the copy or backup is application-consistent. The
application administrator or other appropriate user must quiesce the application
before initiating the backup operation. Using ProtectPoint to create a snapshot on the
primary storage system while the application is quiesced enables the application
administrator to minimize the disruption to the application.

After creating the snapshot, the application administrator uses ProtectPoint to move
the snapshot to the Data Domain system. The primary storage system tracks the data
that has changed since the last snapshot was moved to the Data Domain system, and
only copies the changed data. After all the data that is captured in the snapshot is
sent to the Data Domain system, ProtectPoint creates a static-image on the Data
Domain system. The static-image contains the data that reflects the application-
consistent copy that is initially created on the primary storage system.

The static-image and any additional metadata can be managed separately from the
snapshot on the primary storage system, and can be a source from which to create
additional copies of the backup. Static-images that are complete with metadata are
called backup images. ProtectPoint creates one backup image for every protected
LUN. Backup images can be combined into backup sets that represent an entire
application point-in-time backup.

The backup workflow consists of the following steps:

1. On the application host, the application administrator quiesces the application.
2. On the primary storage system, the administrator uses ProtectPoint to create a
snapshoot of the primary storage device. It is safe to unquiesce the application
when this step is complete.
3. The administrator uses ProtectPoint to analyze and copy the changed data to an
encapsulated Data Domain storage device.
4. The Data Domain system creates and stores a static-image of the snapshot.

The following figure displays the basic backup workflow.
Figure 4 Basic backup workflow

In this figure the numbers represent the following:

1. Application host
2. Primary storage production device 0001A
3. Primary storage production device 0001B
4. Backup device 000BA
5. Backup device 000BB
6. Data Domain block services for ProtectPoint device 000BA
7. Data Domain block services for ProtectPoint device 000BB

Basic restore workflow

The application administrator can perform four types of restores:

- Object-level restore from FAST.X-encapsulated devices with SnapVX. The application administrator selects and restores one or more files from a backup image.
- Full-application rollback restore from FAST.X-encapsulated devices with SnapVX. The application administrator restores the application to a previous point-in-time.
- Restore directly to the host from FAST.X-encapsulated devices.
- Restore directly to the host from Data Domain restore devices. The application administrator selects and restores one or more files from a backup image.

For any type of restore, the application administrator selects the backup image to restore from the Data Domain system.

For an object-level restore, after selecting the backup image on the Data Domain system, the application administrator mounts Data Domain block services for...
ProtectPoint devices that the primary storage system presents to the application recovery host and performs the restore operation.

The object-level restore from FAST.X-encapsulated devices with SnapVX workflow consists of the following steps:

1. The Data Domain system writes the static-image to the encapsulated storage device, making it available on the primary storage system via the FAST.X restore device.

2. The application administrator mounts the FAST.X restore device on the host, and uses OS and application-specific tools and commands to restore specific objects to a recovery device on the VMAX.

The following figure displays the object-level restore workflow.

**Figure 5 Object-level restore workflow**

In this figure the numbers represent the following:

1. Recovery host
2. Primary storage production device 0001C
3. Primary storage production device 0001D
4. Recovery device 000BC
5. Recovery device 000BD
6. Data Domain block services for ProtectPoint device 2
7. Data Domain block services for ProtectPoint device 3

The full-application rollback restore from FAST.X-encapsulated devices with SnapVX workflow consists of the following steps:

1. The Data Domain system writes the static-image to the encapsulated storage device, making it available on the primary storage system.

2. The FAST.X restore devices are copied to the production devices, overwriting the contents of the production devices.
The following figure displays the full-application rollback restore workflow to the VMAX production devices.

**Figure 6** Full-application rollback restore to the production devices

In this figure the numbers represent the following:

1. Recovery host
2. Primary storage production device 0001A
3. Primary storage production device 0001B
4. Recovery device 000BC
5. Recovery device 000BD
6. Data Domain block services for ProtectPoint device 2
7. Data Domain block services for ProtectPoint device 3

The restore directly to the host from FAST.X-encapsulated devices workflow consists of the following steps:

1. The Data Domain system writes the static-image to the encapsulated storage device, making it available on the primary storage system.
2. The application administrator mounts the encapsulated storage device to the host, and uses OS and application-specific tools and commands to restore specific objects directly to the application recovery host.

The restore from Data Domain restore devices consists of the following steps:

1. The application administrator makes the Data Domain restore device available to the host.
2. The application administrator uses OS and application-specific tools and commands to restore specific objects.
Environment

The ProtectPoint for VMAX environment consists of the following components:

- **Data Domain:**
  - A Data Domain system with a supported Data Domain operating system.
  - Data Domain block services for ProtectPoint license.
  - (Optional) Data Domain replication license.

- **VMAX:**
  - A VMAX array.
  - A VMAX license is required for ProtectPoint.
  - Solutions Enabler in local mode on the application recovery host.

- **Application:**
  - Application recovery host.
  - ProtectPoint agent on the application recovery host.

To view the supported versions of components, go to:

---

**Note**

ProtectPoint cannot use VMAX devices that are configured for SRDF/Metro.

---

Prerequisites

The following are prerequisites for all ProtectPoint for VMAX operations.

**ProtectPoint file system agent prerequisites**

The following are ProtectPoint file system agent prerequisites for VMAX operations:

- Solutions Enabler must be installed on the ProtectPoint file system agent host. If you have a user that is not root, the Solutions Enabler documentation provides information on how to configure a user account without root access.

- DX directors on the VMAX system must be available to encapsulate the Data Domain protection storage.

- The ProtectPoint file system agent must be installed on the application recovery host.

---

**Database application agent and Microsoft application agent prerequisites**

The database and Microsoft application agent prerequisites for ProtectPoint operations are as follows:

- A valid license for the ProtectPoint environment.

- The application agent must be installed on the production and recovery host.
User accounts for block services for ProtectPoint, and DD Boost must be created on the Data Domain system.

(Optional) Create a user account on the RecoverPoint appliance.

### VMAX prerequisites

The following are VMAX prerequisites for all ProtectPoint for VMAX operations:

- A VMAX array.
- Solutions Enabler in local mode on the application recovery host.
- The required VMAX source capacity licenses.
- In multiple VMAX environments, the recovery devices must be configured in the same Data Domain vdisk pool.
- SAN zoning between the VMAX FA and DX ports and the application recovery hosts:
  - Ensure that one DX emulation exists on each director within the same engine. Each DX emulation requires two ports exclusively for zoning to the Data Domain system.
  - For FC zoning with a single SAN switch, create zones between four VMAX DX ports and two Data Domain ports.
  - For FC zoning with two SAN switches, create zones between four VMAX DX ports and four Data Domain ports.

The following figure displays an example of a single SAN switch zoning configuration.

**Figure 7 SAN zoning example**

![SAN zoning example diagram]

### Data Domain prerequisites

The following are Data Domain prerequisites for all ProtectPoint for VMAX operations:
DD Boost prerequisites

Enable the DD Boost service, and then create a storage unit.

Data Domain block services prerequisites

The prerequisites for Data Domain block services operations are as follows:

- (Optional) Create the Data Domain file system (DDFS).
- Configure a username and password for ownership of the Data Domain block services for ProtectPoint devices. It is recommended that you create this user with the `none` role. If required, other roles can be configured.
- Apply a Data Domain block services for ProtectPoint license.

Block services for ProtectPoint object hierarchy

To plan the ProtectPoint configuration, use the object hierarchy mappings in the following table.

<table>
<thead>
<tr>
<th>Storage object</th>
<th>Mapping level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool</td>
<td>Department</td>
</tr>
<tr>
<td>Device-group</td>
<td>Application</td>
</tr>
<tr>
<td>Device</td>
<td>Device</td>
</tr>
</tbody>
</table>

By default, access control is implemented at the pool level. If additional granularity is required, create the pools based on the access control requirements.

Data Domain storage layout

The following figure displays the storage layout of the DDFS.
In this figure the numbers represent the following:

1. /data
2. /data/coll
3. /data/coll/backup
4. /data/coll/MTree2
5. /data/coll/MTree3

The following table describes each element of the DDFS storage layout.

**Table 5 DDFS storage elements**

<table>
<thead>
<tr>
<th>DDFS directory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/data</td>
<td>Top-level directory of the Data Domain storage file system. This directory cannot be changed.</td>
</tr>
<tr>
<td>/data/coll</td>
<td>Represents a collection of data, and enables the expansion of the file system by creating additional collections, coll2, coll3, coll4, and so on.</td>
</tr>
<tr>
<td>/data/coll/backup</td>
<td>Contains backups of the data and directory structure of the collection. This MTree cannot be deleted or renamed. Subdirectories can be created to organize and separate the data.</td>
</tr>
<tr>
<td>/data/coll/MTree&lt;X&gt;</td>
<td>Represents the lowest level of the Data Domain storage file system. Each MTree is an independently managed directory. Data Domain allows up to 100 MTrees to be created, but performance degradation occurs when more than 32 MTrees are active at one time.</td>
</tr>
</tbody>
</table>

**Data Domain block services for ProtectPoint**

Data Domain block services for ProtectPoint allow you to create devices, device groups, and device pools. The DD Boost service allows you to configure storage units.
Block services also provide additional functionality, such as creating static-images (snapshots) and replicating data.

The *EMC Data Domain Operating System Command Reference Guide* provides more information about the block services for ProtectPoint and the `vdisk` commands that control them.

**Data Domain file system**

The Data Domain file system (DDFS) stores the block services for ProtectPoint objects. For example, a block services static-image can be treated as a file that resides within the DDFS. Therefore, replicating a static-image is the same as replicating a file. By leveraging the services that are provided by the DDFS, the block service for ProtectPoint can efficiently create static-images of LUNs.

---

**Note**

The DDFS automatically defragments backups that are created in a ProtectPoint environment to prevent performance degradation over time.

The *EMC Data Domain Operating System Administration Guide* provides more information about the DDFS.

**FAST.X**

FAST.X provides the ability to attach external storage to a VMAX array. Attaching external storage enables storage administrators or other users to use the physical disk space on a storage system that is not a VMAX array while gaining access to VMAX features. These features include local replication, remote replication, storage tiering, data management, and data migration. In addition, FAST.X simplifies the management of storage arrays.

ProtectPoint uses the encapsulation functionality of FAST.X to preserve the existing data on the Data Domain storage, and enables a user to access the external LUNs through the VMAX array. The Data Domain devices are encapsulated and exported from the VMAX array as thin devices.

ProtectPoint supports FAST.X intelligent pairing to allow the VMAX to automatically choose the encapsulated devices to use for a restore operation.

The *EMC Solutions Enabler Symmetrix Array Controls CLI Product Guide* provides more information about FAST.X.

**SnapVX**

SnapVX is a snapshot mechanism that is available on the VMAX array. The VMAX to Data Domain workflow uses SnapVX technology to create snapshots on the VMAX array and efficiently move data to the Data Domain system without impacting the host application.

TimeFinder SnapVX provides very low impact snapshots for VMAX data volumes. Users can assign names to identify their snapshots, and can optionally set automatic expiration dates on each snapshot. SnapVX provides the ability to manage consistent point-in-time copies for storage groups with a single operation.

The *EMC Solutions Enabler TimeFinder Family CLI User Guide* provides more information about SnapVX.
**Solutions Enabler**

Solutions Enabler is an interface that enables the application administrator or other user to configure storage resources, take snapshots, and perform other operations on the VMAX array. To perform supported operations on the VMAX array, such as taking local data snapshots, a script or external management entity can use Solutions Enabler.

The *EMC Solutions Enabler Array Management CLI User Guide* provides more information about Solutions Enabler.

---

**Note**

When you install Solutions Enabler, configure it to use the same user account on the application recovery host as the ProtectPoint file system agent. The Solutions Enabler documentation provides information on how to configure a user account without root access.

---

**Supported replication topologies**

ProtectPoint for VMAX supports several replication topologies.

The following are definitions for the terminology that is used to describe the supported replication topologies.

**Backup**

Backup to Data Domain.

**Full application rollback restore**

Overwrites the backup source LUNs with a backup.

**Object level restore**

Making the copies that are on Data Domain available for mount to the recovery host. The database application agent and the Microsoft application agent also restore the files that are required for recovery automatically.

---

**Supported VMAX Symmetrix Remote Data Facility replication topologies**

ProtectPoint supports several Symmetrix Remote Data Facility (SRDF) configurations and topologies.

---

**Note**

The first full backup after a full restore triggers a full SRDF replication.

The following VMAX documentation provides details about the interaction between SRDF and SnapVX:

- Appendix B SRDF operations and TimeFinder sessions of the *EMC Solutions Enabler SRDF Family CLI User Guide*
- Appendix B SRDF State Rules Reference of the *EMC Solutions Enabler TimeFinder Family CLI User Guide*

The following tables display whether the specified ProtectPoint operations are supported on the corresponding site when there is a VMAX SRDF in synchronous...
mode (SRDF/S) or asynchronous mode (SRDF/A) from site 1 to site 2. SRDF/Metro is not supported as indicated in the last table.

Any site that has the backup or restore supported requires:

- A physical Fibre Channel connection to Data Domain.
- Primary and protection storage that is provisioned correctly.

For information about provisioning, refer to the [EMC ProtectPoint Primary and Protection Storage Configuration Guide](#).

**Table 6 SRDF/S support**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Site 1</th>
<th>Site 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>File system agent backup</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Database application agent backup</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>File system agent full application rollback restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Database application agent full application rollback restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>File system agent object level restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Database application agent object level restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
</tbody>
</table>

**Table 7 SRDF/A support**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Site 1</th>
<th>Site 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>File system agent backup</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Database application agent backup</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>File system agent full application rollback restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Database application agent full application rollback restore</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>File system agent object level restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Database application agent object level restore</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
</tbody>
</table>

**Table 8 SRDF/Metro support**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Site 1</th>
<th>Site 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>File system agent backup</td>
<td>Not supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>Database application agent backup</td>
<td>Not supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>File system agent full application rollback restore</td>
<td>Not supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>Database application agent full application rollback restore</td>
<td>Not supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>File system agent object level restore</td>
<td>Not supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>Database application agent object level restore</td>
<td>Not supported</td>
<td>Not supported</td>
</tr>
</tbody>
</table>

**SRDF/S**

The file system agent is agnostic to SRDF/S. A user can decide what sites to backup and what sites to restore to. To perform a rollback restore, a user must suspend SRDF/S, and then restore the link.
Different from the file system agent, the database application agent discovers the SRDF/S link and corresponding site 2 devices. In addition to backing up from site 1 devices, the database application agent can perform backups from site 2 automatically when configured to do so. The database application agent can also perform rollback from site 2 to site 1 automatically when the agent is running from the application host at site 1.

**Note**

The database application agent cannot perform backups concurrently at site 1 and site 2 in the same backup job.

It does not matter which site a backup is taken from, the file system agent or the database application agent can enable or perform an object level restore to a recovery host on any site. Restore devices must be provisioned to the recovery host.

**Note**

With the database application agent, rollback restore at site 2 is not supported because data is always rolled back to the original VMAX source devices at site 1.

In the following diagram, a source LUN referred to as R1 on the site 1 array is associated with a source LUN referred to as R2 on the site 2 array. The SRDF/S software maintains continuous synchronization of the two sources by copying all changes from the R1 LUN to the R2 LUN.

Refer to the *EMC ProtectPoint File System Agent Installation and Administration Guide* and *EMC Data Domain Boost for Enterprise Applications and EMC ProtectPoint Database Application Agent Installation and Administration Guide* for configuration details.
In the following diagram, a source LUN referred to as R1 on the site 1 array is associated with a source LUN referred to as R2 on the site 2 array. The SRDF/S software maintains continuous synchronization of the two sources by copying all changes from the R1 LUN to the R2 LUN. Also, site 1 and site 2 have a Fibre Channel connection to their own Data Domain Restorer (DDR). There is no Data Domain replication between the DDRs.

In this topology, frequent backups can be taken at site 1, and less frequent backups can be taken at site 2 using the SRDF/S link.
SRDF/A

The file system agent is agnostic to SRDF/A. A user can decide what sites to backup and what sites to restore to. To perform a rollback restore, a user must suspend SRDF/A, and then restore the link.

The database application agent can back up and roll back from site 1.

It does not matter which site a backup is taken from, the file system agent or the database application agent can enable or perform an object level restore to a recovery host on any site. Restore devices must be provisioned to the recovery host.

**NOTICE**

If a snapshot and backup are performed using a site 2 device, the data is a lagged copy of the production data. Therefore, if the application data flushes any data during quiesce mode, data may not be captured on site 2 when a snapshot is taken from site 2. In this case, to ensure that the remote target datafile is updated with quiesced data before a snapshot and backup are performed on the R2 device, use an SRDF checkpoint command.
Supported Data Domain replication topologies

The following table displays the restore operations from Data Domain that ProtectPoint agents support when there is a Data Domain replication from site 1 to site 2.

Table 9 Data Domain replication support

<table>
<thead>
<tr>
<th>Operation</th>
<th>Site 1</th>
<th>Site 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>File system agent full application rollback restore</td>
<td>Supported</td>
<td>Only for VMAX</td>
</tr>
<tr>
<td>Database application agent full application rollback restore</td>
<td>Supported</td>
<td>Only for VMAX</td>
</tr>
<tr>
<td>Microsoft application agent full application rollback restore</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>File system agent object level restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Database application agent object level restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Microsoft application agent object level restore</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
</tbody>
</table>

Supported VPLEX replication topologies

VPLEX support for VMAX is only available through a Request Price Quotation (RPQ). The ProtectPoint For File Systems with VMAX3 and VPLEX: Offloading Backup and Recovery White Paper includes additional information.
CHAPTER 3

ProtectPoint for XtremIO

This chapter includes the following topics:

- Overview ............................................................................................................36
- Environment .......................................................................................................40
- Prerequisites .......................................................................................................41
- Supported replication topologies .......................................................................44
Overview

ProtectPoint for XtremIO with RecoverPoint integrates primary storage and protection storage for backups on a Data Domain system. ProtectPoint provides block movement of the data on application source LUNs to Data Domain LUNs.

ProtectPoint for XtremIO with RecoverPoint requires both IP network (LAN or WAN) and Fibre Channel (FC) storage area network (SAN) connectivity. The following table lists the required topologies for connecting each component.

**Table 10** ProtectPoint topology requirements

<table>
<thead>
<tr>
<th>Connected components</th>
<th>Connection type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary application host to primary storage system</td>
<td>FC SAN</td>
</tr>
<tr>
<td>Primary application host to RecoverPoint cluster</td>
<td>IP LAN</td>
</tr>
<tr>
<td>Primary recovery host to primary storage system</td>
<td>FC SAN and IP LAN</td>
</tr>
<tr>
<td>Primary recovery host to RecoverPoint cluster</td>
<td>IP LAN</td>
</tr>
<tr>
<td>Primary recovery host to primary Data Domain system</td>
<td>FC SAN</td>
</tr>
<tr>
<td>Primary storage to RecoverPoint cluster</td>
<td>FC SAN and IP LAN</td>
</tr>
<tr>
<td>RecoverPoint cluster to primary Data Domain system</td>
<td>FC SAN and IP LAN</td>
</tr>
<tr>
<td>(Optional) Primary Data Domain system to secondary Data Domain system</td>
<td>IP WAN</td>
</tr>
</tbody>
</table>

The following figure displays a sample primary site topology.

**Note**

The thin gray lines represent IP connections, and the thicker blue lines represent FC connections.
In this figure the numbers represent the following:

1. Application host
2. XtremIO system
3. Primary Data Domain system
4. RecoverPoint appliance
5. Recovery host (optional)
6. Secondary Data Domain system (optional)
7. Secondary recovery host (optional)

ProtectPoint for XtremIO with RecoverPoint works with the features on the Data Domain system, the RecoverPoint appliance, and the XtremIO cluster to provide primary storage to Data Domain protection. ProtectPoint uses the following features:

- On the Data Domain system:
  - Block services for ProtectPoint
  - FastCopy
  - DD Boost
- On the RecoverPoint appliance:
  - Catalog for RecoverPoint appliance
  - Consistency groups
- On the XtremIO cluster:
  - Initiator Groups

ProtectPoint for XtremIO with RecoverPoint enables an application administrator to leverage the ProtectPoint workflow to protect applications and application data. The storage administrator configures the underlying storage resources on the primary storage system and the Data Domain system. With this storage configuration information, RecoverPoint, and the ProtectPoint software executable, the application administrator can trigger the workflow to protect the application. Before triggering
the workflow, the application administrator must quiesce the application to ensure that an application-consistent snapshot is preserved on the Data Domain system.

**Note**

The ProtectPoint database application agent works with the application to quiesce the application automatically.

In addition to backing up and protecting data, the application administrator must retain and replicate copies, restore data, and recover applications. The combination of ProtectPoint and the primary storage to Data Domain workflow enables the application administrator to complete all of these operations.

For restoring data, ProtectPoint enables the application administrator to select a specific backup and make that backup available on selected primary storage devices. The operations to mask, mount, and restore the data must be performed manually on the primary storage system. The workflow provides a copy of the data, but not any application intelligence.

**Basic backup workflow**

In the basic backup workflow, data is transferred from the primary storage system to the Data Domain system. ProtectPoint manages the data flow, but does not modify the data.

To create a copy or backup of an application, the application administrator or other appropriate user must ensure that the source LUNs are in an application-consistent state. The application administrator must quiesce the application before initiating the backup operation. Using ProtectPoint to create the backup on the primary storage system enables the application administrator to minimize the disruption to the application.

After creating the snapshot, RecoverPoint moves the snapshot to the Data Domain system. The primary storage system tracks the data that has changed since the last update to the Data Domain system, and then only copies the changed data. After all the data that is captured in the snapshot is copied, the Data Domain system creates a static-image of the data. The static-image of the data reflects the application-consistent copy that is initially created on the primary storage system.

The backup workflow consists of the following steps:

1. On the application host, the application administrator quiesces the application.
2. On the primary storage system, the administrator uses ProtectPoint to create a snapshot of the primary storage device. It is safe to unquiesce the application when this step is complete.
3. RecoverPoint analyzes the data, and then copies the changed data to a Data Domain storage device.
4. The Data Domain system creates, and then stores a static-image of the snapshot.

The following figure displays the basic backup workflow.
Note

The objects in the vdisk pool in the figure represent static-images. Each column represents one backup operation.

**Basic restore workflow**

ProtectPoint for XtremIO allows application administrators to restore data directly from the restore devices on the Data Domain system to the application recovery host, without involving the primary storage or the RecoverPoint cluster.

ProtectPoint for XtremIO supports object-level restores and rollback restores:

- **Object-level restores**
  
  The application administrator performs the following steps:
  
  1. Selects the backup image on the Data Domain system.
  2. To present to the application recovery host, uses ProtectPoint to restore the data to a new set of Data Domain block services for ProtectPoint devices (restore devices) that are visible to the application recovery host.
  3. Mounts the storage device to the host.
  4. Uses operating system and application-specific tools and commands to restore specific objects.

- **Rollback restores**
  
  The ProtectPoint agent performs the following steps:
  
  1. Selects the backup from the catalog.
  2. To present to the application recovery host, restores the data to a new set of Data Domain block services for ProtectPoint devices (restore devices).
3. Copies the entire backup back to the original production devices, overwriting the current contents of the production devices.

The rollback restore workflow consists of the following steps:

1. The application administrator selects a backup to use for the rollback restore.
2. The application administrator starts the rollback operation, and the ProtectPoint file system agent executes the rollback.

The following figure displays the basic restore workflow for an object level restore.

Figure 13 Basic restore workflow

Environment

The ProtectPoint for XtremIO with RecoverPoint environment consists of the following components:

- **Data Domain:**
  - A Data Domain system with a supported Data Domain Operating System.
  - Data Domain block services for ProtectPoint.
  - DD Boost.
  - (Optional) Data Domain MTree replication.

- **RecoverPoint:**
  - A RecoverPoint cluster with two to eight RecoverPoint appliances.

- **XtremIO:**
  - An XtremIO cluster running Storage Array Software.

- **Application:**
Prerequisites

The following are prerequisites for all ProtectPoint for XtremIO with RecoverPoint operations.

ProtectPoint file system agent prerequisites

The ProtectPoint file system agent prerequisites for all ProtectPoint for XtremIO with RecoverPoint operations are as follows:

- User accounts for block services for ProtectPoint, and DD Boost must be created on the Data Domain system.
- (Optional) Create a user account on the RecoverPoint appliance.
- The ProtectPoint file system agent must be installed on the application recovery host.

Database application agent and Microsoft application agent prerequisites

The database and Microsoft application agent prerequisites for ProtectPoint operations are as follows:

- A valid license for the ProtectPoint environment.
- The application agent must be installed on the production and recovery host.
- User accounts for block services for ProtectPoint, and DD Boost must be created on the Data Domain system.
- (Optional) Create a user account on the RecoverPoint appliance.

RecoverPoint prerequisites

The RecoverPoint prerequisites for all ProtectPoint for XtremIO operations are as follows:

- A RecoverPoint backup (BK) license.
- A RecoverPoint cluster with RecoverPoint appliances, running RecoverPoint software.
- Port 443 must be open between the RecoverPoint appliances, the XtremIO Management System, and the XtremIO System-wide Management (SYM) module on X1-Storage Controller 1 (X1-SC1) and X1-Storage Controller 2 (X1-SC2) IP addresses.
- Port 11111 must be open between the RecoverPoint appliances and XtremIO SYM module on X1-SC1 and X1-SC2.
- IP connectivity must be configured between the RecoverPoint appliance and the Data Domain system.
  For IP connections between the RecoverPoint appliances and the Data Domain system, the Data Domain ifgroup feature provides improved network performance.
by spreading the network traffic across multiple network interfaces. The *EMC Data Domain Operating System Administration Guide* provides more details about ifgroups.

- FC zoning between the RPA and the XtremIO cluster. FC zoning is optional between the RecoverPoint appliance and the Data Domain system.
- (Optional) FC zoning between the RecoverPoint appliance and the Data Domain system is only required if DD Boost over FC is used for communication between the RecoverPoint appliance and the Data Domain system:
  - Zone at least two initiators from the RecoverPoint appliance to the Data Domain system.
  - One zone per fabric between the RecoverPoint appliance and the XtremIO cluster. Include all the RecoverPoint appliance ports that are intended for XtremIO connectivity, and all the XtremIO ports that are intended for RecoverPoint appliance connectivity in the zone.
  - Zone the RecoverPoint initiators to multiple targets on the Data Domain system or XtremIO cluster in accordance with RecoverPoint best practices.

**XtremIO prerequisites**

The XtremIO prerequisites for all ProtectPoint for XtremIO operations are as follows:

- An XtremIO cluster running XtremIO software.
- FC zoning must be configured between the XtremIO cluster and the application recovery host:
  - Use a single-initiator per single-target (1:1) zoning scheme or use multipathing between XtremIO and the hosts for failover and redundancy. If the FC switchzone count limitation has been reached, it is also possible to use single-initiator per multiple-target (1:many) zoning scheme.
  - The optimal number of paths depends on the operating system and server information. To avoid multipathing performance degradation, do not use more than 16 paths per device.
  - Enable MPIO if two or more paths are zoned to a Windows application recovery host.

**Data Domain prerequisites**

The Data Domain prerequisites for all ProtectPoint for XtremIO operations are as follows:

- A Data Domain system that ProtectPoint supports.
- Block services for ProtectPoint must be enabled on the Data Domain system.
- A Data Domain system with DD Boost enabled.
- Data Domain Cloud Tier can be enabled, but the Data Domain storage unit that ProtectPoint uses cannot have a data movement policy.

**DD Boost prerequisites**

Enable the DD Boost service, and then create a storage unit.

**Data Domain block services prerequisites**

The prerequisites for Data Domain block services operations are as follows:
(Optional) Create the Data Domain file system (DDFS).

Configure a username and password for ownership of the Data Domain block services for ProtectPoint devices. It is recommended that you create this user with the none role. If required, other roles can be configured.

Apply a Data Domain block services for ProtectPoint license.

Data Domain storage layout

The following figure displays the storage layout of the DDFS.

**Figure 14 DDFS storage layout**

In this figure the numbers represent the following:

1. /data
2. /data/coll
3. /data/coll/backup
4. /data/coll/MTree2
5. /data/coll/MTree3

The following table describes each element of the DDFS storage layout.

**Table 11 DDFS storage elements**

<table>
<thead>
<tr>
<th>DDFS directory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/data</td>
<td>Top-level directory of the Data Domain storage file system. This directory cannot be changed.</td>
</tr>
<tr>
<td>/data/coll</td>
<td>Represents a collection of data, and enables the expansion of the file system by creating additional collections, col2, col3, col4, and so on.</td>
</tr>
<tr>
<td>/data/coll/backup</td>
<td>Contains backups of the data and directory structure of the collection. This MTree cannot be deleted or renamed. Subdirectories can be created to organize and separate the data.</td>
</tr>
</tbody>
</table>
Table 11 DDFS storage elements (continued)

<table>
<thead>
<tr>
<th>DDFS directory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/data/col1/MTree&lt;X&gt;</td>
<td>Represents the lowest level of the Data Domain storage file system. Each MTree is an independently managed directory. Data Domain allows up to 100 MTrees to be created, but performance degradation occurs when more than 32 MTrees are active at one time.</td>
</tr>
</tbody>
</table>

Data Domain block services for ProtectPoint

Data Domain block services for ProtectPoint allow you to create devices, device groups, and device pools. The DD Boost service allows you to configure storage units. Block services also provide additional functionality, such as creating static-images (snapshots) and replicating data.

The *EMC Data Domain Operating System Command Reference Guide* provides more information about the block services for ProtectPoint and the `vdisk` commands that control them.

Data Domain file system

The Data Domain file system (DDFS) stores the block services for ProtectPoint objects. For example, a block services static-image can be treated as a file that resides within the DDFS. Therefore, replicating a static-image is the same as replicating a file. By leveraging the services that are provided by the DDFS, the block service for ProtectPoint can efficiently create static-images of LUNs.

**Note**

The DDFS automatically defragments backups that are created in a ProtectPoint environment to prevent performance degradation over time.

The *EMC Data Domain Operating System Administration Guide* provides more information about the DDFS.

Supported replication topologies

ProtectPoint for XtremIO with RecoverPoint supports several replication topologies.

The following are definitions for the terminology that is used to describe the supported replication topologies.

**Backup**

Backup to Data Domain.

**Full application rollback restore**

Overwrites the backup source LUNs with a backup.

**Object level restore**

Making the copies that are on Data Domain available for mount to the recovery host. The database application agent and the Microsoft application agent also restore the files that are required for recovery automatically.
Supported RecoverPoint replication topologies

The following tables display the RecoverPoint replication topologies that the ProtectPoint agents support at site 1 and site 2.

Any site that is supported requires:

- The recovery host to have a Fibre Channel connection to Data Domain where the backup copies exist.
- Restore devices from that Data Domain that are provisioned correctly to the recovery host.

For information about provisioning, refer to the *EMC ProtectPoint Primary and Protection Storage Configuration Guide*.

### Table 12: RecoverPoint Local Replication

<table>
<thead>
<tr>
<th>Operation</th>
<th>Site 1</th>
<th>Site 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>File system agent backup</td>
<td>Not supported</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Database application agent backup</td>
<td>Not supported</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Microsoft application agent backup</td>
<td>Not supported</td>
<td>Not applicable</td>
</tr>
<tr>
<td>File system agent full application rollback restore</td>
<td>Not supported</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Database application agent full application rollback restore</td>
<td>Not supported</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Microsoft application agent full application rollback restore</td>
<td>Not supported</td>
<td>Not applicable</td>
</tr>
<tr>
<td>File system agent object level restore</td>
<td>Not supported</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Database application agent object level restore</td>
<td>Not supported</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Microsoft application agent object level restore</td>
<td>Not supported</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

RecoverPoint does not support local replication for the specified set of source devices when those devices are configured to back up to Data Domain with ProtectPoint.

### Table 13: RecoverPoint Remote Replication

<table>
<thead>
<tr>
<th>Operation</th>
<th>Site 1</th>
<th>Site 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>File system agent backup</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>Database application agent backup</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>Microsoft application agent backup</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>File system agent full application rollback restore</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>Database application agent full application rollback restore</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>Microsoft application agent full application rollback restore</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>File system agent object level restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Database application agent object level restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Microsoft application agent object level restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
</tbody>
</table>
For RecoverPoint Remote Replication, at site 1, ProtectPoint backup and restore from site 1 is supported. At site 2, RecoverPoint supports Remote Replication but does not support Data Domain backup on the replication site.

Data Domain replication without a RecoverPoint appliance at site 2

ProtectPoint supports a disaster recovery configuration that includes Data Domain replication without a RecoverPoint appliance (RPA) at site 2.

This configuration is recommended when an RPA cluster does not exist at site 2. ProtectPoint agent backups are stored on the Data Domain Restorer (DDR) at site 1. The backups are replicated to a site 2 DDR with Data Domain MTree or Data Domain Collection replication.

Figure 15 Data Domain replication without a RecoverPoint appliance at site 2

To configure the Data Domain replication, use the Data Domain management user interface or the Data Domain Operating System (DDOS) CLI.

The following list includes the benefits of this configuration:

- At site 1, restores can be performed from the site 1 DDR. Object level restores and rollbacks are supported.
- At site 2, after a site 1 failure, an object level restore can be performed to a recovery host from the site 2 DDR.
At site 1, a restore to a recovery host can be performed from a site 2 DDR.

Data Domain replication with a RecoverPoint appliance at site 2

ProtectPoint supports a disaster recovery configuration that includes Data Domain replication with a RecoverPoint appliance (RPA) at site 2.

In this configuration, each RPA consistency group has a production volume on an XtremIO, a site 1 copy on a Data Domain, and a site 2 copy. A ProtectPoint agent backup is initiated from site 1 and stored on the site 1 Data Domain. A benefit of this configuration is the RecoverPoint Remote Replication.

Figure 16 Data Domain replication with a RecoverPoint appliance at site 2

At site 1, the following tasks can be performed:

- RecoverPoint product restores from the site 2 copy.
- ProtectPoint agent object level or rollback restores from the site 1 Data Domain Restorer (DDR).

At site 2, the following tasks can be performed:

- ProtectPoint agent object level or rollback restores from the site 2 DDR.
- After a site 1 failure, failovers can be performed to the RPA site 2 copy.
 Supported Data Domain replication topologies

The following table displays the restore operations from Data Domain that ProtectPoint agents support when there is a Data Domain replication from site 1 to site 2.

**Table 14 Data Domain replication support**

<table>
<thead>
<tr>
<th>Operation</th>
<th>Site 1</th>
<th>Site 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>File system agent full application rollback restore</td>
<td>Supported</td>
<td>Only for VMAX</td>
</tr>
<tr>
<td>Database application agent full application rollback restore</td>
<td>Supported</td>
<td>Only for VMAX</td>
</tr>
<tr>
<td>Microsoft application agent full application rollback restore</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>File system agent object level restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Database application agent object level restore</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Microsoft application agent object level restore</td>
<td>Supported</td>
<td>Not supported</td>
</tr>
</tbody>
</table>
CHAPTER 4

Application Storage Configuration

This chapter includes the following topics:

- Application storage configuration overview.............................................................. 50
- Data Domain sizing considerations........................................................................ 50
- Discovering application storage............................................................................. 51
- VMAX storage configuration................................................................................... 51
- RecoverPoint and XtremIO storage configuration.................................................. 54
Application storage configuration overview

Application storage is the primary storage for application data. This storage often consists of a number of separate LUNs that have file systems. Mount points or drive letters make the storage available to the application host. These LUNs are the source for any ProtectPoint backup. The following sections provide information about configuring or discovering LUNs, and using that information to create the equivalent snapshot target and recovery LUNs.

If it is not necessary to provision new application storage. Discovering application storage on page 51 includes information about discovering the existing application storage.

When configuring application storage, complete the following high-level processes:

- Provision primary storage LUNs to the application recovery host.
- For VMAX configurations, connect Data Domain devices to the primary storage system.
- For XtremIO with RecoverPoint configurations, register the Data Domain to RecoverPoint.

Provision the LUNs on the primary storage system to the application recovery host first. Then connect the Data Domain devices to the primary storage system.

The second procedure, connecting the Data Domain devices to the primary storage system, requires storage management visibility into both system environments. You complete some tasks in the primary storage environment and other tasks in the Data Domain environment. Therefore, you must have one window open to the primary storage environment and one window open to the Data Domain environment. You switch between environments as you connect the Data Domain devices to the primary storage system.

Data Domain sizing considerations

To plan for provisioning the primary storage for ProtectPoint, use the best practices and limits that are defined in the documentation for the primary storage system.

The following guidelines apply to provisioning an appropriate amount of storage on the primary Data Domain system, and if applicable, providing an appropriate amount of storage at the secondary site:

- To accommodate all the application recovery hosts in the deployment, verify that sufficient capacity is available on the primary Data Domain system. Each primary storage LUN requires block services devices of equal or greater size on the primary Data Domain system. One device is for backups, and the other device is for restores.
- If applicable, verify that the primary storage system and Data Domain system at the secondary site have available storage capacity that is greater than or equal to the storage capacity at the production site.

To estimate the required logical capacity on the Data Domain system, use the following values:

- **Number**: The number of LUNs to back up.
- **Size**: The size of each LUN to back up.
- **Copies**: The number of backups to keep.
To account for copies of the data on both the backup and restore devices, add two to the number of backups to keep.

The formula for calculating the logical capacity is: \((\text{Number} \times \text{Size}) \times (\text{Copies} + 2)\)

The following table displays an example with 10 LUNs that are each 10 GB, keeping five backups.

**Table 15** Sizing calculation example

<table>
<thead>
<tr>
<th>Element</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>10</td>
</tr>
<tr>
<td>Size</td>
<td>10 GB</td>
</tr>
<tr>
<td>Copies</td>
<td>(5 + 2)</td>
</tr>
<tr>
<td>Required capacity</td>
<td>700 GB</td>
</tr>
</tbody>
</table>

**Note**

Logical capacity is calculated before compression and deduplication. Compression and deduplication reduce the actual amount of capacity consumed.

Capacity monitoring is available at the following levels:

- Logical capacity is reported at the system, MTree (block services for ProtectPoint pool), and file (static-image) levels.
- Actual capacity is reported at the system level.

**Discovering application storage**

Configure ProtectPoint after storage provisioning is complete by discovering existing application storage, and then using the storage to determine the Data Domain storage requirements. The storage administrator can help identify all the necessary storage configuration information.

The information that is required includes, but is not limited to, the number of devices allocated to the application, the geometry of the devices created, and awareness of the masking views, ports used, and SAN zoning. The process to provision the Data Domain storage and connect the storage to the primary storage system is identical to provisioning new storage.

**VMAX storage configuration**

VMAX storage configuration for ProtectPoint includes provisioning VMAX storage to the application recovery host, and encapsulating Data Domain restore devices on the VMAX array.

**Provisioning LUNs on the VMAX array to the application recovery host**

Provisioning VMAX storage for the application recovery host consists of the following tasks:

- Create a storage group.
- Add the devices to the storage group.
Create a port group.
Add the front-end ports to the port group where the server is zoned.
Create an initiator group.
Add the initiator WWNs of the application recovery host to the initiator group.
Create a masking view.
Discover newly provisioned LUNs on the application recovery host.

**Note**
These tasks are for provisioning VMAX storage for new installations. Some of these tasks might not be required in all cases.

**Encapsulating Data Domain devices on the VMAX array**

Encapsulating Data Domain storage devices on the VMAX array consists of the following prerequisites and tasks.

**Note**
The following tasks are for encapsulating Data Domain storage on the VMAX array for new installations. Some of these tasks may not be required in all cases.

**Prerequisites**
The following are prerequisites for encapsulating Data Domain storage devices on the VMAX array:

- Before you begin, to determine the devices in use, use the commands in the *Data Domain Operating System Administration Guide* and the Solutions Enabler functionality. Then use that information to complete the tasks in this section, as applicable.
- You must have already provisioned LUNs on the VMAX array to the application recovery host.
- You know or can obtain the geometry of the devices that are created on the VMAX array.
- You are logged in to the host where Solutions Enabler is installed.
- You complete some tasks in the VMAX environment, and other tasks in the Data Domain environment. Therefore, you must have one window open to the VMAX environment and one window open to the Data Domain environment.
- Complete the following tasks on the Data Domain system:
  1. Log in to an SSH session on the Data Domain system.
  2. Enable block services for ProtectPoint if not already enabled.
  3. Create a block services for ProtectPoint device pool.
  4. Create a block services for ProtectPoint device-group.
  5. Create block services for ProtectPoint devices that have the equivalent or larger geometry as the VMAX primary LUNs. Create two block services for ProtectPoint devices for every device that is created on the VMAX array, one for backups and one for restores.
  6. Create an access group on the Data Domain.
7. Add the block services for ProtectPoint devices to the access group on the Data Domain.
8. Verify that the VMAX DX ports and the Data Domain endpoint ports are zoned together.
9. View the list of VMAX initiators on the Data Domain.
10. Add the VMAX initiators to the access group on the Data Domain.

- To complete the following steps on the VMAX array, use Solutions Enabler:
  1. View the back-end ports (DX ports) on the VMAX array and display the WWNs.
  2. Display the LUNs that are visible for a specific WWN.
  3. List the disk groups that are available on the VMAX array.
  4. Use the FAST.X functionality to encapsulate the Data Domain disks on the VMAX array.

- Encapsulating an external LUN creates the VMAX LUN that enables access to the external LUN. Manually set the encapsulated LUN as the snapshot target. Encapsulating the block services for ProtectPoint restore LUNs is required for restoration operations.
- The VMAX array must have four paths to the Data Domain system to correctly enable the relationship between the two systems. Prerequisites on page 23 provides more information about path requirements.

Configuring the Data Domain system

**Procedure**

1. Log in to an SSH session on the Data Domain system.
2. Enable block services for ProtectPoint if not already enabled.
3. Create a block services for ProtectPoint device pool.
4. Create a block services for ProtectPoint device-group.
5. Create block services for ProtectPoint devices that have the equivalent or larger geometry as the VMAX primary LUNs. Create two block services for ProtectPoint devices for every device that is created on the VMAX array, one for backups and one for restores.
6. Create an access group on the Data Domain.
7. Add the block services for ProtectPoint devices to the access group on the Data Domain.
8. Verify that the VMAX DX ports and the Data Domain endpoint ports are zoned together.
9. View the list of VMAX initiators on the Data Domain.
10. Add the VMAX initiators to the access group on the Data Domain.

Configuring the VMAX array

To complete the following tasks on the VMAX array, use Solutions Enabler.

**Procedure**

1. View the back-end ports (DX ports) on the VMAX array and display the WWNs.
2. Display the LUNs that are visible for a specific WWN.
3. List the disk groups that are available on the VMAX array.
4. Use the FAST.X functionality to encapsulate the Data Domain disks on the VMAX array.

**RecoverPoint and XtremIO storage configuration**

RecoverPoint and XtremIO storage configuration for ProtectPoint consists of provisioning storage on the XtremIO cluster, integrating the XtremIO cluster with the RecoverPoint cluster, and creating the backup and restore devices on the Data Domain system.

The following tasks are for configuring storage for new installations. Some of these tasks might not be required in all cases.

**Configuring the XtremIO cluster**

**Procedure**

1. Create an Initiator Group, and register all the RecoverPoint cluster FC ports to the Initiator Group.
2. Provision Volumes on the XtremIO cluster, and make the Volumes available to the application recovery host.

**Configuring the RecoverPoint cluster**

**Procedure**

1. Register the XtremIO Management Server on the RecoverPoint cluster.
2. Register the Data Domain system on the RecoverPoint cluster.
3. Create a RecoverPoint consistency group that contains all the XtremIO Volumes created for the ProtectPoint environment.

**Configuring the Data Domain system**

**Procedure**

1. On the Data Domain system, log in to an SSH session.
2. If block services for ProtectPoint is not already enabled, enable block services for ProtectPoint.
3. If DD Boost is not already enabled, enable DD Boost.
4. Create a block services for ProtectPoint pool where the ProtectPoint static-images are to reside.
5. Create a storage unit on the ProtectPoint MTree. This storage unit is the destination for restore data from the RecoverPoint cluster.
6. Create two block services for ProtectPoint device pools. One pool is for backups and the other pool is for restores.
After creating the block services for ProtectPoint device pool, RecoverPoint automatically creates the block services for ProtectPoint device-groups and devices that are required for ProtectPoint with RecoverPoint backups.

7. Create a block-services for ProtectPoint device-group for restores that resides in the restore pool.

8. Populate the restore device-group with restore devices of the same size as the production LUNs you are backing up.