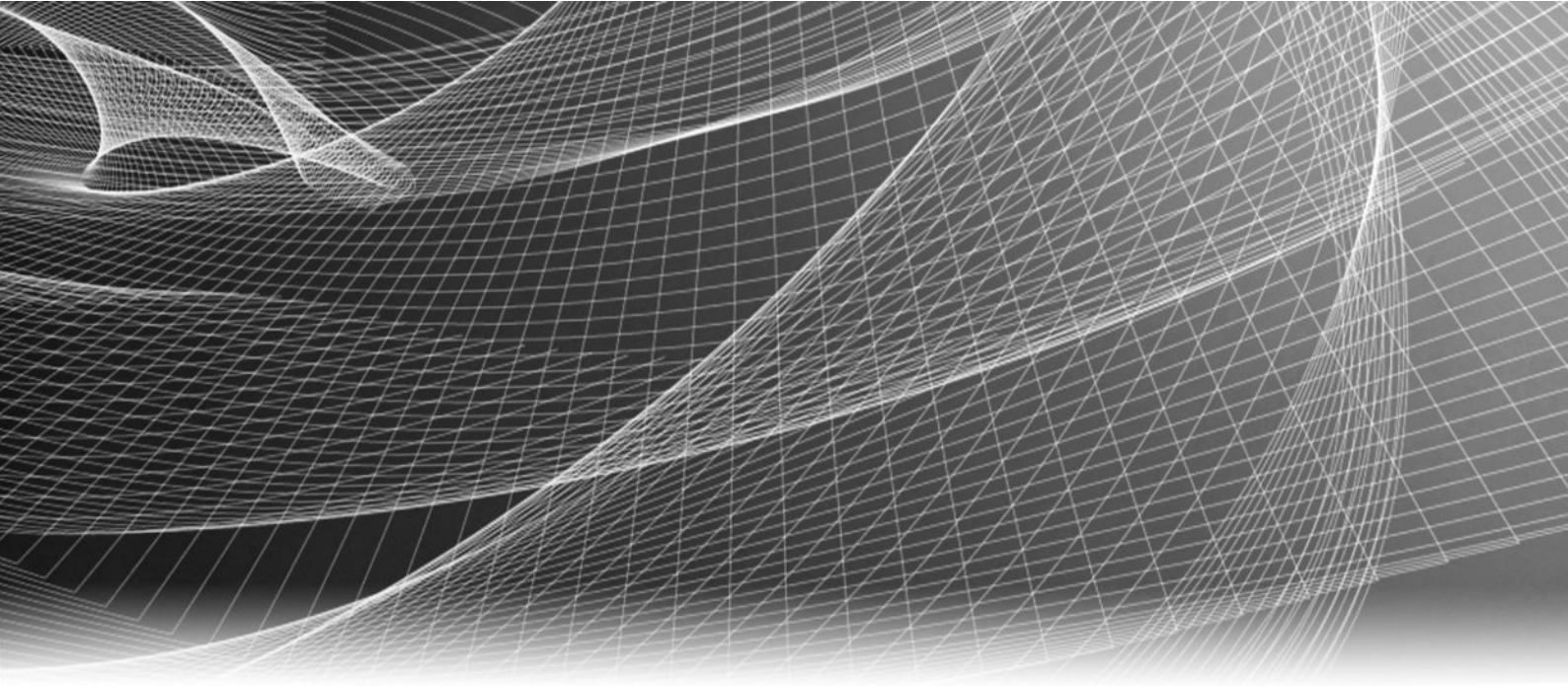

EMC® Avamar® 7.3 and EMC Data Domain® System

Integration Guide

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REV 01

EMC²

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PREFACE

As part of an effort to improve its product lines, EMC periodically releases revisions of its software and hardware. Therefore, some functions described in this document might not be supported by all versions of the software or hardware currently in use. The product release notes provide the most up-to-date information on product features.

Contact your EMC technical support professional if a product does not function properly or does not function as described in this document.

Note

This document was accurate at publication time. Go to EMC Online Support (https://support.emc.com) to ensure that you are using the latest version of this document.

Purpose

This guide describes how to configure and use a Data Domain system as a backup target for Avamar.

Audience

The information in this guide is primarily intended for system administrators who are responsible for configuring and maintaining Avamar and Data Domain system integrated backups.

Revision history

The following table presents the revision history of this document.

Table 1 Revision history

Revision	Date	Description
01	April, 2016	GA release of Avamar 7.3

Related documentation

The following EMC publications provide additional information:

- *EMC Avamar Compatibility and Interoperability Matrix*
- *EMC Avamar Release Notes*
- *EMC Avamar Administration Guide*
- *EMC Avamar Operational Best Practices*
- *EMC Avamar Product Security Guide*
- *EMC Avamar for IBM DB2 User Guide*
- *EMC Avamar for Exchange VSS User Guide*
- *EMC Avamar for Hyper-V VSS User Guide*
- *EMC Avamar for SAP with Oracle User Guide*
- *EMC Avamar for SharePoint VSS User Guide*
- *EMC Avamar for SQL Server User Guide*
- *EMC Avamar for Sybase ASE User Guide*

- *EMC Avamar for Oracle User Guide*
- *EMC Avamar for VMware User Guide*

The following Data Domain publications also provide additional information:

- *DD OS Release Notes*
- *DD OS Initial Configuration Guide*
- *DD OS Administration Guide*
- *DD OS Command Reference*
- *DD OS Command Reference Guide*
- *Data Domain Hardware Guide*
- The Data Domain installation and setup guides for each of the supported platforms (for example, DD610, DD690, DD880, and so forth)

Special notice conventions used in this document

EMC uses the following conventions for special notices:

NOTICE

Addresses practices not related to personal injury.

Note

Presents information that is important, but not hazard-related.

Typographical conventions

EMC uses the following type style conventions in this document:

Bold	Use for names of interface elements, such as names of windows, dialog boxes, buttons, fields, tab names, key names, and menu paths (what the user specifically selects or clicks)
Italic	Use for full titles of publications referenced in text
`Monospace`	Use for: • System code • System output, such as an error message or script • Pathnames, file names, prompts, and syntax • Commands and options
Monospace italic	Use for variables
`Monospace bold`	Use for user input
[ ]	Square brackets enclose optional values
|	Vertical bar indicates alternate selections - the bar means “or”
{ }	Braces enclose content that the user must specify, such as x or y or z
...	Ellipses indicate nonessential information omitted from the example

Where to get help

The Avamar support page 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 EMC Customer Support.

To access the Avamar support page:

1. Go to https://support.EMC.com/products.
2. Type a product name in the **Find a Product** box.
3. Select the product from the list that appears.
4. Click the arrow next to the **Find a Product** box.
5. (Optional) Add the product to the **My Products** list by clicking **Add to my products** in the top right corner of the **Support by Product** page.

Documentation

The Avamar product documentation provides a comprehensive set of feature overview, operational task, and technical reference information. Review the following documents in addition to product administration and user guides:

- Release notes provide an overview of new features and known limitations for a release.
- Technical notes provide technical details about specific product features, including step-by-step tasks, where necessary.
- White papers provide an in-depth technical perspective of a product or products as applied to critical business issues or requirements.

Knowledgebase

The EMC Knowledgebase contains applicable solutions that you can search for either by solution number (for example, esgxxxxxx) or by keyword.

To search the EMC Knowledgebase:

1. Click the **Search** link at the top of the page.
2. Type either the solution number or keywords in the search box.
3. (Optional) Limit the search to specific products by typing a product name in the **Scope by product** box and then selecting the product from the list that appears.
4. Select **Knowledgebase** from the **Scope by resource** list.
5. (Optional) Specify advanced options by clicking **Advanced options** and specifying values in the available fields.
6. Click the search button.

Online communities

Visit EMC Community Network at http://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 EMC products.

Live chat

To engage EMC Customer Support by using live interactive chat, click **Join Live Chat** on the **Service Center** panel of the Avamar support page.

Service Requests

For in-depth help from EMC Customer Support, submit a service request by clicking **Create Service Requests** on the **Service Center** panel of the Avamar support page.

Note

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

To review an open service request, click the **Service Center** link on the **Service Center** panel, and then click **View and manage service requests**.

Facilitating support

EMC recommends that you enable ConnectEMC and Email Home on all Avamar systems:

- ConnectEMC automatically generates service requests for high priority events.
- Email Home emails configuration, capacity, and general system information to EMC Customer Support.

Your comments

Your suggestions will help us continue to improve the accuracy, organization, and overall quality of the user publications. Send your opinions of this document to DPAD.Doc.Feedback@emc.com.

Please include the following information:

- Product name and version
- Document name, part number, and revision (for example, 01)
- Page numbers
- Other details that will help us address the documentation issue

CHAPTER 1

Introduction

This chapter includes the following topics:

Overview

EMC® Data Domain® deduplication storage systems are typically implemented to back up large high-change rate databases. EMC Avamar® is typically implemented to back up file systems, virtual servers, low change rate databases, remote offices, and desktop/ laptops.

Avamar and Data Domain system integration enables:

- Data Domain systems to be a backup target for Avamar backups
- One or more Data Domain systems to be managed by Avamar
- Avamar clients to use the EMC Data Domain Boost software option to use Data Domain systems as backup targets
- The target destination of backup data, which is set by a backup policy at the dataset level
- Transparent user interaction to the backup target (Avamar or Data Domain)

Architecture

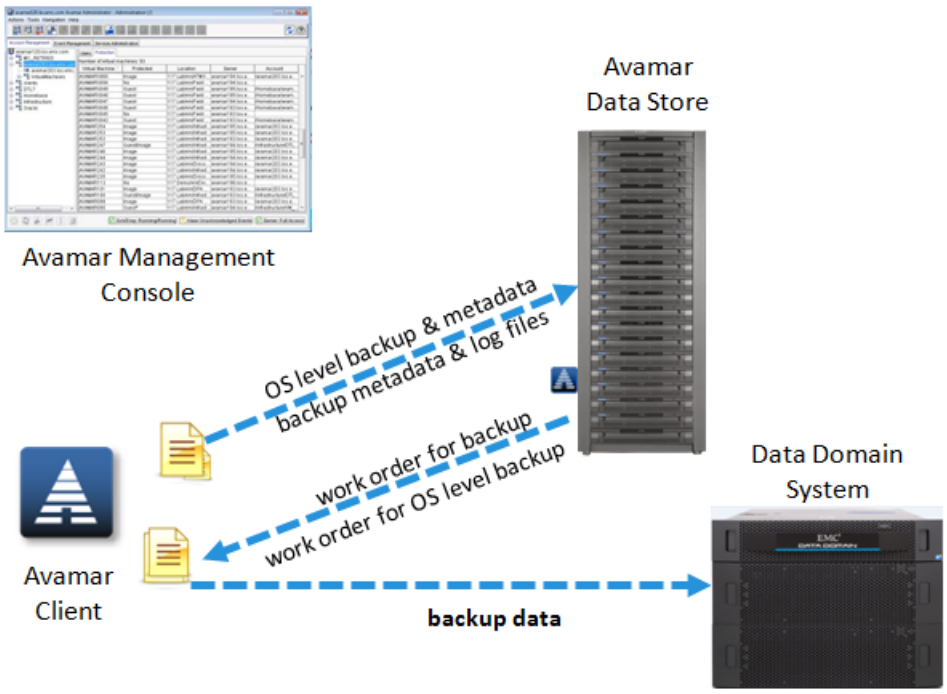
A Data Domain system performs deduplication through DD OS software. Avamar source based deduplication to a Data Domain system is facilitated through the use of the Data Domain Boost library.

Avamar uses the DD Boost library through API-based integration to access and manipulate directories, files, and so forth. contained on the Data Domain File System. The DD Boost API gives Avamar visibility into some of the properties and capabilities of the Data Domain system. This enables Avamar to control backup images stored on Data Domain systems. It also enables Avamar to manage maintenance activities and to control replication to remote Data Domain systems.

DD Boost is installed on the backup clients and on the Avamar utility node, an Avamar single node system, or on Avamar Virtual Edition.

The following figure depicts a high-level architecture of the combined Avamar and Data Domain solution. With Avamar and Data Domain integration you can specify whether specific datasets in an Avamar backup policy target an Avamar server or a Data Domain system.

Figure 1 Avamar and Data Domain system workflow



When you select an Avamar server as the backup target, the Avamar client on each host performs deduplication segment processing. Data and metadata are stored on the Avamar server.

When you select a Data Domain system as the backup target, backup data is transferred to the Data Domain system. The related metadata generated by the Avamar client software is simultaneously sent to the Avamar server for storage. The metadata enables the Avamar management system to perform restore operations directly from the Data Domain system without first going through the Avamar server.

Mixed backups are supported. It is possible for backup data to span across both Avamar servers and a Data Domain system within the same backup.

If backups are taking place to an Avamar server and then redirected to a Data Domain system, then subsequent incremental backup data will be stored on the Data Domain system while the original backup data is on the Avamar server. This can affect capacity because the forever incremental data will continue to reside on the Avamar Server while newer/changed incremental data will be stored on the Data Domain system.

If the desire is to ensure backup data is released on the Avamar server and redirect backups to data domain then a full backup must be initiated. This can be achieved by renaming the client's cache files, which will force a full backup. However, note that this will cause the client's backup to take longer and impact performance since it will have to create a new backup on the Data Domain system. If there are many clients that need to be moved to a Data Domain system then it is recommended that the initial full backup be scheduled appropriately to avoid performance impact.

If the capacity on the Avamar server is not a concern then the system will continue to backup incremental backup data to the Data Domain but its prior backup data will remain on the Avamar server until it expires. The implication is that when the last backup containing parts on the Avamar server expire, then a full backup will trigger. The recommendation is to perform a controlled and/or scheduled full backup.

Backup

During a backup, the Avamar server sends a backup request to the Avamar client. If the backup request includes the option to use a Data Domain system as the target, backup data is stored on the Data Domain system. Metadata is stored on the Avamar server.

The following topics provide details on the types of backup data that Avamar can store on a Data Domain system.

Up-to-date client compatibility information is available in the *EMC Avamar Compatibility and Interoperability Matrix* on EMC Online Support at https://support.EMC.com.

Avamar checkpoints

You can store checkpoints for a single-node Avamar server or Avamar Virtual Edition (AVE) on a Data Domain system. Checkpoints are system-wide backups taken for disaster recovery of the Avamar server.

Storage of checkpoints on a Data Domain system is useful in environments that do not have a secondary Avamar server and Data Domain system for replication, or in environments where most backups are stored on a Data Domain system.

Restore of checkpoints from a Data Domain system requires assistance from EMC Professional Services.

Restore

The process of data recovery from a Data Domain system is transparent to the backup administrator. The backup administrator uses the same Avamar recovery processes that are native to current Avamar implementations.

VMware Instant Access

VMware Instant Access is used to boot up a lost or corrupted virtual machine almost instantaneously from an image backup stored on a Data Domain system.

VMware Instant Access works through the following processes:

1. A virtual machine image backup is staged to a temporary location on the Data Domain system.
2. The virtual machine is exported to a temporary location as a secure NFS share.
3. The share is mounted as a NFS datastore on an ESX/ESXi host.

When VMware Instant Access is used, the virtual machine should not be left running on the Data Domain system for extended periods. When the virtual machine runs on the Data Domain system, performance might degrade because of the workflow. To move the VMware Instant Access from the Data Domain system to the VMware production environment, use vMotion.

An alternative to VMware Instant Access is to restore a virtual machine back to the production environment. The Avamar software's ability to leverage Changed Block Tracking (CBT) dramatically speeds the recovery process. If performance problems occur when an ISP is hosting multitenancy clients, you can disable instant access. In the `datadomain` section of `mcserver.xml`, set `ddr_instant_access_enabled` to `false`.

The *EMC Avamar for VMware User Guide* provides additional information on VMware Instant Access.

Replication

Replication between primary and replica Data Domain systems is integrated into the Avamar management feature set. This is configured in Avamar Administrator through the Avamar replication policies applied to each dataset.

All typical Avamar replication scenarios are supported for datasets that use a Data Domain system as a target, including:

- Many-to-one, one-to-many, cascading replication
- Extension of data retention times
- Root-to-root

Monitoring and reporting

Avamar can collect and display data for health monitoring, system alerts, and capacity reporting on a Data Domain system by using Simple Network Management Protocol (SNMP).

This enables you to monitor Data Domain activities, events, capacity, and system status in the same way that you monitor activities, events, capacity, and system status for the Avamar server.

You can also run reports to analyze the system.

Security

The connection between the Avamar client and the Data Domain system is encrypted if you use Avamar 7.1 clients, Avamar 7.1 server(s) and DD OS 5.5.x. Previous versions of software do not support data encryption between the client and the Data Domain system. Backups from the Avamar client to the Avamar server are always compressed and encrypted by default.

Use caution when granting users access to the Data Domain system. A user should not be able to directly access the Data Domain system and manually delete data.

Token-based authentication

With release 7.3 of the Avamar software, Avamar can establish a connection to a Data Domain system running DDOS 5.7 or greater by using Data Domain Boost token-based authentication. This allows Avamar clients to connect securely to the Data Domain system without passing user name and password information.

Token-based authentication is enabled by default in Avamar 7.3, by setting the `use_ddr_auth_token` parameter in the `mcserver.xml` file on the Avamar server to **`true`**. To disable token-based authentication, set `use_ddr_auth_token` to **`false`**.

The amount of time that an authentication token is valid is set in the `mcserver.xml` by using the `dr_auth_token_duration` parameter. By default, this parameter is set to 36000 seconds (ten hours). Some backup and replication jobs, such as NDMP backups, may require that the authentication token be valid for a longer period of time.

Configuring a ddboost account for token-based authentication

To configure a ddboost account for token based authentication:

Procedure

1. On the Data Domain system, log in as sysadmin and create a user with admin rights and assign the user as a ddboost user:

   a. **user add *newuser* role admin**

   b. **ddboost user assign *newuser***

   where *newuser* is the user name for the new ddboost user.

2. In the Avamar Administrator, add a new or edit an existing Data Domain to connect with Avamar using the new ddboost user.

   Adding a Data Domain system on page 25 and Editing a Data Domain system on page 26 provide instructions for adding and editing Data Domain systems.

3. On the Data Domain system, log in as sysadmin and associate the new ddboost user with the Avamar mtree:

   ddboost storage-unit modify *storage-unit* user *newuser*
   where *storage-unit* is the mtree of the Avamar system, usually in a format like `avamar-1234567890`, and *newuser* is the user name for the new ddboost user.

After you finish

Perform a test backup to ensure that the configuration was successful.

Data migration

You cannot migrate backup data directly from the Avamar server to the Data Domain system.

To start using the Data Domain system as the backup target for an Avamar client instead of the Avamar server, edit the dataset to use the Data Domain system, and start performing backups to the Data Domain system. When you change the backup target to the Data Domain system, you must perform a full backup.

After you successfully perform a backup to the Data Domain system, you can delete the earlier backups from the Avamar server. The *EMC Avamar Administration Guide* provides details on how to delete backups.

CHAPTER 2

Avamar and Data Domain System Integration

This chapter includes the following topics:

Pre-integration requirements

Ensure that the environment meets all system requirements before you integrate a Data Domain system with Avamar.

Note

This chapter assumes the Avamar server and any Data Domain systems are installed and configured.

Data Domain system requirements

To support Avamar and Data Domain integration, ensure the environment meets the Data Domain system requirements listed in the following table.

Table 2 Data Domain system requirements

Data Domain feature or specification	Requirement for use with Avamar
Data Domain Operating System (DD OS)	Check the Avamar and Data Domain Compatibility Interoperability Matrix for the most current information.
DD Boost	Check the Avamar and Data Domain Compatibility Interoperability Matrix for the most current information DD Boost software enables backup servers to communicate with storage systems without the need for Data Domain systems to emulate tape. There are two components to DD Boost: one component that runs on the backup server and another that runs on the Data Domain system. In the context of Avamar, the component that runs on the backup server (DD Boost libraries) is integrated into the Avamar Client. DD Boost software is an optional product that requires a license to operate on the Data Domain system.
Data Domain device type	Avamar supports any Data Domain system that supports the execution of the required DD OS version.
Data Domain File System	Enable Data Domain File System using either the Data Domain System Manager or CLI. After you enable file system operations, it may take up to 10 minutes before Avamar Administrator correctly reflects the status of the Data Domain system, especially if the Data Domain system is using the DD Extended Retention option. Do not perform backups, restores, or system maintenance operations until the status appears correctly in Avamar Administrator. Otherwise, the backups, restores, or system maintenance operations may fail.
DD Boost user account	The DD Boost library uses a unique login account name created on the Data Domain system. This account name is known as the DD Boost account. If the account is renamed and/or the password is changed, these changes must be immediately updated on the Avamar system by editing the Data Domain configuration options. Failure to update the DD Boost account information could potentially yield integrity check errors and/or backup/

Table 2 Data Domain system requirements (continued)

Data Domain feature or specification	Requirement for use with Avamar
	restore problems. The DD Boost account must have administrator privileges.

Note

When you enable DD Boost on the Data Domain device, DD Boost becomes the preferred method of connectivity for any clients that are enabled for DD Boost. While this method is acceptable for clients that can take advantage of DD Boost features, it can result in performance degradation for other clients. Proper due diligence and effective data gathering are keys to avoiding such interactions, especially during upgrades.

Network requirements

The following sections list network requirements for Avamar and Data Domain system integration.

Network throughput

Before integrating a Data Domain system with an Avamar server, ensure that enough network bandwidth is available.

To obtain the maximum throughput available on a Data Domain system (for restores, level zero backups, and subsequent incremental backups after a level-zero backup), verify that the network infrastructure provides more bandwidth than the bandwidth required by the maximum throughput of the Data Domain system.

Network configuration

Configure (or verify) the following network configuration:

- Assign a fully qualified domain name (FQDN) to each Data Domain system.
- Do not use IP addresses in place of hostnames when registering a Data Domain system. This can limit the ability to route optimized duplication traffic exclusively through a registered interface.
- Ensure that DNS on the Data Domain system is properly configured.
- Ensure forward and reverse DNS lookups work between the following systems:
  - Avamar server
  - Data Domain system
  - Backup and restore clients
- Use hosts files to resolve hostnames to non-routable IP addresses.
- Do not create secondary hostnames to associate with alternate or local IP interfaces.

NTP requirements

Configure the Avamar server and Data Domain system to use the same Network Time Protocol (NTP) Server.

Licensing requirements

Ensure that the environment meets the licensing requirements in the following table.

Table 3 Licensing requirements

Product	Licensing requirements
Avamar	Standard Avamar licensing requirements apply.
Data Domain	The DD Boost license must be installed on the Data Domain system. For replication from one Data Domain system to another, a replication license must be installed.

Data port usage and firewall requirements

To enable communication between Avamar and the Data Domain systems, review and implement the port usage and firewall requirements in the following documents:

- *EMC Avamar Product Security Guide*
- "Port Requirements for Allowing Access to Data Domain System Through a Firewall," on EMC Online Support

Capacity requirements

Carefully assess your backup storage needs when evaluating how much data to store on the Data Domain system and the Avamar server. Include estimates from data that is sent to the Data Domain system from any other servers.

Review the capacity management information in the EMC Avamar Administration Guide.

When the Data Domain system reaches its maximum storage capacity, no further backups to the Data Domain system occur until additional capacity is added or old backups are deleted.

Data Domain system streams

Each Data Domain system has a soft limit to the maximum number of connection and data streams that can be sustained simultaneously while maintaining performance. The number of streams varies depending on the Data Domain system model.

For example, the EMC Data Domain DD990 can support 540 backup streams, while the EMC Data Domain DD620 can support 20 backup streams. You configure the maximum number of streams Avamar can use when you add a Data Domain system to the Avamar server.

The Avamar server uses the backup stream value to limit the number of concurrent backup or restore jobs. If the Data Domain system is fully dedicated to the Avamar server, the stream value entered in Avamar Administrator could potentially be the maximum number of streams supported by the Data Domain system model. In cases where the Data Domain system is shared with other third-party applications or another Avamar server, then a subset of the number of streams should be allocated.

Each Avamar backup client (that supports multi-stream backups) can be configured to use the appropriate number of streams (typically based on the number of databases) through multi-streaming configuration when the Avamar backup job is configured. The streams are released when the backup/restore operation completes. The number of streams allocated should depend on the number and type of Avamar clients that backs up data at about the same time.

Note

Avamar jobs are used for backups, restores, and replication. Avamar 7.1 integrated with a Data Domain system can support up to 336 jobs concurrently. Each job can consist of multiple streams. Avamar 7.1 integrated with a Data Domain system supports a maximum of 500 streams (maxconn). The limits of 336 jobs/500 streams are fixed for all Avamar integrations with Data Domain systems (Avamar Virtual Edition, Single Node Avamar, or Multi-Node Avamar). Avamar 7.1 backing up to an Avamar Data Store supports the original number of jobs per node (72) with a maximum 107 streams per node (maxconn).

Existing backup products in use with Data Domain

Data Domain systems can use other third-party backup and archiving software. The Avamar server does not assume it has sole ownership of the Data Domain system. Ensure that proper sizing is evaluated if the system is shared with other software products.

The Avamar server makes no use of the native Data Domain system snapshot and replication features. Replication occurs through the DD Boost SDK library by using copying and cloning. However, other third party products may make use of the native Data Domain system snapshot and replication features. In this case, a snapshot of an entire Data Domain system or a replication of an entire Data Domain system includes the Avamar data.

Preparing the Data Domain system for Avamar integration

Before you can add a Data Domain system to the Avamar configuration, prepare the Data Domain system by enabling DD Boost and creating a DD Boost user account for the Avamar server to use to access the Data Domain system for backups and restores (and replication, if applicable).

Note

DD OS 5.5 and later supports the use of multiple DD Boost accounts, which can be used for segregation of accounts when multiple backup programs are sharing a common Data Domain system.

Procedure

1. Disable DD Boost on the Data Domain system by logging in to the Data Domain CLI as an administrative user and typing **`ddboost disable`**.
2. Create a DD Boost account and password:
   a. Create the user account with admin privileges by typing the following command:

      `user add user role admin`

      where *user* is the username for the new account.

   b. Set the new account as the DD Boost user by typing the following command:

ddboost set user-name *user*

where *user* is the username for the account.

3. Enable DD Boost to allow the changes to take effect by typing **ddboost enable**.

After you finish

- By default encryption is enabled for Data Domain systems through Avamar. If you leave encryption enabled, the `passphrase` command must be set on the Data Domain system. The *EMC Data Domain Operating System Administration Guide* provides additional information on the `passphrase` command.
- If you change the DD Boost account name or password, edit the Data Domain system configuration in Avamar Administrator. Otherwise all backups, restores, and maintenance activities fail.

Configuring IP support

The IP configuration depends on the versions of IP and DD OS in the environment. The following topics provide details.

Configuring dual stack IPv4 and IPv6 support

If you are using IPv4 exclusively, or both IPv4 and IPv6, the configuration can be set through the GUI without any special configuration.

IPv6 support requires DD OS 5.5.x.

Configuring IPv6 support with DD OS 5.5.1

To add the Data Domain system exclusively with IPv6, edit the `mcserver.xml` file.

Procedure

1. Open a command shell and log in by using one of the following methods:
   - For a single-node server, log in to the server as admin.
   - For a multi-node server, log in to the utility node as admin.
2. Stop the MCS by typing **dpnctl stop mcs**.
3. Open `/usr/local/avamar/var/mc/server_data/prefs/mcserver.xml` in a UNIX text editor.
4. Find the `ipv6_only_supported` entry key.
5. Change the `ipv6_only_supported` setting to **true**.

   ```
   <entry key="ipv6_only_supported" value="true" />
   ```

6. Close `mcserver.xml` and save your changes.
7. Start the MCS by typing **dpnctl start mcs**.

Configuring IPv6 with DD OS 5.5.0

DD OS 5.5.0 in an integrated Avamar and Data Domain system configuration requires dual stack IPv4 and IPv6.

Procedure

1. Open a command shell and log in by using one of the following methods:

- For a single-node server, log in to the server as admin.
- For a multi-node server, log in to the utility node as admin.

2. Stop the MCS by typing **dpnctl stop mcs**.
3. Open /usr/local/avamar/var/mc/server_data/prefs/mcserver.xml in a UNIX text editor.
4. Find the ipv6_only_supported entry key.
5. Change the ipv6_only_supported setting to **true**.

   ```
   <entry key="ipv6_only_supported" value="true" />
   ```

6. Close mcserver.xml and save your changes.
7. Start the MCS by typing **dpnctl start mcs**.
8. Open /etc/hosts in a UNIX text editor.
9. Add an extra line for each IPv6 Data Domain system to the /etc/hosts file in the dual-stacked Avamar server in the following format:

   ```
   <IPv4 address of DD server> <IPv6 FQDN of DD server> <IPv6
   hostname of DD server> <IPv4 FQDN of DD server> <IPv4
   hostname of DD server>
   ```

10. Close /etc/hosts and save the changes.

Adding a Data Domain system

Procedure

1. In Avamar Administrator, click the **Server** launcher button.

   The **Server** window appears.
2. Click the **Server Management** tab.
3. Select **Actions** › **Add Data Domain System**.

   The **Add Data Domain System** dialog box appears.
4. On the **System** tab, specify Data Domain system information:
   a. In the **Data Domain System Name** box, type the fully qualified domain name of the Data Domain system to add.

   Note

   Do not use an IP address or a secondary hostname that associates with alternative or local IP interfaces. It may limit the ability of Avamar to route optimized deduplication traffic.

   b. In the **DDBoost User Name** box, type the username of the DD Boost account for Avamar to use to access the Data Domain system for backups, restores, and replication.
   c. In the **Password** box, type the password for the account that Avamar should use to access the Data Domain system for backups, restores, and replication.
   d. In the **Verify Password** box, type the password again to verify it.
   e. If you have more than one Data Domain system associated with Avamar, you can specify one Data Domain system to be the default replication storage. Select **Use**

system as default replication storage if this system is the default replication storage.

f. To store checkpoints for a single-node Avamar server or Avamar Virtual Edition (AVE) server on the Data Domain system instead of the Avamar server, select the **Use as target for Avamar Checkpoint Backups** checkbox.

g. Click **Get Stream Info** to view the maximum number of streams that the Data Domain system supports.

h. Specify the maximum number of streams that Avamar can use at any one time to perform backups and restores:

- To specify a defined number of streams, type the number in the **Max used by Avamar** box.
- To specify a maximum number of streams based on the percentage of the total number of supported streams, type the percentage in the **Max used by Avamar** box and then select the **As percentage of the max limit** checkbox.

Consider both the maximum number of streams that the Data Domain system supports, as well as whether other applications are using streams to send data to and receive data from the Data Domain system.

If the processes writing to and reading from the Data Domain system use all available streams, then Avamar queues backup or restore requests until one or more streams become available.

5. To configure SNMP, click the **SNMP** tab.

   SNMP configuration enables Avamar to collect and display data for system health monitoring, system alerts, and capacity reporting.

6. Verify the SNMP configuration:
   - The **Getter/Setter Port Number** box lists the port on the Data Domain system from which to receive and on which to set SNMP objects. The default value is 161.
   - The **SNMP Community String** box lists the community string Avamar uses for read-only access to the Data Domain system.
   - The **Trap Port Number** box lists the trap port on the Avamar server. The default value is 163.
7. Click **OK**.

   A progress message appears.

8. When the operation completes, click **Close**.

Results

When you add a Data Domain system to the Avamar configuration, Avamar creates an MTree on the Data Domain system for the Avamar server. The MTree refers to the directory created within the DD Boost path. Data Domain systems support a maximum of 100 MTrees. If you reach the limit, then you cannot add the Data Domain system to the Avamar configuration.

Editing a Data Domain system

Procedure

1. In Avamar Administrator, click the **Server** launcher button.

   The **Server** window appears.

2. Click the **Server Management** tab.
3. Select the Data Domain system to edit.
4. Select **Actions** › **Edit Data Domain System**.

   The **Edit Data Domain System** dialog box appears.
5. Edit the settings for the Data Domain system as necessary.

   The settings are the same as the settings that you specified when you added the Data Domain system to the Avamar configuration.
6. (Optional) If the **Re-add SSH Key** and **Re-add Trap Host** buttons are enabled, then click the buttons to restore the SSH key and trap host values on the Data Domain system.

   When these buttons are enabled, the configuration on the Avamar server is not synchronized with the configuration on the Data Domain system. Clicking the buttons restores the values to the Data Domain system to ensure synchronization.
7. Click **OK**.

   A confirmation message appears.
8. After the edits are complete, click **Close**.

After you finish

If you edited the Data Domain system name, the DD Boost username, or the DD Boost password, then create and validate a new checkpoint. If you perform a rollback to a checkpoint with the outdated Data Domain system name or DD Boost information, then the rollback fails. The *EMC Avamar Administration Guide* provides instructions on creating and validating checkpoints.

Deleting a Data Domain system

You can delete a Data Domain system from the Avamar configuration if the Data Domain system is online and if there are multiple Data Domain systems configured on the Avamar server.

If you are deleting the only Data Domain system configured on the Avamar server, or if the Data Domain system is offline, then the Avamar server requires advanced service. Contact your EMC sales representative to purchase this service.

Procedure

1. Ensure that no backups are stored on the Data Domain system:
   a. Delete each backup for all clients that use the Data Domain system as a backup target.
   b. Ensure that all backups on the Data Domain system are expired and deleted through the Avamar garbage collection process.
   c. Ensure that there are no checkpoints for the Avamar server that refer to backups on the Data Domain system by using one of the following methods:
      - Wait for all checkpoints that contain backups for the Data Domain system to expire.
      - Perform and validate a new checkpoint after all backups to the Data Domain system are deleted, and then delete all other checkpoints.
2. Ensure that the Data Domain system is not the default replication storage system.

Setting the default Data Domain destination on page 40 provides details.

3. In Avamar Administrator, click the **Server** launcher button.

   The **Server** window appears.
4. Click the **Server Management** tab.
5. Select the Data Domain system to delete.
6. Select **Actions** › **Delete Data Domain System**.

   A confirmation message appears.
7. Click **Yes**.

   A dialog box shows the progress of the operation.
8. When the deletion completes, click **Close**.

After you finish

Create and validate a new checkpoint. The *EMC Avamar Administration Guide* provides instructions on creating and validating checkpoints. If you perform a rollback to a checkpoint with the deleted Data Domain system, then the Data Domain system is restored to the configuration

Best practices for WAN backups

Review and implement the best practices in the following topics for environments with DD OS 5.5 or later and backups over a WAN.

Network throttling

The **Network rate throttle setting** in the plug-in options for file system plug-ins controls the rate at which Avamar sends data to the server. When you specify a value in Mbps for this option, the `avtar` process pauses as long as necessary after sending each packet to ensure that network usage does not exceed the specified maximum bandwidth.

Use of this option can improve WAN backups for desktop and laptop clients.

Efficient restore

Enable efficient restore by using the `--ddr-compressed-restore` option in `avtar` for better restore performance over a WAN.

Do not enable efficient restore for clients within the Data Center.

WAN bandwidth guidelines

The WAN use cases in the following table are estimates of typical latencies and bandwidths for the associated use cases. The following network characteristics were tested and are supported for backup over the WAN to an integrated Avamar and Data Domain system. The exact characteristics vary by network type.

Any network characteristics that exceed these requirements (for example, greater than 100ms latency) is not supported.

Table 4 WAN use case bandwidth guidelines

Use case configuration	Speed up/ down	Range of latency (in ms)	Jitter	Percentage of bandwidth usable by the integrated Avamar and Data Domain system
Laptop backup from home (DSL line) Home use DSL link shared with other devices	256kbps up / 4000kbps down	20-100	10% normal 25% bad	50-100%
Consumer WAN DSL/Cable Small remote office	683kbps up / 8000kbps down	20-100	10% normal 25% bad	10-100%
Business WAN Use case 1 T1 Remote office / branch office	1000kbps up / 1000kbps down	10-100	10% normal 20% bad	10-100%
Business WAN Use case 2 T1 Remote office / branch office	30Mbps up / 30Mbps down	10-100	10% normal 20% bad	10-100%
High Speed Dedicated T3 to 1GbE	667Mbps up / 667Mbps down	10-100	1% normal 5% bad	10-100%

Encryption in flight

When storing backups on or restoring data from a Data Domain system, you can specify the encryption method for data transfer between the client and the Data Domain system. The **Encryption method to Data Domain system** option appears in the plug-in options during a backup or restore.

The following values are supported:

- **Default**
- **None** (clear text)
- **Medium**
- **High**

The default value is **Default**, which is high encryption. To edit the default value for the option, edit the `mcserver.xml` file.

The following guidelines should be used for encryption best practices:

- For large backups or restores (for example, L0 backups) within the data center, set encryption to **Medium** or **None** to improve performance.
- If you have desktop/laptop clients backing up over a WAN, set encryption to **High.**

Note

Use the `--ddr-encrypt-strength` option to specify the encryption method during command line backups and restores. Available values are `none`, `medium`, and `high`.

System upgrades

The Avamar and Data Domain upgrade path is very specific. Failure to upgrade software in the proper order can cause Avamar maintenance functions to fail. If this happens and the GSAN fails, then rollback operations fail.

When you are upgrading the DD OS, ensure that the DD OS version that you upgrade to is compatible with both the current Avamar server version and the next Avamar server version.

The following figure illustrates a complete list of supported upgrade steps.

Figure 2 System upgrade paths

Skipping any intermediate steps can create an incompatibility issue that disrupts server operation.

Upgrading the DD OS from 5.4.0.8 to 5.5 before you upgrade the Avamar server to release 7.1 is desirable but not required. If you do not upgrade the DD OS to 5.5 before you upgrade the Avamar server to release 7.1, then upgrade the DD OS immediately afterward.

You can upgrade a Data Domain system without EMC support, but you must open a Service Request with EMC Customer Service before you upgrade the Avamar server. It is recommended that you open an Avamar Service Request before you upgrade a Data Domain system.

CHAPTER 3

Backups with Avamar and Data Domain

This chapter includes the following topics:

Overview of backups with Avamar and Data Domain

During a backup, the Avamar server sends a backup request to the Avamar client. If the backup request includes the option to use a Data Domain system as the target backup data is stored on the Data Domain system and metadata is stored on the Avamar server.

Where backup data is stored

All data for a backup is stored under a single dedicated MTree on a single Data Domain system.

How Avamar manages backup data

During a backup, Avamar sends the metadata for the backup from the client to the Avamar server. This process enables Avamar to manage the backup even though the data is stored on a Data Domain system.

Avamar does not store the original path and file name for a file on the Data Domain system. Instead, Avamar uses unique file names on the Data Domain system.

Supported backup types

You can perform full backups, incremental backups, and differential backups. Differential backups are only available for select clients or plug-ins when a Data Domain system is the backup target. You can also perform VMware backups with Changed Block Tracking enabled.

Store the full backup for a client and all subsequent incremental and differential backups on either the Avamar server or a single Data Domain system.

Avamar does not support:

- Full backup on a Data Domain system and incremental or differential backups on the Avamar server
- Full backup on the Avamar server and incremental or differential backups on a Data Domain system
- Full backup on one Data Domain system and incremental or differential backups on another Data Domain system

If you change the device on which backups for a client are stored, then you must perform a full backup before any further incremental or differential backups.

Note

When you use the Avamar Plug-in for SQL Server and you perform a tail-log backup during a restore, then the tail-log backup is always stored on the Avamar server.

Canceling and deleting backups

If you cancel a backup while it is in progress, then Avamar deletes the backup data that was written to the Data Domain system during the next cycle of the Avamar garbage collection process.

If you delete a backup in Avamar, then the backup is deleted from the Data Domain system during the next cycle of the Avamar garbage collection process.

The *EMC Avamar Administration Guide* provides instructions on how to cancel or delete a backup.

Selecting a Data Domain target for backups

To select a Data Domain system as the storage for a backup, select the **Store backup on Data Domain system** checkbox in the plug-in options for the backup, and then select the Data Domain system from the list.

Storing Avamar server checkpoints on a Data Domain system

You can store checkpoints for a single-node Avamar server or Avamar Virtual Edition (AVE) on a Data Domain system. Checkpoints are system-wide backups taken for disaster recovery of the Avamar server.

Restore of checkpoints from a Data Domain system requires assistance from EMC Professional Services.

The *EMC Avamar Administration Guide* provides details on checkpoints.

Procedure

1. In Avamar Administrator, click the **Server** launcher button.

   The **Server** window appears.
2. Click the **Server Management** tab.
3. Select a Data Domain system.
4. Select **Actions** › **Edit Data Domain System**.

   The **Edit Data Domain System** dialog box appears.
5. Click the **System** tab, and then select **Use system as target for Avamar Checkpoint Backups**.
6. Click **OK**.

   A confirmation message appears.
7. After the edits are complete, click **Close**.

CHAPTER 4

Replication

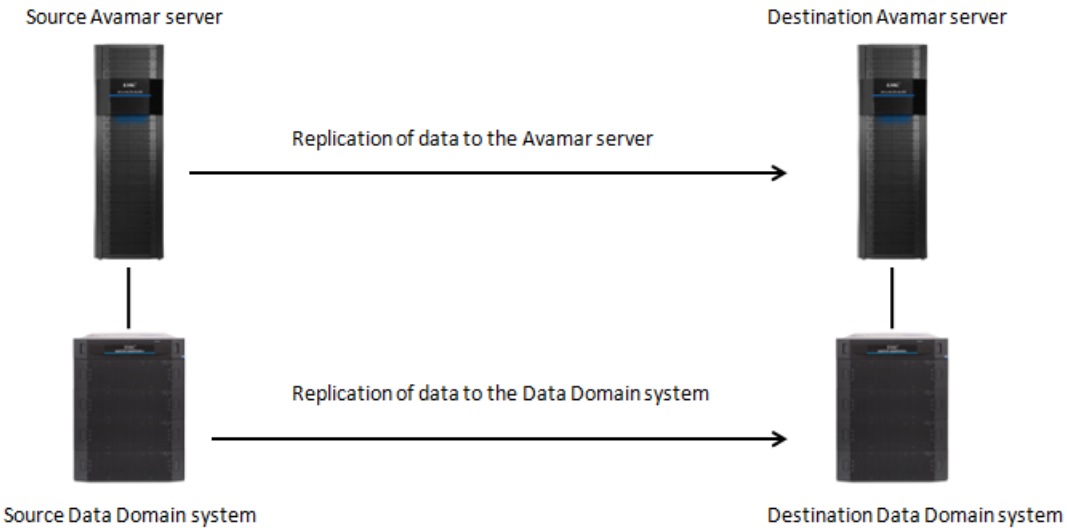
This chapter includes the following topics:

Overview of replication

The Avamar replication feature transfers data from a source Avamar server to a destination Avamar server. When you use a Data Domain system with Avamar, then the replication process transfers Avamar data from the source Data Domain system to a destination Data Domain system.

If a Data Domain system is configured with a source Avamar server, then there must be a corresponding Data Domain system configured with a destination server. If there is no destination Data Domain system configured with the destination Avamar server, then replication fails for backups on the source Data Domain system.

Figure 3 Data Domain basic replication



Replication configurations

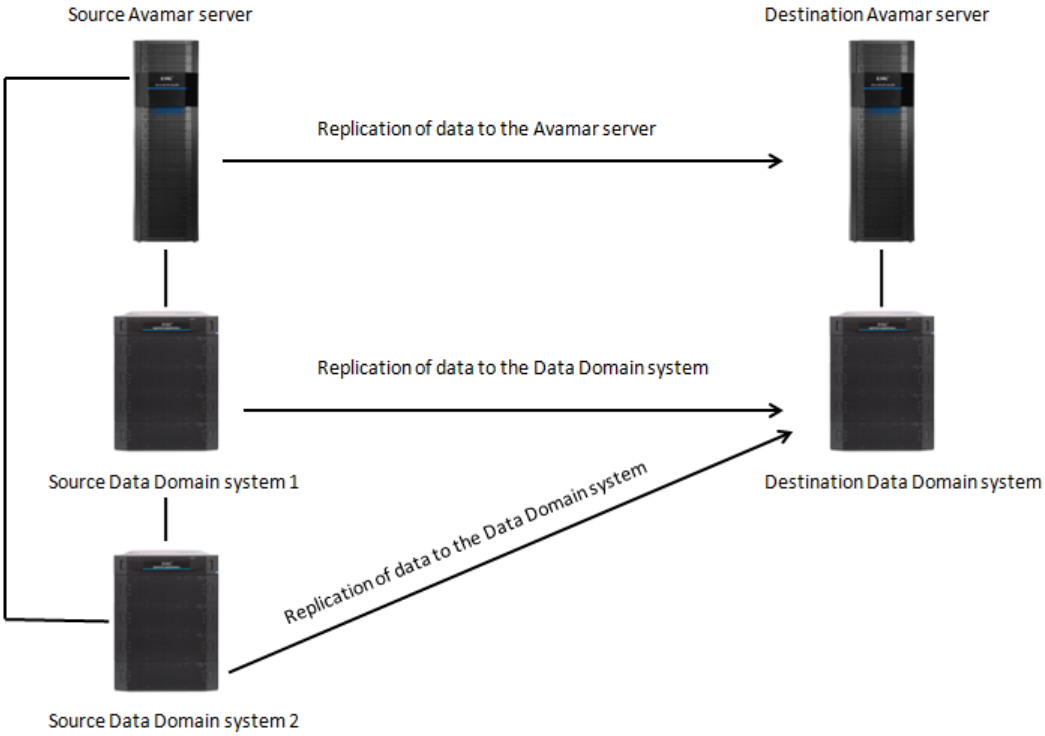
If the source Avamar server uses more than one Data Domain system, then you can use either a single destination Data Domain system or multiple destination systems. Also, if the source Avamar server uses a single Data Domain system, then you can use either a single destination Data Domain system or multiple destination systems. All of the data is replicated through DD Boost.

For long-term backup retention requirements on destination Data Domain systems, you can replicate from a source Data Domain system to destination Data Domain system with DD Extended Retention.

Many to one replication

The following figure illustrates a source Avamar server with two source Data Domain systems. Avamar replicates the backup data on the two source Data Domain systems to a single destination Data Domain system.

Figure 4 Data Domain system replication many to one configuration

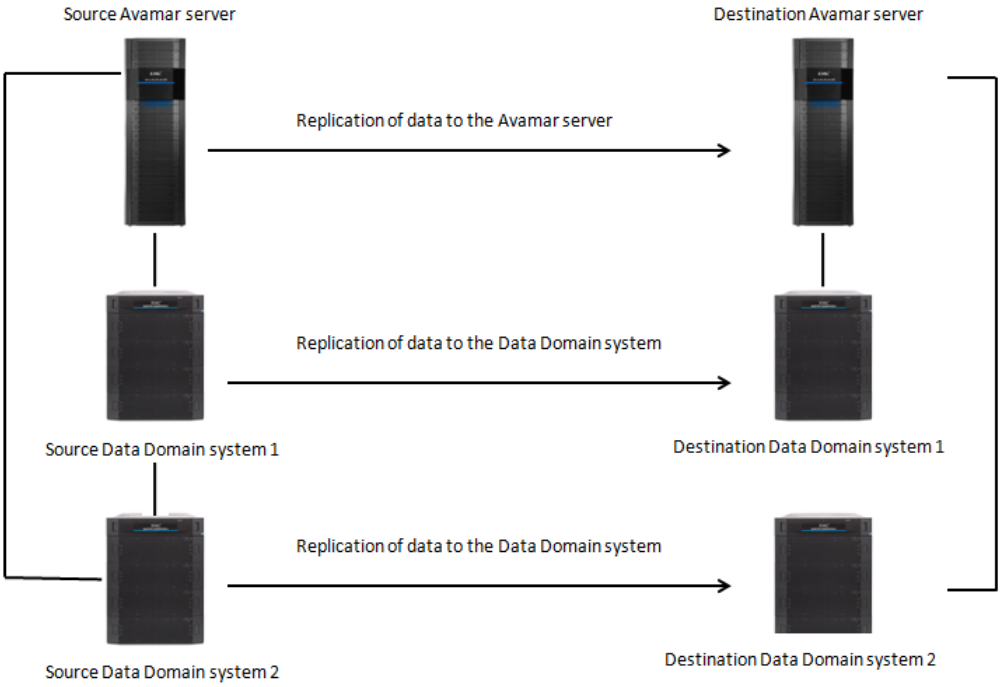


The destination Data Domain system must be able accommodate the replicated data from both source Data Domain systems.

Many to many replication

The following figure illustrates an environment with multiple destination Data Domain systems replicating to multiple destination Data Domain systems.

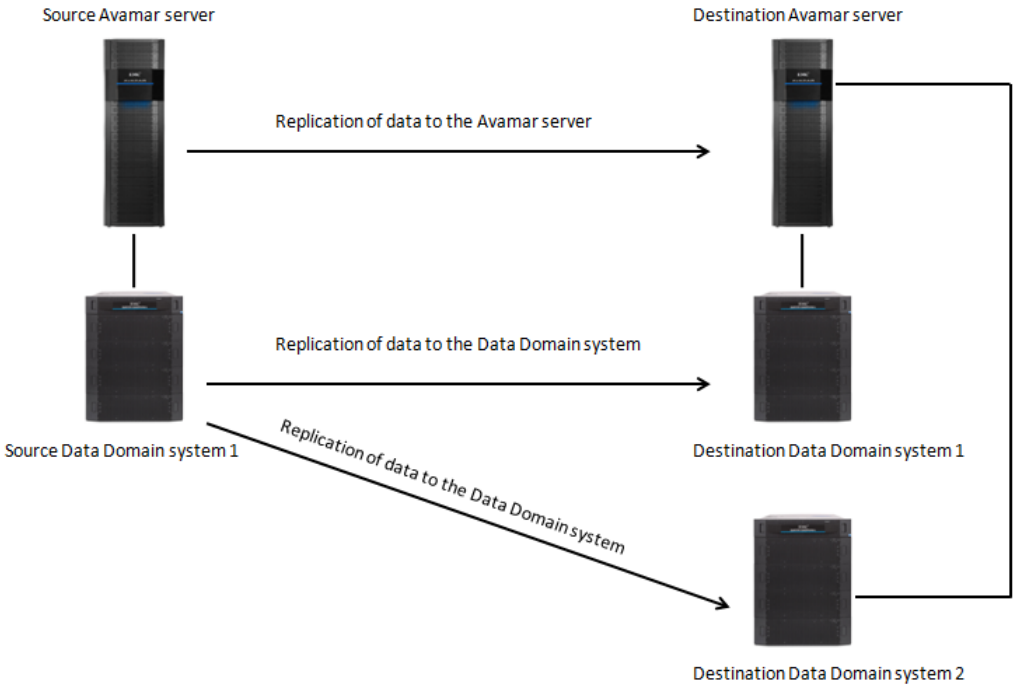
Figure 5 Data Domain system replication many to many configuration



One to many replication

The following figure illustrates an environment where backup data replicates from a single source Data Domain system to multiple destination Data Domain systems.

Figure 6 Data Domain system replication one to many configuration



In a configuration with multiple destination Data Domain systems, you can control which system receives the data that replicates from the source Data Domain system by mapping a domain on the source Avamar server to a destination Data Domain system. Mapping a domain to a Data Domain system on page 40 provides details.

Pool-based replication

Traditional Avamar replication occurs in serial, which can result in a long replication window when the source and targets are both Data Domain systems. Pool-based replication allows for multiple parallel replication backups from a Data Domain source to a Data Domain target.

With traditional Avamar replication, replication is subject to a serial backup queue. This does not guarantee that all backups can be replicated in a single day, if any single backup takes longer to replicate than the desired recovery point objective (RPO). For example, one backup could take 24 hours to replicate, thereby missing an 8 hour RPO.

With pool-based replication, Avamar can start as many backup replication operations as necessary, thereby guaranteeing that the backups eventually reach their destination at the desired RPO . However, due to potential bottlenecks in either replicate throughput of Data Domain systems or the network throughput, it is recommended that replication groups and clients that will be run in parallel should be added one at a time until the desired throughput is achieved.

Pool-based replication is enabled during replication group configuration. Configuring pool-based replication on page 41 provides instructions.

Pool-based replication can also be enabled with the `avrepl` command using the `--use-pool-based` option. Additional options for the `avrepl` command you to determine the order in which backups will be replicated and other information. The *EMC Avamar Administration Guide* contains information about the `--use-pool-based` option with the `avrepl` command and related options.

Replication data flow

Avamar replicates the data directly from one Data Domain system to another. In other words, Avamar does not stage the data on the Avamar server before replicating the data to the destination Data Domain system.

Replication schedule

The replication of Avamar data on a Data Domain system occurs on the Avamar replication schedule. You cannot schedule replication of data on the Data Domain system separately from the replication of data on the Avamar server.

Configuring replication

Procedure

1. Configure replication from the source Avamar server to the destination Avamar server by using Avamar Administrator.

   The *EMC Avamar Administration Guide* provides more information on configuring Avamar replication.

2. If there is more than one destination Data Domain system, specify which Data Domain system is the default destination.

3. If there is more than one destination Data Domain system, map the domains on the source Avamar server to a destination Data Domain system.

Setting the default Data Domain destination

In a replication environment with more than one destination Data Domain system, specify which Data Domain system is the default destination. The default destination is the Data Domain system to which Avamar replicates data when a destination Data Domain system is not identified on the **Replication Storage Mapping** tab.

Procedure

1. In Avamar Administrator, click the **Server** launcher button.

   The **Server** window appears.
2. Select the destination Data Domain system.
3. Select **Actions** › **Edit Data Domain System**.

   The **Edit Data Domain System** dialog box appears.
4. Click the **System** tab, and then select **Use system as default replication storage**.
5. Click **OK**.

   A confirmation message appears.
6. Click **Close**.

Mapping a domain to a Data Domain system

If there are multiple destination Data Domain systems, you can control which system receives the data that replicates from the source Data Domain system. To specify the destination Data Domain system, map a domain on the source Avamar server to a destination Data Domain system. If you do not provide a mapping, then Avamar replicates the data from the source Data Domain system to the default destination.

Note

You cannot map the domains on the source Avamar server to a destination Data Domain system until after the first replication. During the first replication, the data replicates to the default destination.

Procedure

1. In Avamar Administrator, click the **Replication** launcher button.

   The **Replication** window appears.
2. Click the **Storage Mapping** tab, and then click **Add Domain**.

   The **Select a Domain** dialog box appears.
3. From the **Map to Data Domain System** list, select the Data Domain system to use as the replication target.
4. Click **OK**.

Deleting a domain mapping

When you delete a domain mapping, any data that has already replicated to the destination Data Domain system remains there. However, any new data replicates to the

default destination system unless you create a new mapping to a different Data Domain system.

Procedure

1. In Avamar Administrator, click the **Replication** launcher button.

   The **Replication** window appears.
2. Click the **Storage Mapping** tab.
3. Select the mapping and click **Delete**.

   A confirmation message appears.
4. Click **Yes** to confirm the mapping deletion.

Configuring pool-based replication

pool-based replication, which allows for multiple parallel replication backups from a Data Domain source to a Data Domain target, can be enabled during creation or editing of a replication group.

Procedure

1. Follow the instructions for creating or editing a replication group found in the *EMC Avamar Administration Guide*.
2. At the **Order** page of the **New Replication Group** wizard, select **Replicate client backups in parallel** for the mode in which the backups will be processed.
3. Select **Optimize Virtual Synthetic Replication (VSR)** to instruct the replication plug-in to use VSR optimization for plug-ins that support optimization.

   VSR optimization requires that the **Replication order of client backups** must be **Oldest backup to newest backup**. This option is selected by default; to require that all ordering options for pool-based replication are followed, regardless of the plug-in, deselect this option.
4. For the **Replication order of client backups**, select one of the following:
   - **Oldest backup to newest backup** begins replication with the oldest backup first.
   - **Newest backup to oldest backup** begins replication with the newest backup first.
5. Click **Next**.
6. At the **Overview** page, click **More Options**.
7. Select the **Show Advanced Options** checkbox to specify advanced options.

   The advanced options appear in red on the More Options dialog box.
8. For the **Client list ordering** option, determine the order for client replication.
9. For the **Maximum number of Data Domain Replication Streams** option, enter the maximum number of avtar processes that can be started in parallel.
10. Click **OK** to close the **More Options** dialog.
11. Click **Finish** to complete the configuration of the replication group.

CHAPTER 5

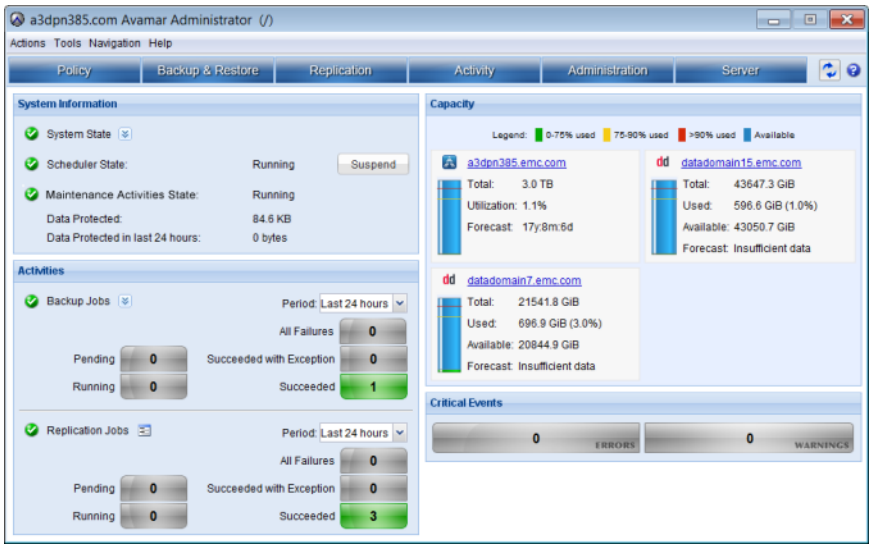
Monitoring and Reporting

This chapter includes the following topics:

Monitoring the system with the Avamar Administrator Dashboard

The Avamar Administrator dashboard provides summary information for the Avamar server and any configured Data Domain systems.

Figure 7 Avamar Administrator dashboard



The following summary information appears for each server:

- Total amount of storage
- Amount of used storage
- Amount of available storage
- Forecast capacity

Monitoring the system with SNMP

Avamar can collect and display data for health monitoring, system alerts, and capacity reporting on a Data Domain system by using Simple Network Management Protocol (SNMP).

To enable Avamar to collect data, specify the port number to receive traps when you add the Data Domain system to the Avamar configuration.

The Data Domain SNMP service on the Avamar server receives and manages the SNMP traps for all Data Domain systems. You can manage the service in Avamar Administrator.

Procedure

1. In Avamar Administrator, click the **Administration** launcher button.

   The **Administration** window appears.

2. Click the **Services Administration** tab.

   The Data Domain SNMP Manager service is the SNMP service for Data Domain.

3. To stop or start the service, right-click the service and select **Stop Data Domain SNMP Manager** or **Start Data Domain SNMP Manager**, respectively.

Monitoring Data Domain system status and statistics

Avamar Administrator provides CPU, disk activity, and network activity for each Data Domain system.

Procedure

1. In Avamar Administrator, click the **Server** launcher button.

   The **Server** window appears.

2. Click the **Server Monitor** tab, and then click **Data Domain** tab.

   The data listed in the following table appears on the **Data Domain** tab.

Table 5 Data Domain tab details in the Server Monitor

Property	Description
Node	
Status indicators	Status of the node. One of the following values: • OK (green)—The Data Domain system is functioning properly. • Warning (yellow)—There is a problem with the Data Domain system, but backups and restores can continue. • Error (red)—There is a problem with the Data Domain system, and backups and restores will not occur until the problem is resolved. If the status is yellow or red, you can view additional status information to determine and resolve the problem. The *EMC Avamar and EMC Data Domain System Integration Guide* provides details.
Name	Hostname of the Data Domain system as defined in corporate DNS.
CPU	
Busy Avg.	Average CPU usage as a percentage of total possible CPU usage.
Max	Maximum CPU usage that has occurred as a percentage of total possible CPU usage.
Disk (KB/S)	
Read	Disk read throughput in kilobytes per second.
Write	Disk write throughput in kilobytes per second.
Busy	Disk I/O usage as a percentage of total possible disk I/O usage.
Network (KB/S)	
Eth#1	Desc—Description of the network interface. In/Out—Network bandwidth usage in kilobytes per second on network interface 1.
Eth#2	Desc—Description of the network interface. In/Out—Network bandwidth usage in kilobytes per second on network interface 2.
Eth#3	Desc—Description of the network interface.

Table 5 Data Domain tab details in the Server Monitor (continued)

Property	Description
	In/Out—Network bandwidth usage in kilobytes per second on network interface 3.
Eth#4	Desc—Description of the network interface. In/Out—Network bandwidth usage in kilobytes per second on network interface 4.

Note

The number of Eth# columns depends on the maximum number of network interfaces that the configured Data Domain systems support.

Monitoring system events

When you configure SNMP communication for Avamar and a Data Domain system, the Avamar Event Monitor displays relevant events for the Data Domain system. You can filter the events to display only those events for a Data Domain system.

Procedure

1. In Avamar Administrator, click the **Administration** launcher button.

   The **Administration** window appears.
2. Click the **Event Management** tab.
3. Select **Actions** › **Event Management** › **Filter**.

   The **Filter** dialog box appears.
4. Select the Data Domain systems.

Option	Description
To view activities for all Data Domain systems	Select **All Systems**.
To view activities for a specific Data Domain system	a. Select **System**. b. Click the **...** . c. Select the Data Domain system in the **Select Data Domain System** dialog box, and then click **OK**.

5. Click **OK** in the **Filter** dialog box.

Monitoring activities

You can monitor recent backup, restore, and validation activities by using the **Activity Monitor** in Avamar Administrator. The **Server** column in the **Activity Monitor** lists the

server, either the Avamar server or the Data Domain system, on which the activity occurred.

The **Activity Monitor** displays the most recent 5,000 client activities during the past 72 hours. You can filter the **Activity Monitor** to view only activities for data on a Data Domain system.

Procedure

1. In Avamar Administrator, click the **Activity** launcher button.

   The **Activity** window appears.
2. Click the **Activity Monitor** tab.
3. Select **Actions** › **Filter**.

   The **Filter Activity** dialog box appears
4. Select **Data Domain Systems** from the **Source** list.
5. Select the Data Domain systems.

Option	Description
To view activities for all Data Domain systems	Select **All Systems**.
To view activities for a specific Data Domain system	a. Select **System**. b. Click the **...** . c. Select the Data Domain system in the **Select Data Domain System** dialog box, and then click **OK**.

6. Click **OK** in the **Filter Activity** dialog box.

Monitoring Data Domain system capacity

Avamar checks the capacity of each Data Domain system every 24 hours. Avamar then logs an event in the Event Monitor if the capacity reaches 95 percent full, or if the forecast number of days until the capacity is full is less than or equal to 90 days.

You can also monitor the capacity of a Data Domain system by using the **Server Management** tab on the **Server** window in Avamar Administrator.

When the Data Domain system reaches its capacity limit, you can reclaim space on the device by using the instructions in Reclaiming storage on a full Data Domain system on page 58.

Note

When the Data Domain system reaches 99 percent capacity, maintenance operations fail. The best practice recommendation is to limit Data Domain capacity usage to 80 percent.

Procedure

1. In Avamar Administrator, click the **Server** launcher button.

   The **Server** window appears.
2. Click the **Server Management** tab.

3. Select the Data Domain system from the tree in the left pane.

   Data Domain system details appear in the right pane.

   The following table provides information on Data Domain system capacity information.

Table 6 Data Domain system capacity details

Field	Description
Total Capacity (post-comp size)	The total capacity for compressed data on the Data Domain system.
Server Utilization (post-comp use%)	The percentage of capacity used on the Data Domain system for any reason after compression of the data.
Bytes Protected	The total number of bytes of data that are protected, or backed up, on the Data Domain system. This value is the number of bytes before the data is compressed.
File System Available (post-comp avail)	The total amount of disk space available for compressed data in the Data Domain File System.
File System Used (post-comp used)	The total amount of disk space used in the Data Domain File System for compressed data.
User Name	The DD Boost user account used for Avamar and Data Domain system integration.
Default Replication Storage System	Specifies if the Data Domain system has been configured as the Default Replication Storage System.
Target for Avamar Checkpoint Backups	Specifies if the Data Domain system is a target for Avamar checkpoint backups. This option is only available for single-node Avamar servers and AVE.
Maximum Streams	Specifies the maximum streams supported by the Data Domain system.
Maximum Stream Limit	The maximum number of Data Domain system streams that Avamar can use at any one time to perform backups and restores.
Instant Access Limit	The maximum number of VMware Instant Access restores allowed. For Avamar 7.1, this number is 1.
DDOS Version	The DD OS version for the Data Domain system.
Serial Number	The serial number for the Data Domain system.
Model Number	The model number for the Data Domain system.
Monitoring Status	The current Avamar monitoring status of the Data Domain system.

Replication monitoring

To monitor replication activity in Avamar, including replication activities associated with a Data Domain system, use either the Activity Monitor or the Replication Report.

Activity Monitor

The Activity Monitor in Avamar Administrator provides a list of recent replication activities. If you select a Replication Source or Replication Destination activity, and then

select **Actions** › **View Statistics**, you can view additional statistics about the replication, including:

- A list of backups that were replicated
- The clients associated with the replicated backups
- The scheduled start and end times for the replication
- The actual start and end times for the replication
- A list of any errors that occurred

The *EMC Avamar Administration Guide* provides more information on how to access the Activity Monitor and the available statistics.

Replication Report
The Replication Report in Avamar Administrator also provides details on recent replication activities. You can filter the report to view only replication activities associated with a Data Domain system.

Server maintenance activity monitoring

Avamar performs the system maintenance operations for backup data on the Data Domain system, including HFS checks, checkpoints, rollbacks, garbage collection, and secure backup deletion.

The `ddmaint` utility implements all required operations on the Data Domain system for the Avamar server. The `ddmaint` utility is installed on the utility node of a multi-node server, or the single node of a single-node server, during Avamar server installation. The `ddmaint` utility is not installed on the data nodes of the Avamar server.

The `ddmaint` utility logs all maintenance activities on the Avamar server in the `ddrmaint.log` file, which is located in the `/usr/local/avamar/var/ddrmaintlogs` directory on the utility node of a multi-node Avamar server. The `ddrmaint.log` file is rotated when it reaches 25 MB in size.

APPENDIX A

Troubleshooting

This appendix includes the following topics:

Viewing detailed status information for troubleshooting

Icons on the status bar in Avamar Administrator indicate whether there is a problem either with the Avamar connection to a Data Domain system or with a Data Domain system.

Table 7 Status bar problem indicators

Status bar icon	Description
	Avamar cannot retrieve information from a Data Domain system. However, backups and restores can continue during this condition.
	Avamar cannot connect to a Data Domain system, or a Data Domain system is disabled in some way. Backups and restores do not occur during this condition.

If one of the icons in the previous table appears in the status bar, you can view more detailed status information for the Data Domain system on the **Server Management** tab in the **Server** window.

Procedure

1. In Avamar Administrator, click the **Server** launcher button.

   The **Server** window appears.

2. Select the **Server Management** tab, and then select the Data Domain system in the tree.

   The **Monitoring Status** row in the right pane provides detailed status of the Data Domain system.

Data Domain status and resolutions

The following table lists the available values for the **Monitoring Status** row on the **Server Management** tab in the **Server** window in Avamar Administrator. If the status indicates a problem, a proposed resolution is provided.

Table 8 Monitoring status values and resolutions

Monitoring status	Resolution
`OK`	No resolution is required.
`SNMP Getter/Setter disabled`	Use the Data Domain SSH CLI to enable SNMP by typing **`snmp enable`**.
`Unable to get CPU, disk, and network statistics data`	Use the Data Domain SSH CLI to enable SNMP by typing **`snmp enable`**.

Table 8 Monitoring status values and resolutions (continued)

Monitoring status	Resolution
`Unable to get CPU and disk statistics data`	Use the Data Domain SSH CLI to enable SNMP by typing **`snmp enable`**.
`Unable to get network statistics data`	Use the Data Domain SSH CLI to enable SNMP by typing **`snmp enable`**.
`Unable to get file system statistics data`	Use the Data Domain SSH CLI to enable SNMP by typing **`snmp enable`**.
`Error invoking ssh cli command`	Review the system log files to determine the cause of the problem. You should also review the *DD OS Command Reference Guide*.
`File system disabled`	Use the Data Domain SSH CLI to enable Data Domain file system operations by typing **`filesys enable`**. When the Data Domain file system is disabled, Avamar cannot perform backups to and restores from the device. After you enable file system operations, it might take as long as 10 minutes before Avamar Administrator correctly reflects the status of the Data Domain system, especially if the Data Domain system is a DD Extended Retention. Do not perform backups, restores, or system maintenance operations until the status appears correctly in Avamar Administrator. Otherwise, the backups, restores, or system maintenance operations might fail.
`Unable to get SNMP file system status`	Verify that the SNMP getter/setter port is valid. This is the port that you specified when you added the Data Domain system to the Avamar configuration.
`Failed to authenticate ssh cli connection with ssh key`	Verify that the SSH public/private key pair was set up correctly on both the Avamar server and the Data Domain system. Re-creating the SSH public/private key pair on page 60 provides more information.
`Failed to authenticate SSH CLI connection with credentials`	Verify that the DD Boost user credentials are correct. The credentials are the username and password that you specified when you added the Data Domain system to the Avamar configuration.
`Unable to retrieve ssh key file pair`	Verify that the SSH public/private key pair is set up correctly on both the Avamar server and the Data Domain system, and that the public key is copied to the correct location on the Data Domain system. Re-creating the SSH public/private key pair on page 60 provides more information.
`Unable to retrieve ssh public key file`	Verify that the SSH public/private key pair was set up correctly on both the Avamar server and the Data Domain system, and that the public key was copied to the correct location on the

Table 8 Monitoring status values and resolutions (continued)

Monitoring status	Resolution
	Data Domain system. Re-creating the SSH public/private key pair on page 60 provides more information.
`Unable to retrieve ssh private key file`	Verify that the SSH public/private key pair was set up correctly on both the Avamar server and the Data Domain system. Re-creating the SSH public/private key pair on page 60 provides more information.
`DDBoost disabled`	Enable DD Boost using either the Data Domain SSH CLI or the web-based Data Domain Enterprise Manager. To enable DD Boost by using the SSH CLI, type **`ddboost enable`**. When DD Boost is disabled, Avamar cannot perform backups to and restores from the device.
`DDBoost user disabled`	Use the Data Domain SSH CLI to enable the DD Boost user by typing **`user enable`** ***`username`***, where *username* is the username of the DD Boost user. When the DD Boost user is disabled, Avamar cannot perform backups and restores to and from the device.
`DDBoost user changed on Data Domain system`	If you edited the DD Boost user account information on the Data Domain system, then you must edit the DD Boost user account information in the Data Domain configuration on the Avamar server. When you edit the DD Boost user account information in Avamar Administrator, the SSH key may fail. To resolve this issue, re-add the SSH key using the instructions in Re-creating the SSH public/private key pair on page 60.
`DDBoost option disabled`	Use the Data Domain SSH CLI to enable DD Boost by typing **`ddboost option set distributed-segment-processing enabled`**. Backups continue when DD Boost is disabled. However, performance decreases.
`DDBoost option not available`	No resolution is required. The Data Domain system is in a cluster. DD Boost is not available in a cluster.
`DDBoost not licensed`	Use the Data Domain SSH CLI to add the license for DD Boost by typing **`license add`** ***`license`***, where *license* is the license code.
`Invalid SNMP port`	Verify that you specified the correct getter/setter port when you added the Data Domain system to the Avamar configuration, and ensure that the getter/setter port is open on the Data Domain system by typing **`snmp show trap-hosts`**.
`Invalid SNMP trap host or trap port`	Use the Data Domain SSH CLI to verify that the Avamar server is configured as a trap host on the Data Domain system by typing **`snmp show trap-hosts`**.

Table 8 Monitoring status values and resolutions (continued)

Monitoring status	Resolution
	If necessary, use the Data Domain SSH CLI to add the Avamar server as a trap host on the Data Domain system by typing **`snmp add trap-host hostname`**, where *hostname* is the hostname of the Avamar server. By default, port 163 is used. Verify that you specified the correct trap port when you added the Data Domain system to the Avamar configuration.
`Invalid SNMP community string`	Use the Data Domain SSH CLI to verify the SNMP community string by typing **`snmp show ro-communities`**. Verify that you specified the correct SNMP community string when you added the Data Domain system to the Avamar configuration.
`Error getting SNMP objects`	Review the system log files to determine the cause of the problem. Search the Data Domain knowledgebase for the error message.
`SNMP trap manager is not running`	Start the Data Domain SNMP Manager service: 1. In Avamar Administrator, click the **Administration** tab. The **Administration** window appears. 2. Click the **Services Administration** tab. 3. Right-click the **Data Domain SNMP Manager** row in the right pane and select **Start Data Domain SNMP Manager**.
`Unknown Host`	The DNS server cannot resolve the hostname of the Data Domain system. Ensure that the hostname and IP address for the Data Domain system are configured correctly in DNS.
`Host is not reachable`	Avamar cannot connect to the hostname or IP address of the Data Domain system. This may be because the device is powered off, there is a network connection issue, the connection is blocked by the firewall, and so on.
`Invalid host, user name, or password`	Ensure that you specified the hostname or IP address of the Data Domain system, the DD Boost username, and password. Attempt to log in to the Data Domain system with the specified username and password. Verify that the Avamar server can ping the Data Domain system.
`Synchronization of maintenance operations is off`	Avamar cannot synchronize maintenance operations such as checkpoints, HFS checks, and Garbage Collection with the Data Domain system. EMC Customer Service must enable synchronization of these operations by using the `avmaint config` command to set the `useddr` value to `TRUE`.
`Unknown`	Contact Data Domain Support.

Monitoring status

When the monitoring status on the **Server Management** tab in the **Server** window in Avamar Administrator is a value other than `OK`, additional information appears in a list below the **Monitoring Status**.

The following table describes status messages and provides resolutions if the status indicates a problem.

Table 9 Server Management monitoring status details

Monitoring status	Description
• `DDBoost Licensed` • `DDBoost not Licensed`	DD Boost licensing status. If the value is `DDBoost not licensed`, then use the Data Domain SSH CLI to add the license for DD Boost by typing **`license add license`**, where *license* is the license code.
• `DDBoost Enabled` • `DDBoost Disabled`	DD Boost status. If the value is `DDBoost Disabled`, then enable DD Boost by using either the Data Domain SSH CLI or the web-based Data Domain Enterprise Manager. To enable DD Boost by using the SSH CLI, type **`ddboost enable`**. When DD Boost is disabled, Avamar cannot perform backups to and restores from the device.
• `DDBoost User Enabled` • `DDBoost User Disabled`	DD Boost user status. If the value is `DDBoost User Disabled`, then use the Data Domain SSH CLI to enable the DD Boost user by typing **`user enable username`**, where *username* is the username of the DD Boost user. When the DD Boost user is disabled, Avamar cannot perform backups to and restores from the device.
• `DDBoost User Valid` • `DDBoost User Changed`	DD Boost user status. If the value is `DDBoost User Changed` and you edited the DD Boost user account information on the Data Domain system, then you must edit the DD Boost user account information in the Data Domain configuration on the Avamar server. When you edit the DD Boost user account information in Avamar Administrator, the SSH key may fail. To resolve this issue, re-add the SSH key using the instructions in Re-creating the SSH public/private key pair on page 60.
• `DDBoost Option Enabled`	DD Boost option status. If the value is `DDBoost Option Disabled`, then use the Data Domain SSH CLI to enable DD Boost by typing

Table 9 Server Management monitoring status details (continued)

Monitoring status	Description
• DDBoost Option Disabled • DDBoost Option not Available	**ddboost option set distributed-segment-processing enabled**. Backups continue when DD Boost is disabled. However, performance decreases. If the value is DDBoost Option not Available, then the Data Domain system is in a cluster, and DD Boost is not available in a cluster.
• SNMP Enabled • SNMP Disabled	SNMP status. If the value is SNMP Disabled, then use the Data Domain SSH CLI to enable SNMP by typing **snmp enable**.
• File System Running • File System Enabled • File System Disabled • File System Unknown • File system status unknown since SNMP is disabled	Status of the Data Domain file system. When the Data Domain file system is disabled, Avamar cannot perform backups to and restores from the device. If the value is File System Disabled, then use the Data Domain SSH CLI to enable Data Domain file system operations by typing **filesys enable**. If the value is File system status unknown since SNMP is disabled, then use the Data Domain SSH CLI to enable SNMP by typing **snmp enable**. If the value is File System Unknown, then verify that the SNMP getter/setter port is valid. This is the port that you specified when you added the Data Domain system to the Avamar configuration. If you enable file system operations, it may take as many as 10 minutes before Avamar Administrator correctly reflects the status of the Data Domain system, especially if the Data Domain system is a DD Extended Retention. Do not perform backups, restores, or system maintenance operations until the status appears correctly in Avamar Administrator. Otherwise, the backups, restores, or system maintenance operations may fail.
• Synchronization of maintenance operations is off • Synchronization of maintenance operations is on	Synchronization status of maintenance operations, such as checkpoints, HFS checks, and Garbage Collection, between the Avamar server and the Data Domain system. If the value is Synchronization of maintenance operations is off, then EMC Customer Service must enable synchronization of these operations by using the avmaint config command to set the useddr value to TRUE.

Common problems and solutions

This topic lists common problems and solutions when you store Avamar backups on a Data Domain system.

Backup fails if the Data Domain system is offline
If the Data Domain system is offline when a backup starts, then the backup may take five minutes or more before it fails. The failure occurs because there is a minimum timeout period of five minutes for almost all DD Boost operations.

To resolve the failed backup, set the Data Domain system online and then retry the backup.

Tail-log backup restrictions with DD Extended Retention
If you are restoring SQL Server data from either the target archive or sealed archive tiers on a DD Extended Retention, then you must clear the **Tail-log backup** checkbox to disable tail-log backups. The **Use SQL Replace** checkbox must be selected. Otherwise, the restore fails. Tail-log backups are supported only when restoring data from the active tier of a Data Domain system.

Level 1 Oracle backups to a DD Extended Retention may time out
When performing a Level 1 backup from an Oracle client to a DD Extended Retention, the backup may time out and fail in the process of creating a snapview. To work around this issue, increase the timeout limit by adding the following flag to the `avoracle.cmd` file:

`--[avoracle]subprocesstimeoutsecs=`*n*

where *n* is the number of seconds before the timeout occurs. The default value is 150. A value of 200 or greater is recommended.

Rollback includes deleted Data Domain system
If you roll back to a checkpoint that contains a configured Data Domain system that you deleted from the configuration after the checkpoint, then the Data Domain system is restored to the configuration.

If you do not want the Data Domain system, then delete it from the configuration after the rollback completes. However, if you want to restore the Data Domain system to the configuration, then you must re-add the SSH key and trap host to the Data Domain system. These values are deleted when you delete the Data Domain system and cannot be restored on the Data Domain system during a rollback of the Avamar server. To restore these values, open the **Edit Data Domain System** dialog box in Avamar Administrator and click the **Re-add SSH Key** and **Re-add Trap Host** buttons.

Backend capacity reports fail
Do not run a backend capacity report for a client with backups on a Data Domain system. Otherwise, the report fails. Backend capacity reports cannot include data on a Data Domain system.

Reclaiming storage on a full Data Domain system

If you use all of the storage space on a Data Domain system, the following issues may occur:

- Backups do not succeed and may not start.
- Operations that change information on the Data Domain system fail, including the deletion of checkpoints, active backups, and expired backups during Garbage Collection. These operations may fail because they involve directory renames, which are not allowed on a full Data Domain system.

Procedure

1. Determine the source of the data that is using the storage. The data may be from a specific client, a group of clients associated with a specific Avamar server, or a different backup product that stores data on the Data Domain system.
2. Cancel any backups that are in progress:
   a. In Avamar Administrator, click the **Activity** launcher button.
   b. In the **Activity** window, click the **Activity Monitor** tab.
   c. Select the backups, and then select **Actions** › **Cancel Activity**.
   d. Click **Yes** on the confirmation message.
3. Suspend backups and restores:
   a. In Avamar Administrator, click the **Server** launcher button.
   b. In the **Server** window, click the **Server Management** tab.
   c. In the tree pane, select the Avamar server node of the tree.
   d. Select **Actions** › **Suspend Backups/Restores**.
   e. Click **Yes** on the confirmation message.
4. Suspend server maintenance operations on the Avamar server:
   a. In Avamar Administrator, select **Tools** › **Manage Schedules**.
   b. In the **Manage All Schedules** window, click **Suspend All**.
5. On the Data Domain system, manually delete the existing `STAGING`, `DELETED`, or `cur/DELETED` directories for the Avamar server.
6. Use Data Domain Enterprise Manager to initiate the Data Domain file system cleaning operation.

   This process should free enough space to enable Avamar server maintenance operations to successfully complete.
7. Restart server maintenance operations on the Avamar server:
   a. In Avamar Administrator, select **Tools** › **Manage Schedules**.
   b. In the **Manage All Schedules** window, click **Resume All**.
8. Restart backups and restores:
   a. In Avamar Administrator, click the **Server** launcher button.
   b. In the **Server** window, click the **Server Management** tab.
   c. In the tree pane, select the Avamar server node of the tree.
   d. Select **Actions** › **Resume Backups/Restores**.
   e. Click **Yes** on the confirmation message.
9. After server maintenance operations completes, you might need to perform the following tasks to reclaim storage space on the Data Domain system:
   - Delete backups.
   - Delete checkpoints.
   - Run Avamar Garbage Collection.
   - Run the Data Domain file system cleaning operation.

Re-creating the SSH public/private key pair

When you add a Data Domain system to the Avamar configuration, the system automatically creates and exchanges the public/private keys that the Avamar Management Console Server (MCS) needs to enable a secure connection with the Data Domain Secure Shell (DDSSH) interface.

However, in some unlikely circumstances, such as if you edit the DD Boost account that Avamar uses to connect to the Data Domain system, then the SSH key may fail. If this occurs, you must re-create and re-add the key on the Data Domain system.

Procedure

1. Open a command shell and log in by using one of the following methods:
   - For a single-node server, log in to the server as admin.
   - For a multi-node server, log in to the utility node as admin.
2. Change to the `.ssh` directory by typing **`cd ~/.ssh`**.
3. Generate a public/private key pair by typing the following command:

   `ssh-keygen -t rsa -N "" -f ddr_key`

   This command sets `ddr_key` as the file name for the key. There is no passphrase for the key.
4. Log in to the Data Domain system by typing the following command:

   `ssh Avamar_ostuser@dd_system`

   where *Avamar_ostuser* is the name of the DD Boost user for Avamar on the Data Domain system, and *dd_system* is the name of the Data Domain system.
5. Add the SSH public key to the SSH authorized keys file on the Data Domain system by typing the following command:

   `adminaccess add ssh-keys user Avamar_ostuser`
6. Copy and paste the public key, which is the contents of the file `ddr_key.pub`, in `/home/admin/.ssh`:
   a. Open a second command shell and log in to the utility node of the Avamar server as admin.
   b. Change to the `.ssh` directory by typing **`cd ~/.ssh`**.
   c. Display the ddr_key.pub file by typing **`cat ddr_key.pub`**.
   d. Select and copy the contents of the file.
   e. Return to the first command shell window.
   f. Paste the contents of the file in `/home/admin/.ssh`.
7. Enter the key by pressing **`Ctrl+D`**.
8. Switch user to root by typing **`su -`**.
9. Change directory to `/usr/local/avamar/lib` by typing the following command:

   `cd /usr/local/avamar/lib/`

10. Copy the private key to `/home/admin/.ssh/ddr_key`, which is the path and name specified by `ddr_ssh_key_path_name` in the `mcserver.xml` file, by typing the following command:

    `cp /home/admin/.ssh/`*`ddr_key`* **`.`**

    where *ddr_key* is the file name for the key.

11. Change the ownership of the key to the admin group by typing the following command:

    `chown root:admin` ***`ddr_key`***

    where *ddr_key* is the file name for the key.

12. Change the permissions for the key to 440 by typing the following command:

    `chmod 440` ***`ddr_key`***

    where *ddr_key* is the file name for the key.

13. Test that you can log in to the Data Domain system without providing a password by typing the following command:

    `ssh -i` ***`path/ddr_key Avamar_ostuser@dd_system`***

    where:

    - *path/ddr_key* is the path and filename of the key.
    - *Avamar_ostuser* is the name of the DD Boost user for Avamar on the Data Domain system.
    - *dd_system* is the name of the Data Domain system.

Using legacy certificate authentication with Data Domain requires command line flags

When performing a backup to Data Domain using the `--encrypt=tls-sa` command line flag to indicate legacy certificate authentication, metadata backups to the Avamar server will succeed but backups to the Data Domain will fail. For successful backup, you must specify the following flags:

```
--ddr-auth-enabled=false
--ddr-auth-mode=3
```

This will force certificate authentication for metadata backups to the Avamar server while allowing backups to the Data Domain to succeed.

GLOSSARY

A

Avamar Administrator A graphical management console software application that is used to remotely administer an Avamar system from a supported Windows or Linux client computer.

Avamar client A computer or workstation that runs Avamar software and accesses the Avamar server over a network connection. Avamar client software comprises a *client agent* and one or more *plug-ins*.

Avamar server The server component of the Avamar client/server system. Avamar server is a fault-tolerant, high-availability system that efficiently stores the backups from all protected clients. It also provides essential processes and services required for data restores, client access, and remote system administration. Avamar server runs as a distributed application across multiple networked storage nodes.

B

backup A point-in-time copy of client data that can be restored as individual files, selected data, or as an entire backup.

C

checkpoint A server backup taken for the express purpose of assisting with disaster recovery of the Avamar server.

client A computer or workstation that runs Avamar software and accesses the Avamar server over a network connection. Avamar client software consists of a client agent and one or more plug-ins.

D

Data Domain system Disk-based deduplication appliances and gateways that provide data protection and disaster recovery (DR) in the enterprise environment.

dataset A policy that defines a set of files, directories, and file systems for each supported platform that are included or excluded in backups across a group of clients. A dataset is a persistent and reusable Avamar policy that can be named and attached to multiple groups.

DD Boost DD Boost is the API that Avamar clients use to access a Data Domain system. The DD Boost API is installed automatically on the client computer when you install the Avamar client. It is also installed automatically on the Avamar server when you install Avamar.

DD OS Data Domain Operating System (DD OS) is the internal operating system on the Data Domain system. The DD OS provides both a command line interface (CLI) for performing all system operations and the Enterprise Manager (a graphical user interface, or GUI) for some configuration operations, management, and monitoring.

ddrmaint utility Installed on the utility node of a multi-node server (or the single node of a single-node server), this utility implements all required operations on the Data Domain system on behalf of the Avamar server. It is not installed on the storage nodes of the Avamar server.

The `ddrmaint` utility also uses the DD Boost to connect to a Data Domain system. The DD Boost is installed with the `ddrmaint` utility automatically when you install Avamar.

M

MCS Management console server. The server subsystem that provides centralized administration (scheduling, monitoring, and management) for the Avamar server. The MCS also runs the server-side processes used by *Avamar Administrator*.

P

plug-in Avamar client software that recognizes a particular kind of data resident on that client.

plug-in options Options that you specify during backup or restore to control backup or restore functionality.

policy A set of rules for client backups that can be named and applied to multiple groups. Groups have dataset, schedule, and retention policies.

R

replication Replication is an optional feature that enables one Avamar server to store a read-only copy of its data on another Avamar server to support future disaster recovery of that server.

restore An operation that retrieves one or more file systems, directories, files, or data objects from a backup and writes the data to a designated location.

retention The time setting to automatically delete backups on an Avamar server. Retention can be set to permanent for backups that should not be deleted from an Avamar server. Retention is a persistent and reusable Avamar policy that can be named and attached to multiple groups.

S

SNMP Simple Network Management Protocol (SNMP) is a UDP-based network protocol. It is used mostly in network management systems to monitor network-attached devices for conditions that warrant administrative attention.