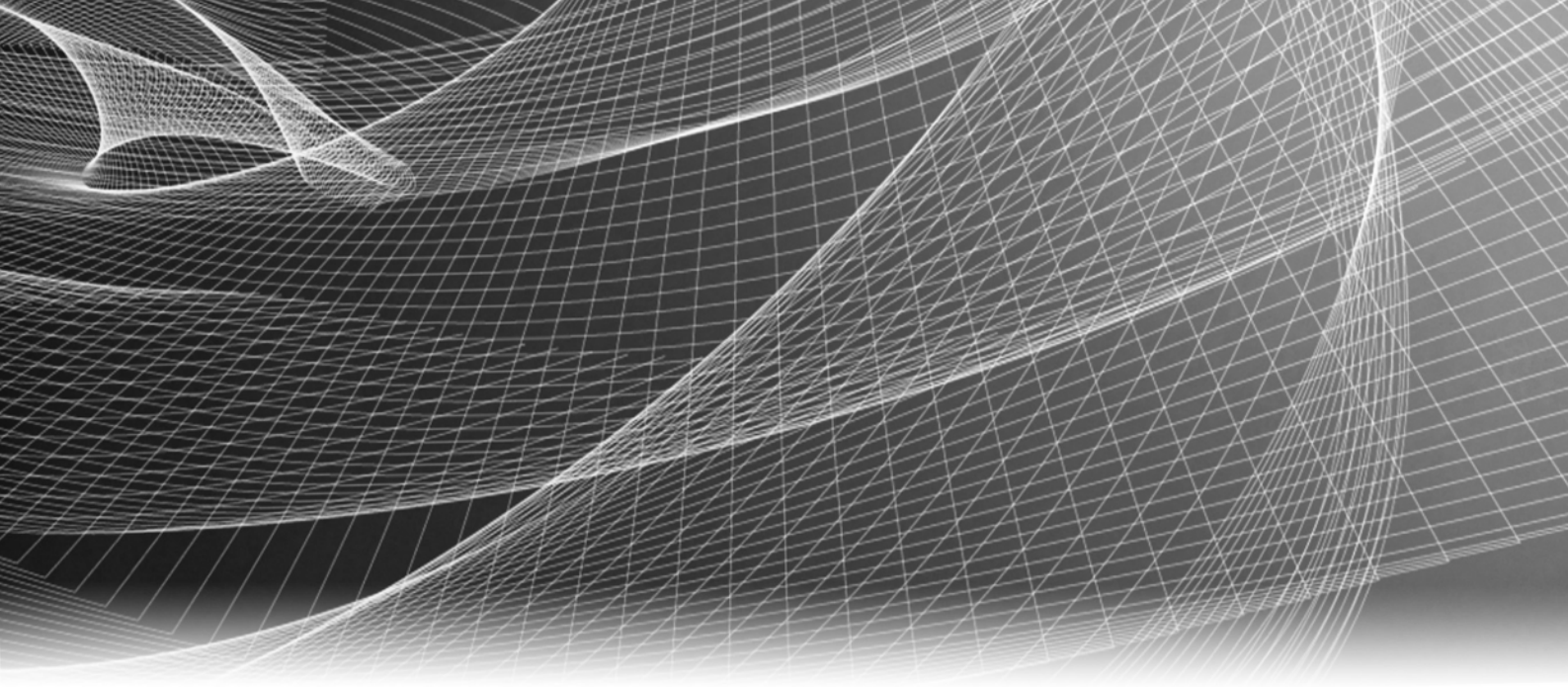

EMC® Avamar® 7.0 for Oracle

User Guide

P/N 300-015-235
REV 04

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 install, configure, administer, and use the EMC Avamar Plug-in for Oracle.

Audience

This document is intended for:

- System administrators who are responsible for installing software and maintaining servers and clients on a network
- Oracle Database Administrators (DBAs) who are responsible for backing up and maintaining Oracle databases

Revision history

Table 1 on page 9 presents the revision history of this document.

Table 1 Revision history (page 1 of 2)

Revision	Date	Description
04	April 28, 2014	• Updated "Oracle Exadata" on page 26 to include more information about supported environments. • Fixed typographical errors.

Table 1 Revision history (page 2 of 2)

Revision	Date	Description
03	November 15, 2013	Added: • "Oracle Exadata" on page 26. • "Backups fail when backup copies is set to more than 1" on page 153. • "RMAN backup script fails with media management errors" on page 159. Updated "Configuring an RMAN retention policy" on page 123 Fixed typographical error in "Backups unavailable after registering secondary Oracle RAC node" on page 153.
02	July 12, 2013	Updated: • "Registering and activating the inactive node" on page 131. • "Backup options" on page 136.
01	July 10, 2013	Initial release of Avamar 7.0.

Related documentation

The following EMC publications provide additional information:

- *EMC Avamar Administration Guide*
- *EMC Avamar Backup Clients User Guide*
- *EMC Avamar for Windows Server User Guide*
- *EMC Avamar Operational Best Practices*
- *EMC Avamar Compatibility and Interoperability Matrix*
- *EMC Avamar Release Notes*

Conventions used in this document

EMC uses the following conventions for special notices:

NOTICE

NOTICE is used to address practices not related to personal injury.

Note: A note presents information that is important, but not hazard-related.

IMPORTANT

An important notice contains information essential to software or hardware operation.

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 output, such as an error message or script • System code • 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 https://community.EMC.com for peer contacts, conversations, and content on product support and solutions. Interactively engage online with customers, partners, and certified professionals for all 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 help us to continue to improve the accuracy, organization, and overall quality of the user publications. Send your opinions of this document to:

BSGDocumentation@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

The following topics provide an introduction to the EMC® Avamar® Plug-in for Oracle:

Architecture

The Avamar Plug-in for Oracle works with Oracle and Oracle Recovery Manager (RMAN) to back up Oracle databases, tablespaces, or datafiles to an Avamar server or a Data Domain system. The Avamar Plug-in for Oracle serves as a backup module and the Avamar server or Data Domain system as a storage device. You can perform backups and restores from Avamar Administrator or from the RMAN command line interface.

From the RMAN command line interface, RMAN uses the Avamar Plug-in for Oracle as a data mover to perform backup and recovery.

From Avamar Administrator, the Avamar Plug-in for Oracle creates an RMAN script to perform the backup or restore operation and spawns an RMAN process to run the script. RMAN then uses the Avamar Plug-in for Oracle as a data mover to perform a backup or a restore operation.

Stand-alone configuration

You can deploy the Avamar Plug-in for Oracle in stand-alone configurations for all supported platforms. The *EMC Avamar Compatibility and Interoperability Matrix* provides more information about supported platforms.

Figure 1 on page 16 shows a stand-alone configuration that uses the Avamar Plug-in for Oracle to back up or restore Oracle data to or from an Avamar server or a Data Domain system.

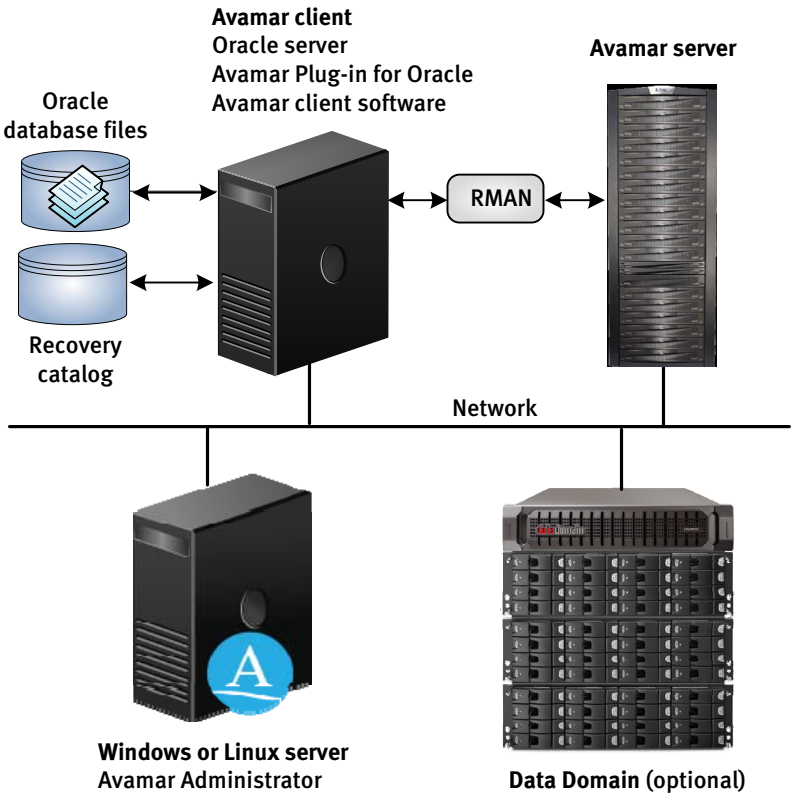


Figure 1 Avamar Plug-in for Oracle in a stand-alone configuration

HIgh-availability configuration

You can also deploy the Avamar Plug-in for Oracle in the following high-availability (HA) configurations:

- Two-node Microsoft Cluster Server (MSCS) configuration
- Two-node Solaris Cluster Server (VCS) configuration
- Oracle Real Application Clusters (RAC) configuration on HP-UX, IBM AIX, Linux, Solaris, or Windows platforms

MSCS configurations

The Avamar Plug-in for Oracle supports backing up Oracle database files from Windows Server 2008 and MSCS for both 32-bit and 64-bit platforms.

VCS configurations

The Avamar Plug-in for Oracle supports backing up Oracle database files from Solaris platforms that run VCS. The Avamar Plug-in for Oracle supports both two-node active/active and two-node active/passive VCS configurations.

In an active/active cluster configuration, each node runs an instance of the Avamar Plug-in for Oracle as an application in separate service groups. This functionality provides application redundancy. When a failure occurs on one active node, the other active node hosts both service groups.

In an active/passive cluster configuration, the service group is online on the active node until a failover occurs. Then the service group comes online on the passive node.

You can run backups and restores from both nodes.

RAC configurations

RAC is an option for an Oracle database that enables multiple nodes to have shared access to a single database. When one cluster node fails or is taken offline, the other cluster nodes continue operating. The Oracle RAC database remains available to users without interruption. Each node within a RAC environment runs a database instance and maintains a local copy of online logs. The Avamar Plug-in for Oracle backs up and restores Oracle RAC databases by connecting to the instance that runs on the cluster node. This node is the one registered with the Avamar server.

In a RAC configuration, each node runs an instance of the Oracle database. When a failover occurs, users access the database on the failover node. The failover process is transparent to the users.

The Avamar Plug-in for Oracle installation packages for the HP-UX, IBM AIX, Linux, and Solaris platforms include three configuration scripts for Oracle RAC:

- `rac_config`—Configures the Avamar Plug-in for Oracle to back up and restore RAC databases.
- `rac_deconfig`—Deletes the RAC configuration from the Avamar Plug-in for Oracle.
- `rac_stop`—Removes the Avamar agent (`EMCagent`) from the Oracle Clusterware resource list.

The Avamar Plug-in for Oracle installation package for Microsoft Windows includes `AvamarRACConfiguration.exe`.

Data Domain support

The Avamar Plug-in for Oracle supports backups to and restore from Data Domain systems. You can back up Oracle data to a Data Domain system by using Avamar Administrator or by using RMAN backup scripts. The Avamar server stores the metadata for the backup.

You must store the full backup for a client and all subsequent incremental backups on either the Avamar server or a single Data Domain system. The Avamar Plug-in for Oracle does not support backups that are stored partly on Avamar and partly on Data Domain. For example, the Avamar Plug-in for Oracle does not support the following types of backups:

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

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

You restore backed up data from a Data Domain system the same way you restore data from the Avamar server. There are no extra steps. You follow the same restore procedure whether the data is located on the Avamar server or a Data Domain system.

The *EMC Avamar and EMC Data Domain System Integration Guide* provides more information about configuring Data Domain systems for use with Avamar systems.

Log files

The Avamar Plug-in for Oracle creates log files during backup and restore operations. The log files are for debugging purposes. Backup and restore operations from Avamar Administrator create the `avoracle.log` file in the *`install-directory`*`/var/clientlogs` directory.

Backup and restore operations

You can perform backup and restores by using Avamar Administrator or by running RMAN scripts from the command line.

Backups and restores in Avamar Administrator

During backups or restores in Avamar Administrator, the Avamar Plug-in for Oracle generates an RMAN script that performs the backup or restore of the specified database. The Avamar client agent runs RMAN with this script. The script directs Oracle to open a connection with an Avamar Media Management library, which invokes an **avtar** session to connect to the Avamar server.

Figure 2 on page 19 shows the process flow between the Avamar client and Avamar server.

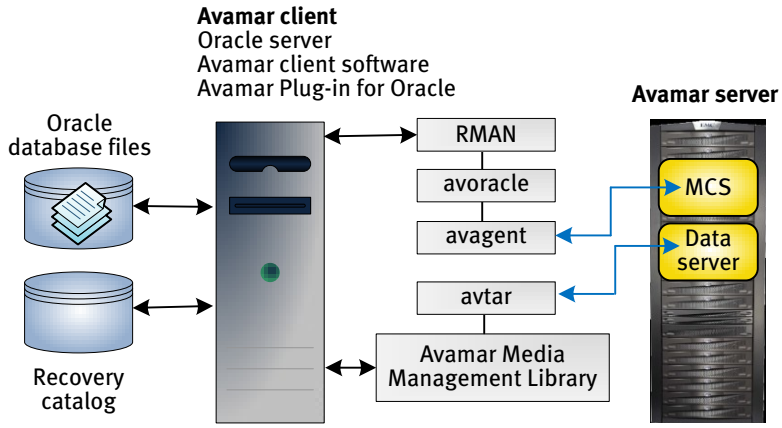


Figure 2 Avamar client and Avamar server process flow diagram

The Oracle backup process generates an RMAN script similar to the following script:

```
configure controlfile autobackup on;
run {
   allocate channel c1 type sbt;
   send 'connect information for avtar to connect to the Avamar server';
   backup database;
}
```

During the backup or restore operation, RMAN creates a log file that you can view from Avamar Administrator:

```
Recovery Manager: Release 11.1.0.7.0 - Production
Copyright (c) 1995, 2004, Oracle. All rights reserved.
connected to target database: ORACLE (DBID=1420649215) using target
database controlfile instead of recovery catalog
RMAN> configure controlfile autobackup on;
2> run {
3> allocate channel c1 type sbt;
4> send '... ';
6> backup database;
7> }
8>
```

```
old RMAN configuration parameters:
CONFIGURE CONTROLFILE AUTOBACKUP OFF;
new RMAN configuration parameters:
CONFIGURE CONTROLFILE AUTOBACKUP OFF;
new RMAN configuration parameters are successfully stored
allocated channel: c1
channel c1: sid=142 devtype=SBT_TAPE
channel c1: AVTAR/Avamar backup (EMC)
sent command to channel: c1

Starting backup at 23-NOV-12
channel c1: starting full datafile backupset
channel c1: specifying datafile(s) in backupset
input datafile fno=00001
name=D:\ORACLE\PRODUCT\10.1.0\ORADATA\ORACLE\ORACLE\SYSTEM01.DBF
input datafile fno=00003
name=D:\ORACLE\PRODUCT\10.1.0\ORADATA\ORACLE\ORACLE\SYSAUX01.DBF
input datafile fno=00002
name=D:\ORACLE\PRODUCT\10.1.0\ORADATA\ORACLE\ORACLE\UNDOTBS01.DBF
input datafile fno=00004
name=D:\ORACLE\PRODUCT\10.1.0\ORADATA\ORACLE\ORACLE\USERS01.DBF
channel c1: starting piece 1 at 23-NOV-12
channel c1: finished piece 1 at 23-NOV-12
piece handle=15gfs32k_1_1 comment=API Version 2.0,MMS Version
2.2.0.108 channel c1: backup set complete, elapsed time: 00:00:45
channel c1: starting full datafile backupset channel c1: specifying
datafile(s) in backupset including current controlfile in backupset
including current SPFILE in backupset channel c1: starting piece 1 at
23-NOV-12 channel c1: finished piece 1 at 23-NOV-12 piece
handle=16gfs341_1_1 comment=API Version 2.0,MMS Version 2.2.0.108
channel c1: backup set complete, elapsed time: 00:00:17 Finished
backup at 21-MAR-11 released channel: c1

Recovery Manager complete.
```

Backup

The following topics describe backup features that the Avamar Plug-in for Oracle supports.

Backup types

The Avamar Plug-in for Oracle supports the following types of backups:

- Backups of Oracle database files and archive logs.
- Cold (offline) backups of the Oracle file system
- Hot RMAN backups of Oracle databases
- Four backup levels:
  - Full—Backs up all datafiles and archive logs. Level full, the default backup level, is not part of the incremental backup strategy.
  - Level 0 (incremental)—Backs up all datafiles and archive logs. You must run a Level 0 backup before you run a level 1 backup.
  - Differential (incremental)—Backs up all database blocks that have changed since the most recent incremental (differential or cumulative) or level 0 backup. Figure 3 on page 21 shows daily level 1 differential backups during a two-week period.

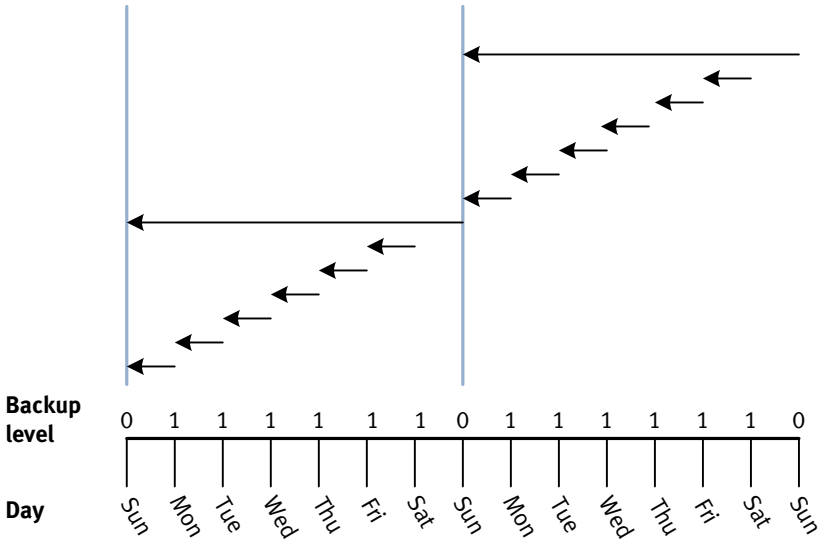


Figure 3 Level 1 differential backups

  - Cumulative (incremental)—Backs up all database blocks that have changed since the most recent level 0 backup.

    Restoring a backup from a cumulative backup is faster than restoring a backup from a differential backup. Cumulative backups, however, require more disk space and take longer to complete than differential backups.

Take cumulative level backups when recovery time is more important than disk space. Figure 4 on page 22 shows daily level 1 cumulative backups during a two-week period.

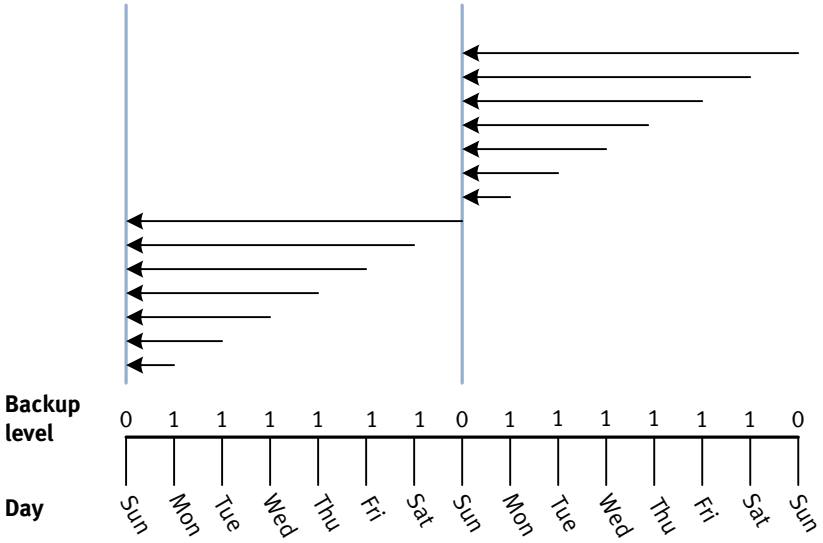


Figure 4 Level 1 cumulative backups

- On-demand or scheduled backups—You can perform on-demand backups or schedule backups to run automatically.

Archive log backups

The **Backup Command Line Options** dialog box includes the following backup options:

- **Back up database**
- **Back up archive logs**
- **Delete archive log after backup**

You must select at least one of the backup options, otherwise the backup fails. Avamar Plug-in for Oracle does not validate these options. When you select the Back up archive logs option, the Avamar Plug-in for Oracle ignores the incremental backup options and performs a full backup.

Avamar Administrator does not support restores of only archive logs. To restore only archive logs, you must use an RMAN script.

Oracle Automatic Storage Management and raw file structure support

Avamar Plug-in for Oracle supports backups of databases that use Automated Storage Management (ASM) for storage management and raw file structure.

Oracle offline backup

The Avamar Plug-in for Oracle supports Oracle's offline backup feature, which enables you to back up a database that is in a mount state. This type of backup is equivalent to a hot backup of a database. A restore of an offline backup uses the same procedure that a restore of a hot backup uses.

RMAN tuning options

Backups you perform with the Avamar Plug-in for Oracle in Avamar Administrator use RMAN. RMAN reads the individual data files, bundles the files into backup sets, and then sends the backup set to `avtar`. To create the backup set, RMAN simultaneously reads multiple files from the disk, and then writes the blocks of file data into the same backup set. The combination of blocks from multiple files is called backup multiplexing.

Figure 5 on page 23 shows multiplexing three files into a backup piece.

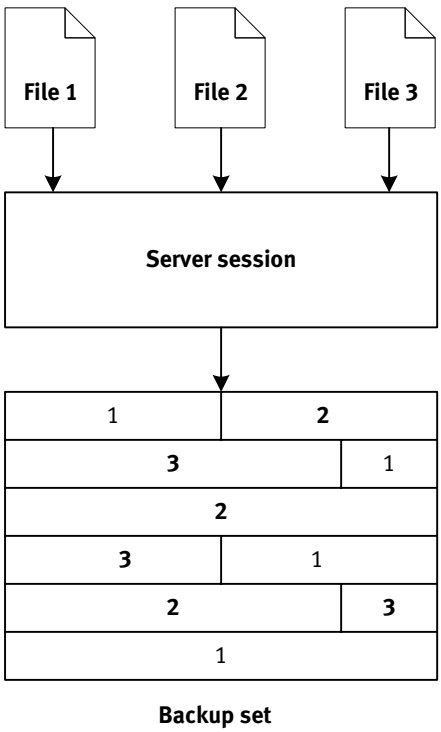


Figure 5 RMAN multiplexing

In Figure 5 on page 23, RMAN simultaneously reads three files and writes them to the backup set intermingled. The RMAN multiplexing feature intermingles the backup files, and does not provide the data stream in a similar format for subsequent reads.

Because of the way the RMAN multiplexing feature intermingles files, backups by the Avamar Plug-in for Oracle to the Avamar server may contain the duplicate data even if no changes were made to the database since the last backup. The RMAN multiplexing feature, therefore, can negatively affect the data deduplication ratio of the Avamar Plug-in for Oracle.

The Avamar Plug-in for Oracle improves data deduplication performance by enabling you to use the **Filesperset** option in Avamar Administrator.

The **Filesperset** option specifies the number of files to include in each backup set. The default value of the **Filesperset** option is 1. When you specify a value for the **Filesperset** option, RMAN uses the value as a limit for the number of files RMAN includes in a backup set.

RMAN backup optimization

The Avamar Plug-in for Oracle supports the RMAN backup optimization feature through the RMAN CLI only. By enabling the backup optimization feature, the RMAN backup command skips the backup of a file if an identical file is already backed up to the allocated device type.

You enable backup optimization with the `configure backup optimization on RMAN` command.

Enabling backup optimization reduces backup time. The Oracle documentation provides more information about backup optimization.

"Enabling RMAN backup optimization" on page 109 provides more information about performing backups that use the backup optimization feature.

Restore and recovery

The following topics describe restore and recovery features that the Avamar Plug-in for Oracle supports.

Corrupt block recovery

The Avamar Plug-in for Oracle includes the **Corrupt blocks** option, which enables you to recover corrupt data blocks only and not the entire database. The Recovery Corrupt blocks only option is an advanced option in the **Restore Command Line Options** dialog box. To use the **Corrupt blocks** option, you must first configure the database to use checksums to verify data blocks. To enable this feature, set the initialization parameter, `DB_BLOCK_CHECKSUM`, to `TYPICAL` for the Oracle database. This setting enables RMAN to detect both physical and logical corruption:

- Physical corruption can occur because of defective memory boards, defective controllers, or broken sectors on a hard disk.
- Logical corruption can occur if the contents of a data block are logically inconsistent. Examples of logical corruption include corruption of a row piece or an index entry.

You can use the **Corrupt blocks** option while the database is open.

Flashback Database recovery

The Avamar Plug-in for Oracle supports Oracle Flashback Database restores. The Flashback Database feature enables you to rewind the database to a target time, system change numbers (SCN), or a log sequence number. The Avamar Plug-in for Oracle provides

a new option in the **Restore Command Line Options** dialog box that enables you to perform a recovery from Flashback Database logs. Appendix B, "Plug-in Options," provides more information about **Flashback Recovery** options.

Roll forward recovery

The Avamar Plug-in for Oracle supports roll-forward recovery by providing the **Open the database with resetlogs after recovery** advanced option in Avamar Administrator. The installation of the Avamar Plug-in for Oracle enables this advanced option by default. The **Open the database with resetlogs after recovery** option instructs the restore operation to open the database with resetlogs after the restore completes. The opening of the database with resetlogs initializes the logs, resets the log sequence number, truncates the available changes in the redo logs, and starts a new incarnation of the database.

To enable a roll forward of a database after a restore operation completes, you must clear the **Open the database with resetlogs after recovery** option in the **Restore Command Line Options** dialog box. When you clear this option, the restore operation does not open the database with resetlogs. You can then apply archive logs to recover the database to the most current point-in-time that is available.

Concurrent backups and restores

The Avamar Plug-in for Oracle supports concurrent backups, restore, or both types of operations from Avamar Administrator. For example, you can select multiple databases for a backup. The Avamar Plug-in for Oracle runs each database backup concurrently. When the backups completes, the Avamar Plug-in for Oracle creates a snapview with all of the backup files. For differential, cumulative, and archive log only backups, the snapview also contains the backup files from the previous backups.

You can perform concurrent backups on Oracle 10*g* and later. You cannot run concurrent backups of the same database from Avamar Administrator and the RMAN CLI simultaneously.

Avamar Plug-in for Oracle backups from the Avamar Administrator use the same page cache files per database. Concurrent backups to a Data Domain system do not use cache files.

Multiple databases

The Avamar Plug-in for Oracle supports the selection of multiple databases for both backup and restore operations.

When multiple databases are backed up on the same workorder, they are logically grouped so that Avamar Administrator can present a hierarchical view of the databases during subsequent restore operations. This "grouping" is accomplished by prefixing a

path that comprises the ORACLE-INSTANCE and ORACLE-SID to each database within the backup. For example, an Oracle 11*g* database with ORACLE-SID of "orcl" is prefixed with /11g/orcl/.

Multi-streaming

Multi-streaming is a feature that enables a backup or a restore to use multiple RMAN channels to the Avamar server or the Data Domain system. A backup or restore that uses multiple RMAN channels runs multiple instances of `avtar` in parallel. The default number of RMAN channels is 1 and the maximum is 10.

RMAN may not use all the RMAN channels you specify. For example, if you specify 4 RMAN channels for a backup, RMAN may use only 2 channels. The backup ignores the other 2 channels.

Allocating multiple RMAN channels for backups and restores may improve performance. Performance improvements for backups and restores, however, depend on the Oracle server configuration.

You can specify multiple RMAN channels for backups and restores by using the **Number of RMAN Channels** option in Avamar Administrator or by specifying `allocate channel` commands in an RMAN script.

Oracle Exadata

The Avamar Plug-in for Oracle supports the same environment for Oracle Exadata (including the Oracle database versions, operating system versions, and Avamar versions) as the environment that the Avamar Plug-in for Oracle supports for Oracle RAC. The *EMC Avamar Compatibility and Interoperability Matrix* provides more information about supported environments for the Avamar Plug-in for Oracle.

The Avamar Plug-in for Oracle supports Oracle Exadata for the following configurations:

- Oracle Database Machine
- Exadata Storage Server (attached to an external database server)

You must install and configure the Avamar Plug-in for Oracle on the Exadata database server the same way you install and configure the Avamar Plug-in for Oracle in Oracle RAC configurations. Use Avamar Administrator to back up and restore the Exadata database server just as you would for non-Exadata database servers. Chapter 4, "Backup," and Chapter 5, "Restore and Recovery," provide more information.

Oracle recovery catalog

The Avamar Plug-in for Oracle supports the Oracle recovery catalog feature during backups and restores.

When you select the **Use recovery catalog** option for a backup, the backup updates the recovery catalog in the normal manner. All backups include the database control file so that future restore operations do not depend on the recovery catalog.

When Avamar Administrator cannot use the recovery catalog for a restore, the restore must use the database control file. You can, however, restore a database from an Avamar backup by using the recovery catalog from RMAN. "Using the catalog for backup and restores" on page 120 provides more information.

Preprocessing and postprocessing backup and restore scripts

The Avamar Plug-in for Oracle supports preprocessing and postprocessing scripts for both backup and restore operations that you perform in Avamar Administrator. Preprocessing and postprocessing scripts are user-written shell scripts (`.sh`) on UNIX or Linux. On Windows, scripts are batch scripts (`.bat`), vb Scripts (`.vbs`), and JScripts (`.js`). The Avamar Plug-in for Oracle runs preprocessing and postprocessing scripts as root on UNIX or Linux, and as an administrator on Windows.

You can use preprocessing and postprocessing scripts for various tasks, such as the following tasks:

- Copying logs from the `var` directory to different directory before a backup.
- Preparing the databases for a backup or restore.
- Running SQL queries to get database information.
- Setting environment parameters.

All preprocessing and postprocessing scripts must be in the `/avamar/etc/scripts` directory on the client. The preprocessing and postprocessing feature is an advanced option in Avamar Administrator. "Preprocessing and postprocessing scripts and attributes" on page 143 provides more information.

In addition to using preprocessing and postprocessing scripts, the Avamar Plug-in for Oracle supports the use of preprocessing and postprocessing attributes. You specify preprocessing and postprocessing attributes and attribute values in the **Enter Attribute** and **Enter Attribute Value** fields.

RAC configurations

You use Avamar Administrator to back up and restore Oracle RAC databases just as you would for non-RAC databases. In an Oracle RAC configuration, each cluster node runs a local instance of the Oracle database. The instance name differs from the database unique name.

To back up an Oracle RAC database, the Avamar Plug-in for Oracle connects to the instance of the database that is running on the current active node.

To restore an Oracle RAC database, you must first shut down all database instances, and then start the instance on the registered node in a "no mount" state.

Chapter 4, "Backup," and Chapter 5, "Restore and Recovery," provide more information about backing up and restoring Oracle databases.

CHAPTER 2
Installation

The following topics describe how to install, upgrade, configure, and uninstall the Avamar Plug-in for Oracle:

Preparing to install the Avamar Plug-in for Oracle

The following topics describe how to prepare the system for the Avamar Plug-in for Oracle installation:

Checking the system requirements

Before you install the Avamar Plug-in for Oracle ensure that you meet all software and hardware requirements.

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.

Hardware requirements

Table 2 on page 30 lists hardware requirements for the Avamar Plug-in for Oracle.

Table 2 Hardware requirements

Resource	Requirement
RAM	64 MB
Hard drive space	130 MB permanent hard drive space for software installation. The Avamar client software also requires an additional 12 MB of permanent hard drive space for each 64 MB of physical RAM. The local cache files use this space.
Network interface	10BaseT minimum. 100BaseT or higher recommended, configured with the latest drivers for the platform.

Software requirements

Installing Avamar Plug-in for Oracle in a Windows cluster requires the Microsoft .NET Framework 4 software.

You can download and install the .NET Framework 4 from the Microsoft Download Center.

Checking Oracle requirements

1. Ensure that you have operating system root privileges on the Oracle server.
2. Ensure that Oracle and RMAN are installed and functioning properly.
3. Ensure that the Avamar server is operational and present on the same network as the Oracle server by opening a command shell on the Oracle server and typing the following command:

   ping *Avamar-server*

   where *Avamar-server* is the network hostname (as defined in DNS) or IP address of the Avamar server.
4. Note the network hostname (which is a DNS entry) for the Avamar server and the utility node.

   The installation and configuration of the Avamar system adds these entries to DNS.

Checking VCS requirements

To install the Avamar Plug-in for Oracle on Solaris platforms that run Veritas Cluster Server (VCS), ensure that you meet the following requirements:

1. The following software is installed on each cluster node:
   - Veritas Cluster Server (supported versions are 4.1 and 5.0)
   - Veritas Volume Manager (VxVM)
   - Veritas File System (VxFS)
   - Veritas Storage Foundation for Oracle
2. The following resources have been configured for VCS service groups:
   - IP resource (which identifies the service group)
   - Mount resource (mount point of the shared disk where the Avamar `/var` directory resides)
3. The Avamar server can resolve the service group name through DNS.
4. The Oracle RMAN plug-in is installed before you configure Oracle as specified by VCS requirements.

Checking the User Account Control setting on Microsoft Windows

The User Account Control (UAC) feature limits application software to standard user privileges. You must provide administrator privileges for certain tasks, such as installing software. UAC is enabled by default.

If you start an Avamar client or plug-in installer without administrator privileges on a Windows computer with UAC enabled, the software does not install correctly.

You can disable or bypass UAC. The installation procedures in this chapter provide one method to bypass UAC. Other methods and additional information are available in the Microsoft documentation.

Downloading the software

1. Log in to the Oracle server with the necessary privileges to perform an installation.
2. Open a web browser and type the following URL:

   http://*Avamar_server*

   where *Avamar_server* is the DNS name or IP address of the Avamar server.

   The EMC Avamar Web Restore page appears.
3. Click **Downloads**.

   The **Downloads** list appears.
4. Click **+** next to the platform heading for the Oracle server.
5. Click **+** next to the operating system heading for the Oracle server.
6. Click the link for the Avamar Plug-in for Oracle installation package.
7. Save the Avamar Plug-in for Oracle installation package to a temporary directory.

Installing the Avamar file system client

Install and register the Avamar file system client:

- For HP-UX, IBM AIX, Linux, and Solaris systems, follow the instructions in the *EMC Avamar Backup Clients User Guide*.
- For Windows systems, follow the instructions in the *EMC Avamar for Windows Server User Guide*.

Installing, upgrading, and uninstalling the software on HP-UX

The following topics describe how to install, upgrade, and uninstall theAvamar Plug-in for Oracle on HP-UX:

- "Installing the Avamar Plug-in for Oracle on HP-UX" on page 32
- "Upgrading the Avamar Plug-in for Oracle on HP-UX" on page 33
- "Uninstalling the Avamar Plug-in for Oracle on HP-UX" on page 34

Installing the Avamar Plug-in for Oracle on HP-UX

You can specify a new location for the `var` directory during the Avamar Client for HP-UX installation by using the `-x ask=true` option with the `swinstall` command. When you install the Avamar Plug-in for Oracle after you install the Avamar Client for HP-UX, the plug-in installation does not automatically use the same location for the `var` directory

that you specified during the Avamar Client for HP-UX installation. You must install the Avamar Plug-in for Oracle by using the `-x ask=true` option with the `swinstall` command.

1. Log in to the Oracle server as root.
2. Change the directory to the temporary directory by typing the following command:

   `cd /`*`tmp`*

   where *tmp* is the temporary directory.
3. Install the software in the default directory or in an alternate directory:
   - To install the Avamar Plug-in for Oracle in the default directory, type the following command:

     `swinstall -s AvamarRMAN-`*`platform-version`***`.depot \*`**

     where *platform-version* is the platform type and Avamar version number.
   - To install the Avamar Plug-in for Oracle in an alternate directory:
     a. Type the following command:

        `swinstall -x ask=true -s`
        *`/TMP/`***`AvamarRMAN-`***`platform-version`***`.depot`**
        `hpuxrman,l=/`*`install-path`*

        where *platform-version* is the platform type and Avamar version number and *install-path* is the installation directory.

     b. Type the name of the directory to use for the installation.

        The following appears in the command shell:

        `Confirm '/install-path/' is the desired location. [n]`

     c. Type **y** to confirm the location.

Upgrading the Avamar Plug-in for Oracle on HP-UX

1. Uninstall the Avamar Plug-in for Oracle. "Uninstalling the Avamar Plug-in for Oracle on HP-UX" on page 34 provides instructions.
2. Uninstall the Avamar Client for HP-UX. The *EMC Avamar Backup Clients User Guide* provides instructions.
3. Download and install the new version of the Avamar Client for HP-UX. The *EMC Avamar Backup Clients User Guide* provides instructions.
4. Download the Avamar Plug-in for Oracle installation package. "Downloading the software" on page 32 provides instructions.
5. Install the new version of the Avamar Plug-in for Oracle. "Installing the Avamar Plug-in for Oracle on HP-UX" on page 32 provides instructions.

NOTICE

The version of the Avamar Client for HP-UX and Avamar Plug-in for Oracle must be the same version.

Uninstalling the Avamar Plug-in for Oracle on HP-UX

1. Log in to the Oracle server as root.
2. Uninstall the Avamar Plug-in for Oracle by typing the following command:

   swremove hpuxrman

Installing, upgrading, and uninstalling the software on IBM AIX

The following topics describe how to install, upgrade, and uninstall theAvamar Plug-in for Oracle on IBM AIX:

Installing the Avamar Plug-in for Oracle on IBM AIX

You can install the Avamar Client for AIX software in either the default installation directory or an alternate directory. Ensure that you install the Avamar Plug-in for Oracle in the same directory as theAvamar Client for AIX. The installation returns an error if you attempt to install the Avamar Plug-in for Oracle in the default directory after you install the Avamar Client for AIX in an alternate directory.

1. Log in to the Oracle server as root.
2. Change the directory to the temporary directory by typing the following command:

   cd /*tmp*

   where *tmp* is the temporary directory.
3. Install the Avamar Plug-in for Oracle in the same directory as the Avamar Client for AIX:
   - To install the Avamar Plug-in for Oracle in the default directory, type the following command:

     geninstall -d AvamarRMAN-aix6-ppc-*version***.bff all**

     where *version* is the version of the Avamar software.
   - To install the Avamar Plug-in for Oracle in an alternate directory, type the following command:

     installp -R /*install-path* **-d AvamarRMAN-aix6-ppc-***version***.bff all**

     where:

     – *install-path* is the directory for the installation files.
     – *version* is the Avamar software version.

Upgrading the Avamar Plug-in for Oracle on IBM AIX

This topic describes how to upgrade the Avamar Plug-in for Oracle on IBM AIX.

NOTICE

You must upgrade the Avamar Plug-in for Oracle before you upgrade the Avamar Client for AIX. The versions of the Avamar Client for AIX and Avamar Plug-in for Oracle must be the same.

1. Download the Avamar Plug-in for Oracle installation packages. "Downloading the software" on page 32 provides instructions.
2. Log in to the Oracle server as root.
3. Change the directory to the temporary directory by typing the following command:

   cd /*tmp*

   where *tmp* is the temporary install directory.
4. Upgrade the Avamar Plug-in for Oracle:
   - To upgrade the Avamar Plug-in for Oracle in the default installation directory, type:

     geninstall -d AvamarRMAN-*platform-version***.bff all**

     where:

     – *platform* is the AIX system type.
     – *version* is the Avamar software version.
   - To upgrade the Avamar Plug-in for Oracle in an alternate installation directory, type:

     installp -R /*install-path* **-d AvamarRMAN-***platform-version***.bff all**

     where:

     – *install-path* is the alternate installation directory.
     – *platform* is the AIX system type.
     – *version* is the Avamar software version.
5. Download the Avamar Client for AIX. The *EMC Avamar Backup Clients User Guide* provides instructions.

6. Upgrade the Avamar Client for AIX:
   - To upgrade the Avamar Client for AIX in the default installation directory, type:

     geninstall -d AvamarClient-*platform-version***.bff all**

     where:

     – *platform* is the AIX system type.
     – *version* is the Avamar software version.
   - To upgrade the Avamar Client for AIX in an alternate installation directory, type:

     installp -R /*install-path* **-d AvamarClient-***platform-version***.bff all**

     where:

     – *install-path* is the alternate installation directory.
     – *platform* is the AIX system type.
     – *version* is the Avamar software version.

Uninstalling the Avamar Plug-in for Oracle on IBM AIX

The following procedure uninstalls the Avamar Plug-in for Oracle on IBM AIX.

1. Log in to the Oracle server as root.
2. View all Avamar packages installed on the system by typing the following command:

   lslpp -l | grep Avamar

   The following appears in the command shell:

   ```
   AvamarClient-aix6-ppc VERSION COMMITTED EMC Avamar client VERSION
   AvamarRMAN-aix6-ppc VERSION COMMITTED EMC Avamar client VERSION
   ```

3. Uninstall the Avamar Plug-in for Oracle software by typing the following command:

   geninstall -u AvamarRMAN-aix6-ppc-*version***.bff**

   where *version* is the Avamar version number.

Installing, upgrading, and uninstalling the software on Linux

The following topics describe how to install, upgrade, and uninstall theAvamar Plug-in for Oracle on Linux:

- "Installing the Avamar Plug-in for Oracle on Linux" on page 37
- "Upgrading the Avamar Plug-in for Oracle on Linux" on page 37
- "Uninstalling the Avamar Plug-in for Oracle on Linux" on page 38

Installing the Avamar Plug-in for Oracle on Linux

You can install the Avamar Client for Linux software in either the default installation directory or an alternate directory. Ensure that you install the Avamar Plug-in for Oracle in the same directory as the Avamar Client for Linux.

1. Log in to the Oracle server as root.
2. Change the directory to the temporary directory by typing the following command:

   cd /*tmp*

   where *tmp* is the temporary directory.
3. Install the Avamar Plug-in for Oracle in the same directory as the Avamar Client for AIX:
   - To install the Avamar Plug-in for Oracle in the default directory, type the following command:

     rpm -ivh AvamarRMAN-linux-*platform-version***.rpm**

     where *platform-version* is the platform type and Avamar version number.
   - To change base directory for the installation, type the following command:

     rpm --relocate /usr/local/avamar=/*install_path* **-i AvamarRMAN-linux-***platform-version***.rpm**

     where:

     – *install_path* is the new directory.
     – *platform-version* is the platform type and the Avamar version number.
   - To change the base directory and `var` directory locations during the installation, type the following command:

     rpm -ivh --relocate /usr/local/avamar=*install_path* **--relocate /var/avamar=***var_path* **AvamarRMAN-linux-***platform-version***.rpm**

     where:

     – *install_path* is the new directory.
     – *var_path* is the new `var` directory.
     – *platform-version* is the platform type and the Avamar version number.

Upgrading the Avamar Plug-in for Oracle on Linux

You can upgrade the Avamar Plug-in for Oracle from 7.0 to a later release by using the `rpm -Uvh` command. You can use the `--relocate` option to specify the alternate installation or `var` directory that you specified when you installed the initial build of release 7.0.

The following procedure upgrades the Avamar Plug-in for Oracle on Linux.

1. Upgrade the Avamar Client for Linux by using the instructions in the *EMC Avamar Backup Clients User Guide*.
2. Change the directory to the temporary directory by typing the following command:

   cd /*tmp*

   where *tmp* is the temporary install directory.

3. Upgrade the Avamar Plug-in for Oracle:
   - To upgrade the software in the default directory, type the following command:

     rpm -Uvh AvamarRMAN-linux-*platform*-*version*.rpm**

     where *platform-version* is the platform type and the Avamar version number.
   - To upgrade the software in a nondefault installation directory, type the following command:

     rpm -Uvh --relocate /usr/local/avamar=*install_path*
     AvamarRMAN-linux-*platform*-*version*.rpm**

     where:
     - *install_path* is the installation directory that you specified when you installed release 7.0.
     - *platform-version* is the platform type and the Avamar version number.
   - To upgrade the software and use a nondefault `var` directory, type the following command:

     rpm -Uvh --relocate /var/avamar=*var_path*
     AvamarRMAN-linux-*platform*-*version*.rpm**

     where:
     - *var_path* is the `var` directory that you specified when you installed release 7.0.
     - *platform-version* is the platform type and the Avamar version number.

   The `rpm -Uvh` command automatically uninstalls the earlier version of the Avamar Plug-in for Oracle, and then installs the new version.

NOTICE

The versions of the Avamar Client for Linux and Avamar Plug-in for Oracle must be the same.

Uninstalling the Avamar Plug-in for Oracle on Linux

1. Log in to the Oracle server as root.
2. Query all Avamar packages installed on the system by typing the following command:

   rpm -qa | grep Av

   The following output appears in the command shell:

   download-**AvamarRMAN**-*version*
   download-**AvamarClient**-*version*

   where *version* is the version of the Avamar software.
3. Uninstall the Avamar Plug-in for Oracle by typing the following command:

   rpm -e AvamarRMAN-*version*

   where *version* is the version of the Avamar Plug-in for Oracle.

4. Uninstall the Avamar Client for Linux by typing the following command:

   rpm -e AvamarClient-*version*

   where *version* is the version of Avamar Client for Linux.

   The following output appears in the command shell:

   ```
   avagent.d Info: Stopping Avamar Client Agent (avagent)...
   avagent.d Info: Client Agent stopped.
   ```

Installing, upgrading, and uninstalling the software on Solaris

The following topics describe how to install, upgrade, and uninstall the Avamar Plug-in for Oracle on Solaris:

Installing the Avamar Plug-in for Oracle on Solaris

To install the Avamar Plug-in for Oracle on a Solaris cluster (VCS), skip this procedure and continue with "Installing and registering the Avamar Cluster Client for Solaris" on page 41.

To install the Avamar Plug-in for Oracle on a stand-alone Solaris platform, complete the following procedure.

1. Log in to the Oracle server as root.
2. Change the directory to the temporary directory by typing the following command:

   cd /*tmp*

   where *tmp* is the temporary install directory.

3. Install the software by typing the following commands:

   pkgadd -d AvamarRMAN-solaris10-*platform***-***version***.pkg**

   where *platform*-*version* is the platform type and Avamar version number.

   The following output appears in the command shell:

   ```
   The following packages are available:
      1   AVMRrman      Avamar Client Plugin for Oracle RMAN
                        (sparc) 7.0.100-nnn

   Select package(s) you wish to process (or 'all' to process
   all packages). (default: all) [?,??,q]:
   ```

4. Type **1** and press **Enter**.

   The following output appears in the command shell:

```
Processing package instance <AVMRrman> from
</AvamarRMAN-solaris10-sparc-7.0.100-nnn.pkg>

Avamar Client Plugin for Oracle RMAN(sparc) 7.0.100-nnn
## Executing checkinstall script.
Using </opt> as the package base directory.
## Processing package information.
## Processing system information.
   4 package pathnames are already properly installed.
## Verifying package dependencies.
## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.

This package contains scripts which will be executed with super-user
permission during the process of installing this package.

Do you want to continue with the installation of <AVMRrman> [y,n,?]
```

5. Type **y** and press **Enter**.

   The following output appears in the command shell:

```
Installing Avamar Client Plugin for Oracle RMAN as <AVMRrman>

## Installing part 1 of 1.
/opt/AVMRclnt/bin/AVMRrman-update.info
/opt/AVMRclnt/bin/avoracle
/opt/AVMRclnt/bin/oracle.pin
/opt/AVMRclnt/bin/rac_config
/opt/AVMRclnt/bin/rac_deconfig
/opt/AVMRclnt/bin/rac_stop
/opt/AVMRclnt/bin/sbtscan
/opt/AVMRclnt/etc/installresponse/AVMRrman
[ verifying class <apps> ]
/opt/AVMRclnt/lib/libobk_avamar.so
/opt/AVMRclnt/lib/libobk_avamar64.so
[ verifying class <libs> ]
## Executing postinstall script.
INSTALLDIR /opt/AVMRclnt
CLIENTBASEDIR /opt/AVMRclnt
BASEDIR /opt
AVMRDIR AVMRclnt
avagent.d Info: Stopping Avamar Client Agent (avagent)...
avagent.d Info: Client Agent stopped.
avagent Info <5008>: Logging to /opt/AVMRclnt/var/avagent.log
avagent Info <5417>: daemonized as process id 28742
avagent.d Info: Client Agent started.
Installation complete

Installation of <AVMRrman> was successful.
```

Installing and registering the Avamar Cluster Client for Solaris

The following topics describes how to install and register the Avamar Cluster Client for Solaris.

Skip this procedure if the Solaris platform is a stand-alone platform.

NOTICE

The Avamar Cluster Client for Solaris includes the Avamar Plug-in for Oracle.

Installing the software

Install the Avamar Cluster Client for Solaris software on both nodes in the VCS cluster.

1. Log in to the active VCS node as root.
2. Change the directory to the temporary directory by typing the following command:

   cd /*tmp*

   where *tmp* is the temporary install directory.
3. Install the software by typing the following commands:

   pkgadd -d AvamarClusterClient-solaris10-*platform-version***.pkg**

   where *platform-version* is the platform type and Avamar version number

   The following output appears in the command shell:

   ```
   The following packages are available:
      1  AVMRclusclnt         Avamar Cluster Client
                              (sparc) 7.0.100-nnn
   Select package(s) you wish to process (or 'all' to process all
   packages). (default: all) [?,??,q]:
   ```
4. Type **1** and press **Enter**.

   The following output appears in the command shell:

   ```
   Processing package instance <AVMRclusclnt> from
   </home/source/fresh/installers/solpkgs/PKGS/AvamarClusterClient-sol
   aris10-sparc-7.0.100-nnn.pkg>
   Avamar Cluster Client(sparc) 7.0.100-nnn
   This software is copyright EMC Corporation, 2001-2012.
   Please read and agree to the End User License Agreement which
   will be placed in the base directory of the install as a file
   named AvamarClient-License.txt.
   ## Executing checkinstall script.
   Using </opt> as the package base directory.
   ## Processing package information.
   ## Processing system information.
   ## Verifying package dependencies.
   ## Verifying disk space requirements.
   ## Checking for conflicts with packages already installed.
   ## Checking for setuid/setvtgid programs.
   This package contains scripts which will be executed with super-user
   permission during the process of installing this package.
   Do you want to continue with the installation of <AVMRclusclnt>
   [y,n,?] y
   ```

5. Type **y** and press **Enter**.

   The following output appears in the command shell:

```
## Installing part 1 of 1.
/opt/AVMRclusclnt/AvamarClient-License.txt
/opt/AVMRclusclnt/bin/avagent.bin
/opt/AVMRclusclnt/bin/avclusinstall
/opt/AVMRclusclnt/bin/avclusuninstall
/opt/AVMRclusclnt/bin/avoracle
/opt/AVMRclusclnt/bin/avregister
/opt/AVMRclusclnt/bin/avscc
/opt/AVMRclusclnt/bin/avtar
/opt/AVMRclusclnt/bin/avtar.bin
/opt/AVMRclusclnt/bin/oracle.pin
/opt/AVMRclusclnt/bin/sbtscan
/opt/AVMRclusclnt/bin/unix.pin
/opt/AVMRclusclnt/etc/AvamarClient-UpdateReplace.sh
/opt/AVMRclusclnt/etc/avagent.d
/opt/AVMRclusclnt/etc/start.sh
/opt/AVMRclusclnt/etc/stop.sh
[ verifying class <apps> ]
/opt/AVMRclusclnt/lib/libgcc_s.so.1
/opt/AVMRclusclnt/lib/libobk_avamar.so
/opt/AVMRclusclnt/lib/libobk_avamar64.so
/opt/AVMRclusclnt/lib/libstdc++.so.5
[ verifying class <libs> ]
## Executing postinstall script.
Installation complete
You may run /opt/AVMRclusclnt/bin/avclusinstall to configure avamar
cluster client.
Installation of <AVMRclusclnt> was successful.
```

6. Run `avclustinstall` by typing the following command:

```
cd /opt/AVMRclusclnt/bin/
./avclusinstall
```

   The following output appears in the command shell:

```
Setting PATH set for Veritas Cluster Server commands
Available service groups for configuration
                1. oraclegrp
   Select an option:
```

7. Type **1** and press **Enter**.

   The following output appears in the command shell:

```
          Selected service group: oraclegrp
             Group                    State
          oraclegrp                   PARTIAL
Enter the resource name of Avamar application for selected service
group (Default: avagent_oraclegrp):
```

NOTICE

The state of `oraclegrp` can be either `ONLINE` or `PARTIAL`. Usually the state is `ONLINE`.

8. Type the resource name of the Avamar application and press **Enter**.

   The following output appears in the command shell:

   ```
   Available mount Resources:
                  1. oramnt (Mount point: /fsclus01)
   Selected mount resource: oramnt
   Do you want to install Avamar Client Plugin for Oracle RMAN? (y/n)
   [y]:
   ```

9. Type **y** and press **Enter**.

   The following output appears in the command shell:

   ```
   Enter the hostname or dns alias associated with virtual-ip
   (15.16.140.13):
   ```

10. Type the hostname or DNS alias and press **Enter**.

    ```
    Active node detected
    === Client Registration and Activation
    This script will register and activate the client with the
    Administrator server.
    Using /opt/AVMRclusclnt/cluster/oraclegrp/var as the var dir for the
    group oraclegrp avagent
    Enter the Administrator server address (DNS text name or numeric IP
    address, DNS name preferred):
    ```

    NOTICE

    The hostname or DNS alias must match the hostname specified by the HOST parameter in the tnsnames.ora and listener.ora files.

11. Type the hostname (defined in DNS) or IP address for the Administrator server and press **Enter**.

    The following output appears in the command shell:

    ```
    Enter the Avamar server domain [clients]:
    ```

12. Type the domain name and press **Enter**.

    The following output appears in the command shell:

    ```
    avagent.d Info: Client Agent not running.
    avagent Info <5241>: Logging to
    /opt/AVMRclusclnt/cluster/oraclegrp/var/avagent.log
    avagent Info <5174>: - Reading
    /opt/AVMRclusclnt/cluster/oraclegrp/var/avagent.cmd
    avagent.d Info: Client activated successfully.
    avagent Info <5241>: Logging to
    /opt/AVMRclusclnt/cluster/oraclegrp/var/avagent.log
    avagent Info <5174>: - Reading
    /opt/AVMRclusclnt/cluster/oraclegrp/var/avagent.cmd
    avagent Info <5417>: daemonized as process id 7154
    avagent.d Info: Client Agent started.
    avagent.d Info: Stopping Avamar Client Agent (avagent)...
    avagent.d Info: Client Agent stopped.
    Registration Complete.
    Avamar Client has been installed for service group 'oraclegrp'
    successfully.
    Do you want to install Avamar in another service group? (y/n) [n]:
    ```

13. Type **n** and press **Enter**.

14. Log in to the passive node as root and type the following command:

    ```
    cd /opt/AVMRclusclnt/bin
    ./avclusinstall
    ```

    The following output appears in the command shell:

    ```
    Setting PATH set for Veritas Cluster Server commands
    Available service groups for configuration
                    1. oraclegrp
          Select an option:
    ```

15. Type **1** and press **Enter**.

    The following output appears in the command shell:

    ```
       Selected service group: oraclegrp
             Group                          State
          oraclegrp                         OFFLINE
    Do you want to install Avamar Client Plugin for Oracle RMAN? (y/n)
    [y]:
    ```

16. Type **y** and press **Enter**.

    ```
    Passive node detected.
    Avamar Client has been installed for service group 'oraclegrp'
    successfully.
    Do you want to install Avamar in another service group? (y/n) [n]:
    ```

17. Type **n** and press **Enter**.

Bring VCS resources online

Bring VCS resources online by typing the following command:

hares -online avagent_*servicegroup* **-sys** *hostname*

where:

- avagent_*servicegroup* is the default name of the Avamar VCS cluster agent. If you did not select the default name in step 8, use the name you specified in step 8.
- *hostname* is the system where the VCS service group is in PARTIAL state.

Upgrading the Avamar Plug-in for Oracle on Sun Solaris

The following procedure describes how to upgrade the Avamar Plug-in for Oracle on Sun Solaris.

1. Uninstall the Avamar Plug-in for Oracle. "Installing the Avamar Plug-in for Oracle on Solaris" on page 39 provides instructions.
2. Uninstall the Avamar Client for Solaris. The *EMC Avamar Backup Clients User Guide* provides instructions.
3. Download the Avamar Client for Solaris and the Avamar Plug-in for Oracle installation packages. "Downloading the software" on page 32 provides instructions.

   NOTICE

   The version of the Avamar Client for Solaris and Avamar Plug-in for Oracle must be the same version.

4. Install the new version of the Avamar Client for Solaris. The *EMC Avamar Backup Clients User Guide* provides instructions.
5. Install the new version of the Avamar Plug-in for Oracle. "Installing the Avamar Plug-in for Oracle on Solaris" on page 39 provides instructions.

Uninstalling the Avamar Plug-in for Oracle on Sun Solaris

1. Log in to the Oracle server host as root.
2. Display all Avamar packages installed on the system by typing the following command:

   pkginfo | grep AVMR

   Information similar to the following appears in the command shell:

   ```
   The following packages are currently installed:
      1  AVMRclnt     Avamar Client
                      (sparc) 7.0.100-nnn
      2  AVMRrman     Avamar Client Plugin for Oracle RMAN
                      (sparc) 7.0.100-nnn
   ```

3. Note the package names.
4. Uninstall the software by typing the following command:

   pkgrm *package_name*

   where *package_name* is the Avamar plug-in package displayed in step 2.

   The following output appears in the command shell:

   ```
   The following package is currently installed:
               package_name
   Do you want to remove this package?
   ```

5. Type **y** and press **Enter**.

   The following output appears in the command shell:

   ```
   Removal of package_name was successful.
   ```

Uninstalling the Avamar Cluster Client for Solaris

The *EMC Avamar Backup Clients User Guide* provides instructions for uninstalling the Avamar Cluster Client for Solaris software.

Installing, upgrading, and uninstalling the software on Windows

The following topics describe how to install, upgrade, and uninstall the Avamar Plug-in for Oracle on Windows:

Installing the Avamar Plug-in for Oracle on Windows

Complete the following instructions on both Windows stand-alone platforms and MSCS two-node clusters. In a cluster, install the Avamar Plug-in for Oracle on both nodes and in the same directory on each node.

The following procedure installs the Avamar Plug-in for Oracle on Windows.

1. Log in to the Oracle server as an administrator.
2. Go to the temporary directory that contains the installation files that you downloaded in "Downloading the software" on page 32.
3. Start the Avamar Plug-in for Oracle installation by using the correct method:
   - If UAC is disabled, double-click the installation package.
   - If UAC is enabled, perform the following steps:
     a. Right-click the **Command Prompt** icon and select **Run as administrator**.
     b. In the **Command Prompt** window, change the working directory to the location of the installation package by typing the following command:

        cd *tmp*

        where *tmp* is the pathname of the directory that contains the installation package.

     c. Type the following command on a single command line to start the installation:

        msiexec /i AvamarRMAN-windows-*platform-version***.msi**

        where *platform-version* is the platform type and Avamar version number.

   "Checking the User Account Control setting on Microsoft Windows" on page 31 provides more information about UAC.

   The installation wizard appears.
3. Follow the instructions in the wizard to install the Avamar Plug-in for Oracle.

   The Avamar Plug-in for Oracle automatically installs to the same directory as the Avamar Client for Windows.
4. When the installation completes, click **Finish**.

Configuring the cluster client on Windows

Use the Avamar Cluster Configuration Tool to configure the Avamar cluster client on the active node in an active/passive configuration or on both active nodes in an active/active configuration.

Before you run the Avamar Cluster Configuration Tool, ensure that the Avamar Client for Windows and the Avamar Plug-in for Oracle are installed on each node in the cluster.

1. Log in to the active node in the cluster as a domain administrator. The account must be a member of the local Administrators group on each cluster node.
2. Select **Start** › **EMC Avamar** › **Cluster Configuration Tool**.

   The **Welcome page of the Cluster Configuration** wizard appears.
3. Click **Next**.

   The **Plug-Ins** page appears.
4. Select **EMC Avamar Backup Plug-in for Oracle** and click **Next**.

   The **Cluster Nodes** page appears.
5. Ensure that the status of all nodes is Up, and then click **Next**.

   The **Operations** page appears.
6. Select the **Configure new Oracle Virtual Client for cluster** option.

   NOTICE

   Select the **Use existing configuration to configure new nodes for Oracle Virtual Clients on cluster** option to add a node to an existing configuration. The *EMC Avamar for Windows Server User Guide* provides more information.
7. Click **Next**.

   The **Prerequisites** page appears. A check mark next to a prerequisite indicates that the prerequisite is met.
8. Ensure that the environment meets all prerequisites on the **Prerequisites** page.

   If a prerequisite is not met, exit the wizard, resolve the issue, and restart the wizard.
9. Select the IP version that the environment uses, and then click **Next**.

   The **Attach to Service** page appears.
10. Select the cluster service for the plug-in, and then click **Next**.

    The **Server Settings** page appears.
11. Specify the settings for the Avamar server:

    a. Type either the DNS name of the Avamar server in the **Name** box or the IP address in the **IPv4**/**IPv6** address box.

    b. Type the name of the Avamar domain for the cluster client in the **Client domain for cluster** box.

To specify a domain at the root level, type **/domain**, where *domain* is the domain name. To specify a subdomain, type **/domain/subdomain**, where *domain* is the domain name and *subdomain* is the subdomain name.

c. Type the data port for Avamar client/server communication in the **Port number** box.

NOTICE

Port 28001 is the default port that the Avamar client uses to communicate with the Avamar server.

d. Type the name of the shared network directory or volume in the **Cluster client's var directory** box or click **Browse** to select a a shared network directory or volume.

The shared network directory or volume stores the cluster client configuration and the log files. All nodes in the cluster must have write access to this directory or volume.

NOTICE

Select a volume that the cluster owns instead of a remote path on the network.

e. Click **Next**.

The **Summary** page appears.

12. Review the configuration settings, and then click **Configure**.

The **Progress** page provides the status of the configuration. When the configuration process completes, the Results page appears.

13. Click **Close**.

Upgrading the Avamar Plug-in for Oracle on Windows

The steps to upgrade the Avamar Plug-in for Oracle on Windows depend on whether the installation is on a stand-alone server or in a cluster.

Upgrading on a stand-alone Windows server

1. Ensure that you meet all system requirements for the new version. "Preparing to install the Avamar Plug-in for Oracle" on page 30 provides more information.
2. Upgrade the Avamar Client for Windows by running the Windows client installation wizard for the new version on the client computer. The *EMC Avamar for Windows Server User Guide* provides instructions.
3. Upgrade the Avamar Plug-in for Oracle by running the plug-in installation wizard for the new version on the client computer. "Installing the Avamar Plug-in for Oracle on Windows" on page 46 provides instructions.

Upgrading in a Windows cluster

1. Uninstall the current version of the Avamar Client for Windows and Avamar Plug-in for Oracle:
   a. Use the Cluster Configuration Tool to uninstall the Avamar cluster client.
   b. Uninstall the earlier version of the Avamar Plug-in for Oracle on each node in the cluster.
   c. Uninstall the earlier version of the Avamar Client for Windows on each node in the cluster.

   The plug-in guide for the earlier release provides instructions.
2. Install the new version of the Avamar Client for Windows and Avamar Plug-in for Oracle:
   a. Install the Avamar Client for Windows in the same directory on each node in the cluster. The *EMC Avamar for Windows Server User Guide* provides instructions.
   b. Install the Avamar Plug-in for Oracle in the same directory on each node in the cluster. "Installing the Avamar Plug-in for Oracle on Windows" on page 46 provides instructions.
   c. Register each node in the cluster with the Avamar server. The *EMC Avamar for Windows Server User Guide* provides instructions.
   d. Use the Cluster Configuration Tool to install the Avamar Cluster Client on an active node. "Configuring the cluster client on Windows" on page 47 provides instructions.

Uninstalling the Avamar Plug-in for Oracle on Windows

The steps to uninstall the Avamar Plug-in for Oracle on Windows depend on whether the installation is on a stand-alone server or in a cluster.

Uninstalling on a stand-alone Windows server

1. Uninstall the Avamar Plug-in for Oracle:
   - On Windows Server 2012 or Windows Server 2008, use **Programs and Features**.
   - On Windows Server 2003, use **Add/Remove Programs**.
2. Uninstall the Avamar Client for Windows:
   - On Windows Server 2012 or Windows Server 2008, use **Programs and Features**.
   - On Windows Server 2003, use **Add/Remove Programs**.

Uninstalling in a Windows cluster

1. Use the Cluster Configuration Tool on an active node to uninstall the Avamar Cluster Client.
   a. Log in to the active node in the cluster as a domain administrator. The account must also be a member of the local Administrators group on each cluster node.
   b. Select **Start** › **EMC Avamar** › **Cluster Configuration Tool**.

      The **Welcome page of the Cluster Configuration** wizard appears.

c. Click **Next**.

The **Plug-Ins** page appears.

d. Select **EMC Avamar Backup Plug-in for Oracle** and click **Next**.

The **Cluster Nodes** page appears with a list of nodes and each node's status.

e. Ensure that the status of all nodes is Up, and then click **Next**.

The **Operations** page appears.

f. Select **Remove the Oracle Virtual Client from all nodes in cluster** and click **Next**.

The **Prerequisites** page appears. A check mark next to a prerequisite indicates that the prerequisite has been met.

g. Ensure that the environment meets all prerequisites on the page, and then click **Next**.

The **Summary** page appears.

h. Review the configuration settings and click **Uninstall**.

The **Progress** page provides the status of the uninstall operation. When the uninstall completes, the Results page appears.

i. Click **Close**.

2. Uninstall the Avamar Plug-in for Oracle from each node:

- On Windows Server 2012 or Windows Server 2008, use **Programs and Features**.
- On Windows Server 2003, use **Add/Remove Programs**.

3. Uninstall the Avamar Client for Windows from each node:

- On Windows Server 2012 or Windows Server 2008, use **Programs and Features**.
- On Windows Server 2003, use **Add/Remove Programs**.

Excluding Oracle directories from file system backups

To optimize Oracle database backups and save storage space, create a dataset that excludes the platform-specific file system from the Avamar Plug-in for Oracle backup.

NOTICE

Including Oracle database files with the file system backup consumes storage space in the Avamar system and increases network traffic during the nightly backup window.

Create a dataset that excludes the entire root directory branch for each Oracle instance, and then assign the dataset to the Avamar client. For example, if the full pathname of a database instance is `/space/local/oracle/ora901`, exclude this directory in the Avamar dataset.

1. Open the `oratab` file in a text editor and note the home directory for all Oracle database instances.
2. In Avamar Administrator, select **Tools** › **Manage Dataset**.

The **Manage All Datasets** window appears.

3. Click **New**.

   The **New Dataset** dialog box appears.

   The box below the **Add to List** (**+**) and **Remove From List** (**-**) buttons lists all plug-ins installed on the client.

4. Type a name for the new dataset.

   The name can include alphanumeric characters (A-Z, a-z, 0-9) and the following special characters: period (.), hyphen (-), and underscore (_). Do not use Unicode characters or the following special characters: ` ~ ! @ # $ % ^ & * ( ) = + [ ] { } | \ / ; : ' " ‹ › , ?

5. Click the **Source Data** tab.

   The **Source Data** tab is where you define a list of source data plug-ins that contribute data to this dataset.

   a. Select **Enter Explicitly** and select the plug-in from the **Select Plug-In Type** list.

   b. To remove a plug-in from the dataset, select the plug-in from the list in the bottom portion of the **New Dataset** dialog box, and then click **-** (**Remove From List**). Repeat this step as necessary.

   NOTICE

   The Avamar Plug-in for Oracle does not support include or exclude lists in datasets.

6. Click the **Options** tab and select the plug-in from the **Select Plug-In Type** list.

7. Complete the following fields:

   a. Leave the **Oracle instance name** field blank. The Oracle instance name is filled in when the Oracle server is assigned to a group.

   b. Type the username to use to authenticate the Oracle database in the **Username** field. If you leave the **Username** field blank, RMAN tries to log in with the same username and password that the Avamar client agent uses, and attempts to assume `SYSDBA` privileges.

   c. Type the password for the account in the **Password** field.

   d. Click **OK**.

      The **New Dataset** dialog box closes.

8. Click **OK** in the **Manage All Datasets** window.

   The **Manage All Datasets** window closes.

9. In Avamar Administrator, click the **Policy** tab.

   The **Policy** window appears.

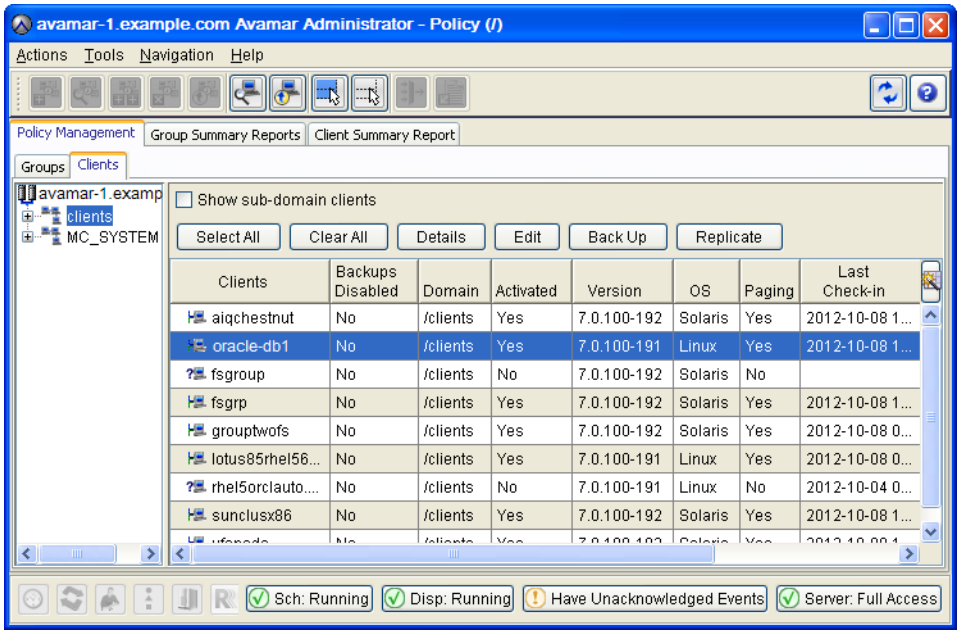
10. Click the **Policy Management** tab.

11. Click the **Clients** tab.

    The left pane contains a list of domains.

12. Click the domain that contains the Oracle server.

    A list of Avamar clients appears in a table to the right of the domains list.



13. Click the client that runs the Oracle server.
14. Click the **Edit** toolbar button.

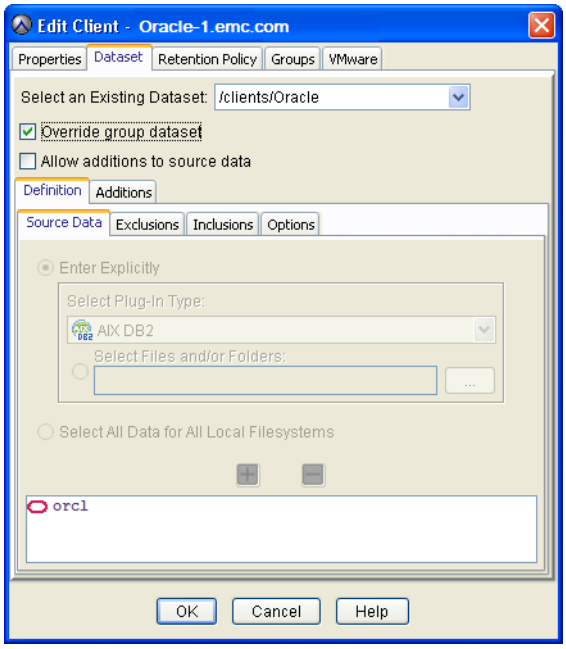
    The **Edit Client** dialog box appears.

15. In the **Edit Client** dialog box, complete the following setting:

    a. Click the **Dataset** tab and select the dataset you created in step 4 from the **Select An Existing Dataset** list.

    b. Select **Override group dataset**.

The following figure shows a completed **Edit Dataset** dialog box.



c. Click **OK**.

CHAPTER 3
Oracle RAC Configuration

The following topics describe how to configure Oracle RAC to use with the Avamar Plug-in for Oracle:

Configuring Oracle RAC on Linux or UNIX

To configure the Oracle RAC on HP-UX, IBM AIX, Linux, or Solaris, complete the following tasks:

1. "Running the rac_config script" on page 56
2. "Registering the Avamar client" on page 57

NOTICE

EMC recommends that you configure a shared `var` directory to ensure automatic failover for the Avamar agent if the active node goes down. If you do not configure a shared `var` directory, you must manually activate another node when the active node goes down. Appendix A, "RAC Issues When Not Using Shared Var Directory," provides more information.

Running the rac_config script

The following procedure runs the `rac_config` script on each RAC node. You must specify the same shared Avamar `var` directory for each node that you configure.

1. Log in to one of the Oracle RAC nodes as root.
2. Change the directory to `/usr/local/avamar/bin` by typing the following command:

   `cd /usr/local/avamar/bin`

3. Start the script by typing the following command:

   `./rac_config`

   The following output appears in the command shell:

   ```
   Enter the path of Oracle Clusterware Home : /u01/app/11.2.0/grid
   Using ORACLE_HOME : /u01/app/11.2.0/grid
   Setting PATH set for Oracle commands
   Oracle cluster version 11 R2
   Do you want to configure on a cluster shared filesystem? [y/n] [y]: y
   Enter the full path of var directory location[]:
   ```

4. Type the directory path, and then press **Enter**.

   The following output appears in the command shell:

   ```
   Enter the virtual hostname [vlrac1]:
   ```

   where *vlrac1* is the scan name for Oracle grid 11*g* R2.

5. Press **Enter** to accept the default virtual hostname.

   The following output appears in the command shell:

   ```
   Using vlrac1 as hostname
   ```

6. Repeat step 1–step 5 on the other nodes.

Registering the Avamar client

The following procedure registers the Avamar client with the Avamar server. You register the client on only one node.

1. Log in to one of the Oracle RAC nodes as root.

   NOTICE

   Run `avregister` on one RAC node only.

2. Change the directory to `/usr/local/avamar/ora_rac/bin` by typing the following command:

   `cd /usr/local/avamar/ora_rac/bin`

3. Start the registration script by typing the following command:

   `./avregister`

   The following output appears in the command shell:

   ```
   === Client Registration and Activation
   This script will register and activate the client with the
   Administrator server.
   Enter the Administrator server address (DNS text name or numeric IP
   address, DNS name preferred):
   ```

4. Type the DNS hostname or IP address of the Administrator server, and then press **Enter**.

   The following output appears in the command shell:

   ```
   Enter the Avamar server domain [clients]:
   ```

5. Press **Enter** to accept the default domain (clients).

   The following output appears in the command shell:

   ```
   avagent.d Info: Server stopped. [ OK ]
   avagent Info <5241>: Logging to
   /usr/local/avamar/ora_rac/var/avagent.log
   avagent.d Info: Client activated successfully. [ OK ]
   avagent Info <5241>: Logging to
   /usr/local/avamar/ora_rac/var/avagent.log
   avagent Info <5417>: daemonized as process id 3385
   avagent.d Info: Server started. [ OK ]
   Registration Complete.
   ```

Once you register the Avamar client with the Avamar server, `start.sh` runs and starts `EMCagent` as an Oracle Clusterware resource on the current node. Backups and restores connect to the RAC database instance on the active node. If the active node goes down, `EMCagent` automatically restarts on one of the other RAC nodes. The new node then automatically notifies Avamar server of the address change for the active node.

Managing Oracle RAC configurations on Linux or UNIX

The following topics provide instructions for performing common Oracle RAC management functions on HP-UX, IBM AIX, Linux, or Solaris:

Changing the active node

The following procedure changes the currently registered RAC node to the inactive node.

1. Log in to the inactive cluster node as root.
2. Change the directory to the shared `var` directory.
3. Restart `EMCagent` by typing the following command:

   `./start.sh.`

Removing the Oracle RAC configuration

You can use `rac_deconfig` to remove the Oracle RAC configuration from one node only or both nodes. If the `EMCagent` resource is online, you must first move it to a different node before running `rac_deconfig`.

The following procedure removes the Oracle RAC configuration:

1. Log in to the registered node as root.
2. Change the directory to `/usr/local/avamar/bin` by typing the following command:

   `cd /usr/local/avamar/bin`

3. Stop `EMCagent` and remove it from the Oracle Clusterware resources by typing the following command:

   `./rac_stop`

   The following output appears in the command shell:

   ```
   /usr/local/avamar/bin/rac_stop
   Enter the path of Oracle Clusterware Home:
   ```

4. Run the `rac_deconfig` script by typing the following command:

   `./rac_deconfig`

   The following output appears in the command shell:

   ```
   avagent.d Info: Client Agent not running.
   [PASSED]
   ```

   The `rac_deconfig` script deletes the *`AVAMAR-INSTALL-DIR`*`/ora_rac` directory.

Configuring Oracle RAC on Windows Server 2008

To configure the Oracle RAC on Windows Server 2008, complete the following tasks:

1. "Running AvamarRACConfiguration.exe" on page 59
2. "Starting the EMCagent clusterware resource on one node only" on page 60
3. "Verifying the Oracle RAC configuration" on page 60

NOTICE

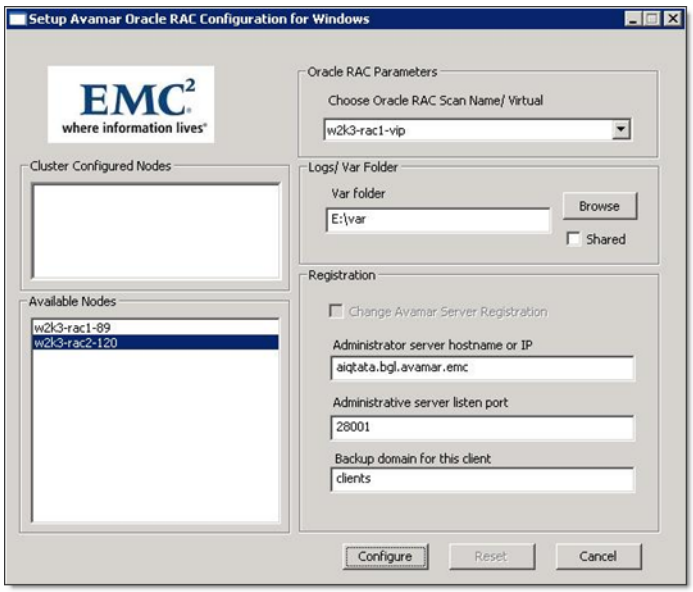
EMC recommends that you configure a shared `var` directory to ensure automatic failover for the Avamar agent if the active node goes down. If you do not configure a shared `var` directory, you must manually activate another node when the active node goes down. Appendix A, "RAC Issues When Not Using Shared Var Directory," provides more information.

Running AvamarRACConfiguration.exe

The following procedure runs `AvamarRACConfiguration.exe` on one Oracle cluster node. `AvamarRACConfiguration.exe` is installed as part of the Avamar Plug-in for Oracle installation and is located in `C:\Program Files\avs\bin`.

1. Log in to one of the Oracle cluster nodes as an administrator.
2. Double-click `C:\Program Files\avs\bin\AvamarRACConfiguration.exe`.

   The **Setup Avamar RAC Configuration for Windows** dialog box appears.



3. Select the correct name from the **Choose Oracle RAC Scan Name/Virtual** list:
   - For Oracle 11*g* R1, select the virtual hostname.
   - For Oracle 11*g* R2, select the scan name.

4. Type the full pathname and folder name for the `var` folder in the **Var folder** field.

   To browse the file system for the `var` folder, click **Browse** and select the `var` folder from the **File Open** dialog box.

5. Select the **Shared** checkbox if the `var` folder is a shared folder or disk.

   NOTICE

   The **Change Avamar Server Registration** option is disabled if the Avamar server is not configured.

6. Type the DNS hostname or IP address for the Avamar server in the **Administrator server hostname or IP** field.
7. Type the port for the Avamar server in the **Administrative server listen port** field. The default value is 28001.
8. Type the domain name in the **Backup domain for this client** field. The default value is clients.
9. Select one or more nodes from the **Available Nodes** box.

   To select multiple entries, press and hold the **Ctrl** key while you select entries with the mouse.

10. Click **Configure**.

Starting the EMCagent clusterware resource on one node only

1. Log in to one of the Oracle cluster nodes as an administrator.
2. Start `EMCagent` from the **Command Prompt** by typing one of the following commands:
   - For Oracle 11g R1, type the following command:

     ```
     crs_start EMCagent
     ```

   - For Oracle 11*g* R2, type following command:

     ```
     crsctl start resource EMCagent
     ```

Verifying the Oracle RAC configuration

1. Log in to the Oracle cluster node as an administrator.
2. Ensure that the Avamar Oracle RAC Backup Agent appears in the Windows Services list.
3. Verify that the `EMCagent` resource was added to Oracle Clusterware by typing one of the following commands:
   - For Oracle 11*g* R1, type the following command:

     ```
     crs_stat EMCagent
     ```

   - For Oracle 11*g* R2, type the following command:

     ```
     crsctl status resource EMCagent
     ```

Managing Oracle RAC configurations on Windows Server 2008

The following topics provide instructions for performing common Oracle RAC management functions on Windows Server 2008:

Stopping the Oracle EMCagent

1. Log in to the Oracle cluster node where `EMCagent` is running as an administrator.
2. Stop `EMCagent` from the **Command Prompt** by typing one of the following commands:
   - For Oracle 11g R1, type the following command:

     ```
     crs_stop EMCagent
     ```
   - For Oracle 11*g* R2, type the following command:

     ```
     crsctl stop resource EMCagent
     ```

Adding a new node to an Oracle RAC configuration

1. Stop `EMCagent` from the **Command Prompt** by typing one of the following commands:
   - For Oracle 11g R1, type the following command:

     ```
     crs_stop EMCagent
     ```
   - For Oracle 11*g* R2, type the following command:

     ```
     crsctl stop resource EMCagent
     ```
2. Use Avamar Administrator to deactivate the registered Oracle RAC client.
   a. In Avamar Administrator, click the **Policy** tab.

      The **Policy** window appears.

   b. Click the **Policy Management** tab.

   c. Click the **Clients** tab.

   d. Select the client from the table.

   e. Select **Actions** › **Client** › **Edit Client**.

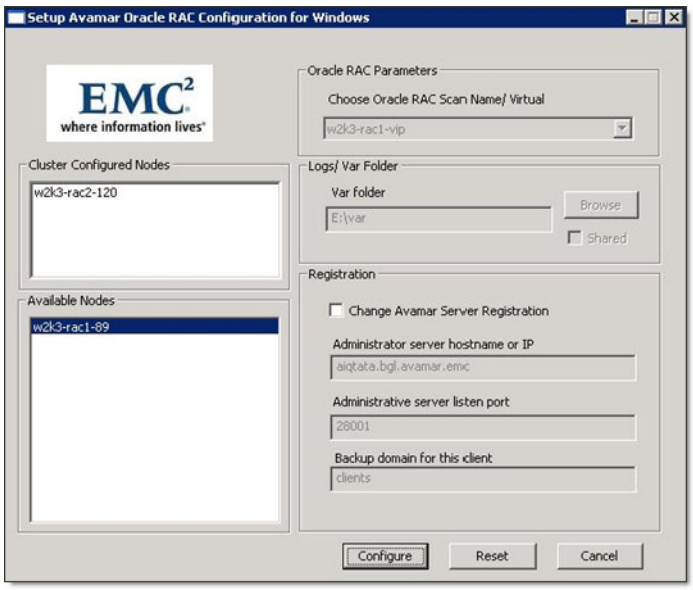
      The **Edit Client** dialog box appears.

   f. Click the **Properties** tab.

   g. Clear the **Activated** checkbox.

3. Run `AvamarRACConfiguration.exe` on any one node.

   The **Cluster Configured Node** section displays all configured nodes.



   The **Oracle RAC Parameters**, **Logs/ Var Folder**, and **Registration** group boxes are disabled when you add a new node to a cluster configuration.

4. Select a node from the **Available Nodes** group box.

   To select multiple entries, press and hold the **Ctrl** key while you select entries with the mouse.

5. After you add the node to the configuration, start the `EMCagent` on any Clusterware node:

   - For Oracle 11g R1, type the following command:

     `crs_start EMCagent`

   - For Oracle 11*g* R2, type the following command:

     `crsctl start resource EMCagent`

Re-registering a node with a different Avamar server

1. Stop `EMCagent` from the **Command Prompt** by typing one of the following commands:

   - For Oracle 11g R1, type the following command:

     `crs_stop EMCagent`

   - For Oracle 11*g* R2, type the following command:

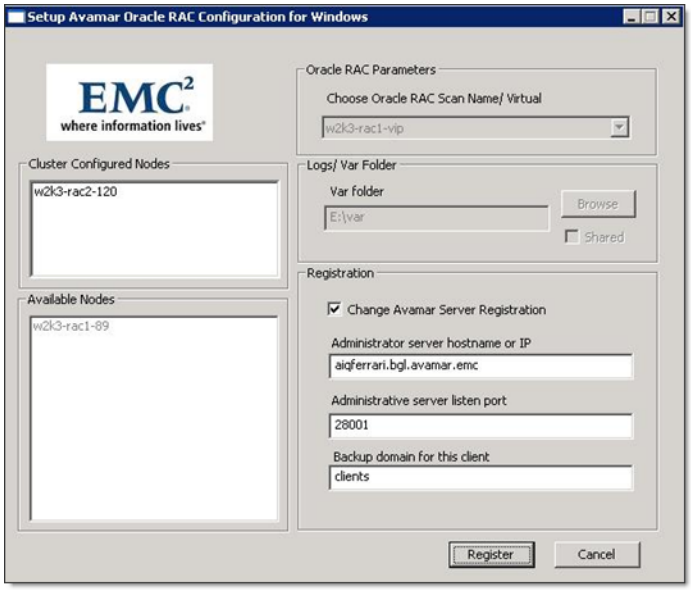
     `crsctl stop resource EMCagent`

2. Run `AvamarRACConfiguration.exe`.

   The C**luster Configured Nodes** group box display all configured nodes.

3. Select the **Change Avamar Server Registration** checkbox.

   The **Setup Avamar Oracle RAC Configuration for Windows** dialog box appears.



   Selecting the **Change Avamar Server Registration** option clears the nodes in the **Available Nodes** group box.

4. Type the DNS hostname or IP address for the Avamar server in the **Administrator server hostname or IP** field.
5. Type the port for the Avamar server in the **Administrative server listen port** field. The default value is 28001.
6. Type the domain name in the **Backup domain for this client** field. The default value is clients.
7. Click **Register**.
8. After the registration completes, start the `EMCagent` on any of the Clusterware nodes by typing one of the following commands:
   - For Oracle 11g R1, type the following command:

     ```
     crs_start EMCagent
     ```

   - For Oracle 11*g* R2, type the following command:

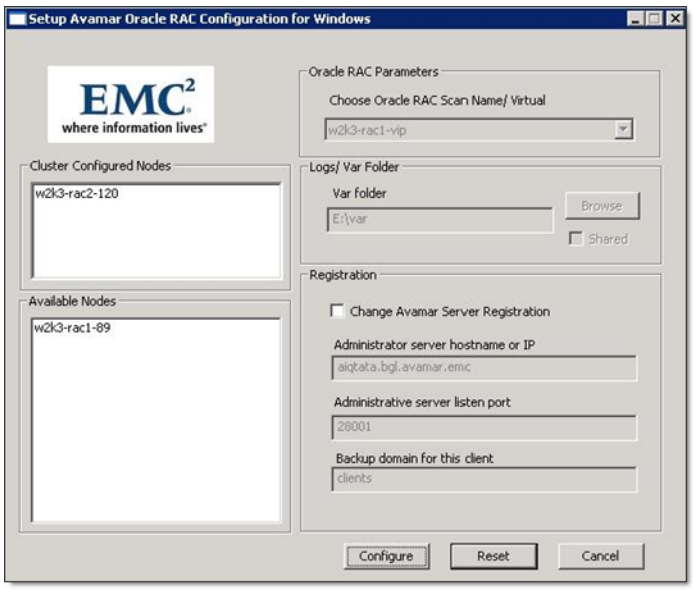
     ```
     crsctl start resource EMCagent
     ```

Resetting the Oracle RAC configuration

The following procedure resets the Oracle RAC configuration. You cannot perform a reset operation on a node that is not a member of the cluster configuration.

1. Log in to the Oracle cluster node as an administrator.
2. On any cluster node, run `AvamarRACConfiguration.exe`.

   The **Setup Avamar RAC Configuration for Windows** dialog box appears.



3. Click **Reset**.

   All the nodes in **Cluster Configured Nodes** group box are deleted and unregistered from the Avamar server.

CHAPTER 4
Backup

The following topics describe how to use the Avamar Plug-in for Oracle to perform hot database backups:

Creating the Oracle user account

If an Oracle user account with SYSDBA privileges does not already exist, you must create one. The Avamar software uses the Oracle account to perform database backups and restores. You specify the username and password in the **Backup Command Line Options**, **Restore Command Line Options**, and **New Dataset** dialog boxes. Oracle documentation provides instruction for creating an Oracle user account.

To use an RMAN catalog, you must configure the catalog.

Enabling Block Change Tracking

The Block Change Tracking feature can improve level 1 (differential and cumulative) backup performance by recording changed blocks in each datafile in a block change tracking file.

The following procedure enables the Block Change Tracking feature.

1. Determine whether Block Change Tracking is enabled by typing the following command from an SQL prompt:

   select status from v$block_change_tracking;

   The STATUS column shows whether Block Change Tracking is enabled.

   The FILENAME column contains the file name of the block change tracking file.

   Oracle documentation provides more information about v$block_change_tracking.

2. Enable Block Change Tracking by typing the following command from an SQL prompt:

   alter database enable block change tracking using file '*filename***';**

   where *filename* is the absolute pathname of the file to be used for Block Change Tracking. Oracle uses this file to track datafile changes.

To schedule level 0, level 1 differential, and level 1 cumulative backups, create three backup schedules: one for level 0 backups, one for level 1 differential backups, and one for level 1 cumulative backups. "Scheduling Oracle database backups" on page 74 provides more information.

Oracle documentation provides more information about Block Change Tracking.

Backup preparation

Before you back up an Oracle database, you must prepare the database. You can perform a hot backup while the database is in ARCHIVELOG mode. Complete the following steps to change the archiving mode of the database to ARCHIVELOG mode. Skip this section if the archiving mode for the database is already set to ARCHIVELOG.

1. Connect to the database by typing the following command:

   sqlplus "/ as sysdba"

   The following information appears in the command shell:

   ```
   SQL*Plus: Release 11.1.0.7.0 - Production on Sat Jul 11 11:42:08 2009

   Copyright (c) 1982, 2008, Oracle. All rights reserved.

   Connected to:
   Oracle Database 11g Enterprise Edition Release 11.1.0.7.0 -
   Production With the Partitioning, OLAP and Data Mining options
   ```

   The command prompt changes to the SQL prompt:

   ```
   SQL>
   ```

2. Determine if the Oracle database is in ARCHIVELOG mode by typing the following command:

   select log_mode from v$database;

   Screen output similar to the following output appears.

   ```
   LOG_MODE
   ----------
   NOARCHIVELOG
   ```

3. Shut down the database by typing the following command:

   shutdown immediate;

   The following information appears in the command shell:

   ```
   Database closed.
   Database dismounted.
   ORACLE instance shut down.
   ```

4. Start the database by typing the following command:

   startup mount;

   The following information appears in the command shell:

   ```
   ORACLE instance started.

   Total System Global Area            171966464 bytes
   Fixed Size                          787988 bytes
   Variable Size                       144964076 bytes
   Database Buffers                    25165824 bytes
   Redo Buffers                        1048576 bytes

   Database mounted.
   ```

5. Change the database archiving mode by typing the following command:

   alter database archivelog;

   The following information appears in the command shell:

   ```
   Database altered.
   ```

6. Open the database for normal operations by typing the following command:

   alter database open;

   The following information appears in the command shell:

   ```
   Database altered.
   ```

7. Disconnect from the database by typing the following command:

   exit

   Information similar to the following output appears in the command shell:

   ```
   Disconnected from Oracle Database 11g Enterprise Edition Release
   11.1.0.7.0
   ```

8. Back up the database by following the instructions in "On-demand backup" on page 68.

On-demand backup

The following procedure describes how to use Avamar Administrator to back up Oracle databases or data files.

1. Start Avamar Administrator and log in.
2. In Avamar Administrator, click the **Backup & Restore** tab.

   The **Backup, Restore and Manage** window appears.

3. Click the **Backup** tab.

   The upper-left pane contains a list of domains.

4. Click the domain that contains the Oracle server.

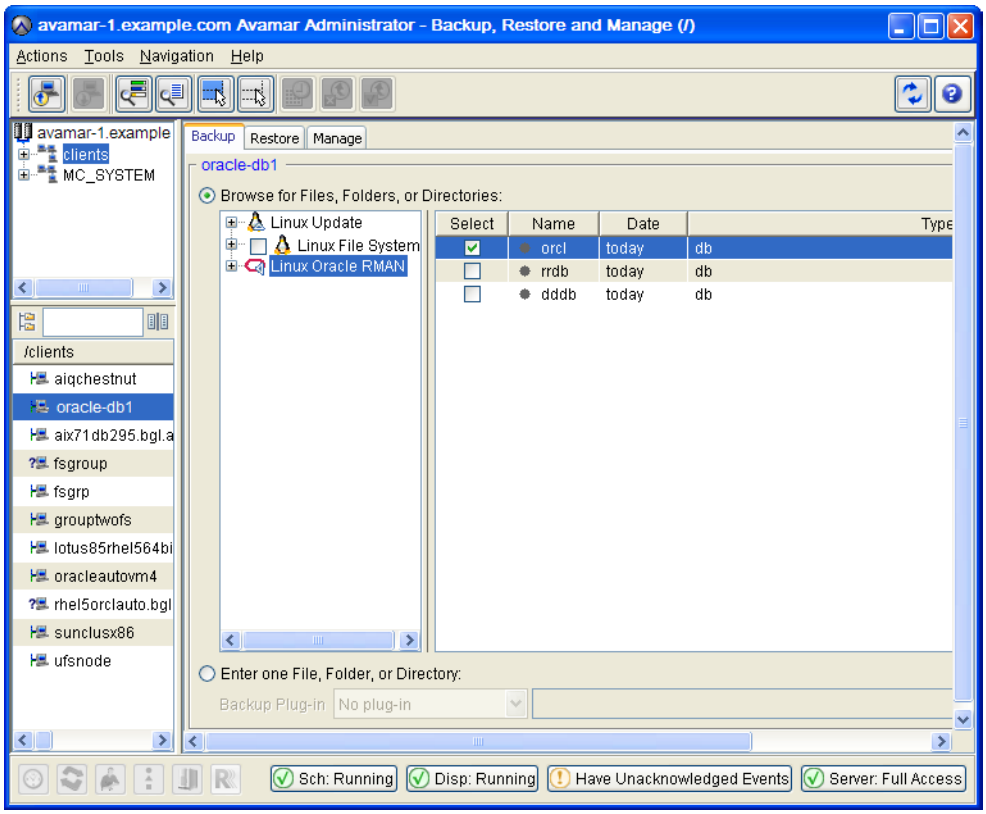
   A list of Avamar clients appears in the pane below the domains list.

5. Click the client that runs the Oracle server.

   The plug-ins installed on the Oracle server appear in the left pane on the **Backup** tab.

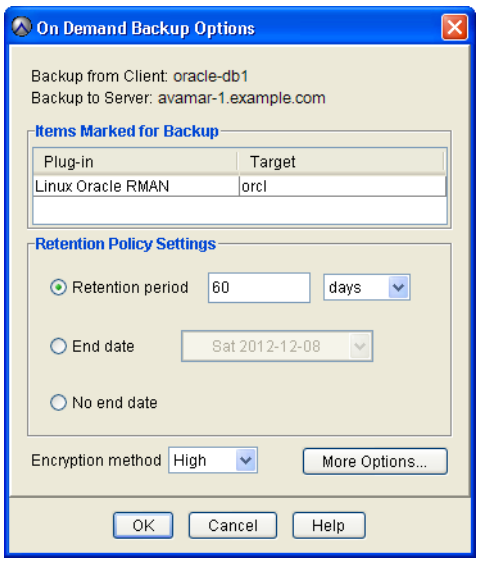
6. Select the Oracle RMAN plug-in for the platform.
7. Select one or more databases for the backup.

The following figure shows the **Backup, Restore and Manage** window after selecting the **orcl** database.



8. Select **Actions › Back Up Now.**

The **On Demand Backup Options** dialog box appears.



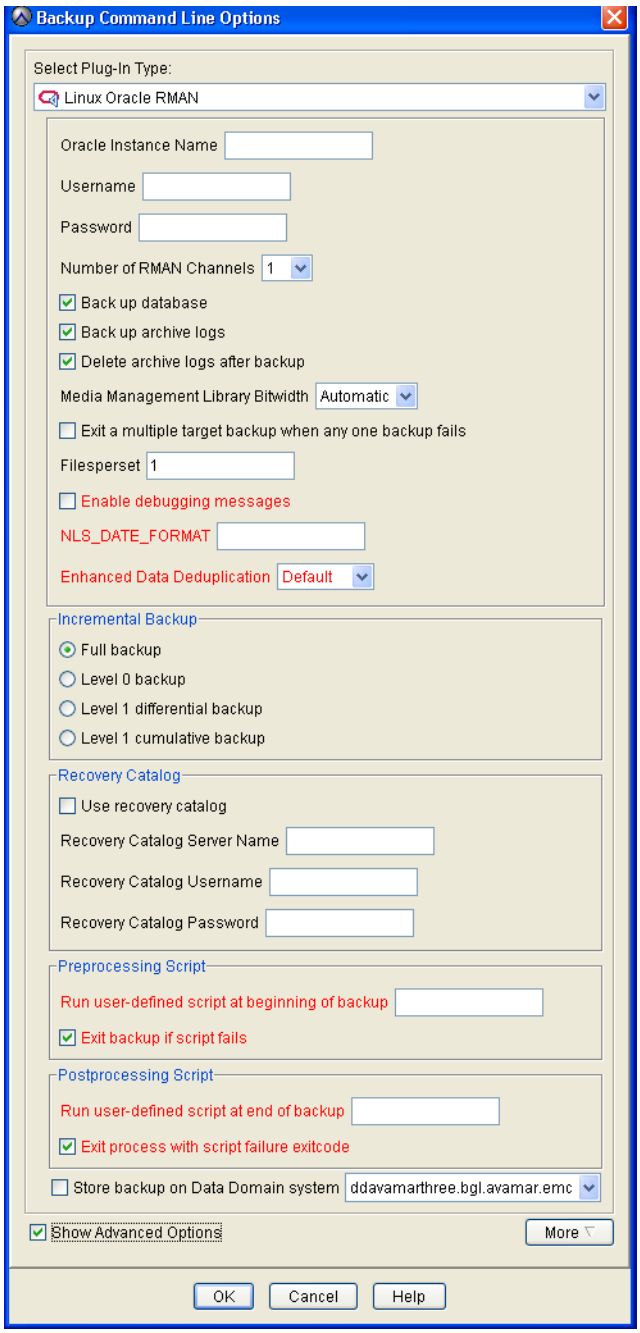
9. Complete the settings in the **On Demand Backup Options** dialog box:
   a. Select a retention policy setting for the backup:
      – To automatically delete this backup from the Avamar server after a specific amount of time, select **Retention period** and specify the number of days, weeks, months, or years for the retention period.
      – To automatically delete this backup from the Avamar server on a specific calendar date, select **End date** and browse to that date on the calendar.
      – To keep this backup for as long as this client remains active in the Avamar server, select **No end date**.
   b. From the **Encryption method** list, select an encryption method to use for client/server data transfer during the backup.

      The exact encryption technology and bit strength used for client/server connection depend on several factors, including the client platform and Avamar server version. The *EMC Avamar Product Security Guide* provides more information.
   c. Click **More Options**.

      The **Backup Command Line Options** dialog box appears.

10. Complete the settings in the **Backup Command Line Options** dialog box:

    a. Select **Show Advanced Options** to view advanced options.



    b. Leave the **Oracle Instance Name** field blank. The Avamar Plug-in for Oracle determines the Oracle instance name when you browse and select a target to back up.

    c. Type the username to use to authenticate the Oracle database in the **Username** field. This is the user with `SYSDBA` privileges.

    d. Type the password for the account In the **Password** field.

e. Select the number of channels to allocate during the backup from the **Number of RMAN Channels** list. The maximum number is 10.

"Backup options" on page 136 provides more information about the **Number of RMAN Channels** option.

f. Select one or more backup options:

- Select **Back up database** to back up the entire Oracle database.
- Select **Back up archive logs** to back up only the archive logs.

  Archive backups are always full backups no matter which backup level you choose in step m.
- Select **Delete archive logs after backup** to automatically delete archive logs after a successful database backup.

NOTICE

The selection of multiple options is cumulative. To back up the entire database and the archive logs, for example, select **Back up database** and **Back up archive logs**.

g. (Linux and UNIX only) If the application bitness and OS bitness are not the same, select the appropriate setting from the **Media Management Library Bitwidth** list.

If the application bitness and OS bitness are the same, leave the **Media Management Library Bitwidth** set to the **Automatic**, the default setting.

The **Management Library Bitwidth** option does not apply to Windows platforms.

h. Select **Exit a multiple target backup when any one backup fails** to prevent a multiple target backup from continuing after one of the backups fails.

i. Type the number of files that RMAN can open concurrently per channel in the **Filesperset** field. The default value is 1.

j. (Advanced option) Do not select the **Enable debugging message** option. This option is for troubleshooting backup problems. When you select the **Enable debugging messages** option, the Avamar Plug-in for Oracle creates large log files.

k. (Advanced option) Leave the **NLS_DATE_FORMAT** field blank.

l. (Advanced option) Select the appropriate option from the **Enhanced Data Deduplication** list:

- To use the global enhanced data deduplication setting already set on the server, select **Default**. This is the default setting.
- To back up the datafiles without using enhanced data deduplication, select **Disabled**.
- To use enhanced data deduplication for the backup, select **Enabled**.

m. Select a backup level from the **Incremental Backup** group box:

- **Full backup** backs up all the data in the database data files when the **Back up database** option is selected in step f.
- **Level 0 backup** backs up all datafiles.

You must perform a level 0 backup before you perform a level 1 (differential or cumulative) backup.

- **Level 1 differential backup** backs up only changed blocks of the database.
- **Level 1 cumulative backup** backs up all database blocks that have changed since the most recent level 0 backup.

NOTICE

The Avamar Plug-in for Oracle supports incremental (level 0 and level 1) backups for Oracle 11*g* and later. To improve level 1 (differential or cumulative) backup performance, enable the `Block Change Tracking` feature. "Enabling Block Change Tracking" on page 66 provides more information.

n. (Optional) If you use a recovery catalog, select **Use recovery catalog** and complete the following fields:

- Type the recovery catalog server name in the **Recovery Catalog Server Name** field.
- Type the recovery catalog username in the **Recovery Catalog User Name** field.
- Type the recovery catalog password in the **Recovery Catalog Password** field.

NOTICE

The **Use recovery catalog** option uses the values in the **Recovery Catalog Server Name**, **Recovery Catalog User Name**, and **Recovery Catalog Password** fields to form a recovery catalog server connection string for RMAN.

o. (Advanced option) Complete options in the **Prepocessing Script** group box:

- Type the name of a preprocessing script in the **Run user-defined script at beginning of backup** field.

  The preprocessing script must be in the `/avamar/etc/scripts` directory on the client.
- Select **Exit backup if script fails** to stop processing the script when the script returns a non-zero status code.

"Preprocessing and postprocessing scripts and attributes" on page 143 provides more information about using scripts.

p. (Advanced option) Complete options in the **Postpocessing Script** group box:

- Type the name of a postprocessing script in the **Run user-defined script at end of backup** field.

  The postprocessing script must be in the `/avamar/etc/scripts` directory on the client.
- Select **Exit process with if script failure exitcode** to exit the script with an exitcode from the script rather than with the standard `avoracle` exitcode.

"Preprocessing and postprocessing scripts and attributes" on page 143 provides more information about using scripts.

q. Select **Store backup on Data Domain system**, and then select the Data Domain system from the list to store the backup on a Data Domain system instead of the Avamar server.

r. Click **OK** to close the **Backup Command Line Options** dialog box.

11. Click **OK** to close the **On Demand Backup Options** dialog box.

    The following status message appears:

    ```
    Backup initiated.
    ```

12. Click **OK**.

Scheduling Oracle database backups

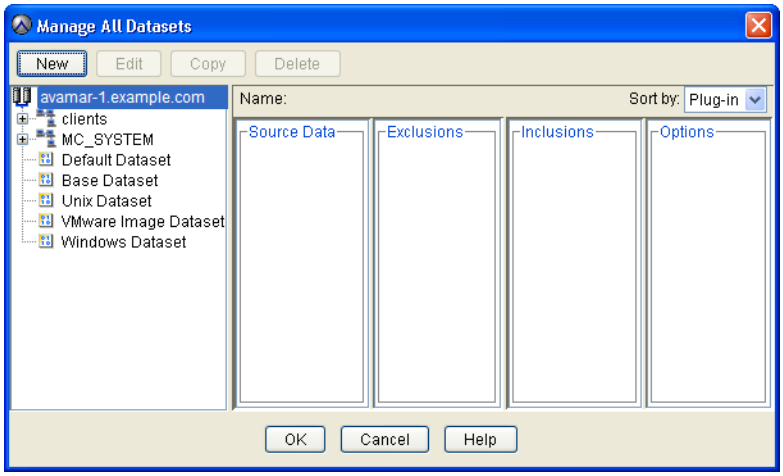
To schedule Oracle database backups, complete the following steps:

1. Create a dataset for Oracle database backups. "Creating a dataset" on page 74 provides instructions.
2. Create a group for Oracle database backups. "Creating a group" on page 80 provides instructions. During the group creation process, you perform the following tasks:
   a. Add the Oracle database client to the new group.
   b. Assign the new dataset to the new group.
   c. Assign a schedule to the new group.
   d. Assign a retention policy to the new group.
3. Enable scheduling for the group. "Enabling scheduled backups" on page 83 provides instructions.

Creating a dataset

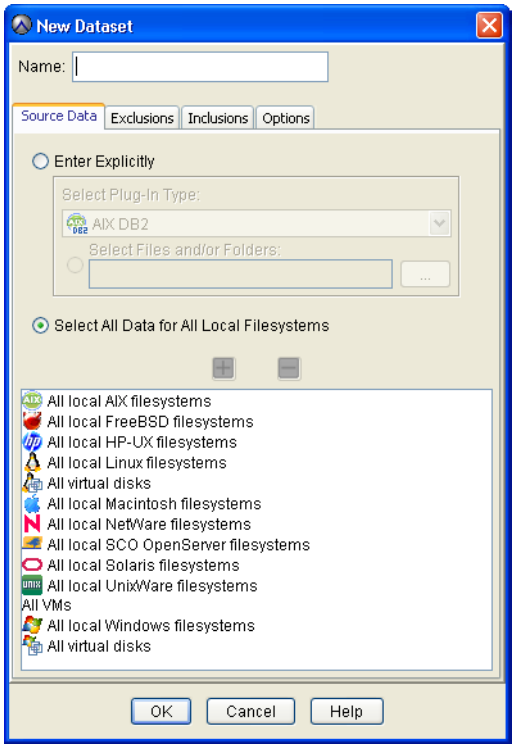
1. In Avamar Administrator, select **Tools** › **Manage Datasets**.

   The **Manage All Datasets** window appears.



2. Click **New**.

The **New Dataset** dialog box appears.



3. Complete the settings in the **New Dataset** dialog box:

   a. In the **Name** field, type a name for the dataset in the **Name** field.

      The name can include alphanumeric characters (A-Z, a-z, 0-9) and the following special characters: period (.), hyphen (-), and underscore (_). Do not use Unicode characters or the following special characters: ` ~ ! @ # $ % ^ & * ( ) = + [ ] { } | \ / ; : ' " ‹ › , ?

      NOTICE

      The Avamar Plug-in for Oracle converts spaces in a dataset name to underscores in Avamar Plug-in for Oracle log files.

   b. Click the **Source Data** tab.

   c. Select **Enter Explicitly**.

   d. Select the Oracle RMAN plug-in for the platform from the **Select Plug-In Type** list.

   e. Click the **Browse for files and/or folders** button (**...**).

      The **Select Files and/or Folders** dialog box appears.

4. In the **Select Files and/or Folder** dialog box:

   a. Click the domain to view the clients.

      A list of clients appears below the domain.

   b. Click the client that runs the Oracle server.

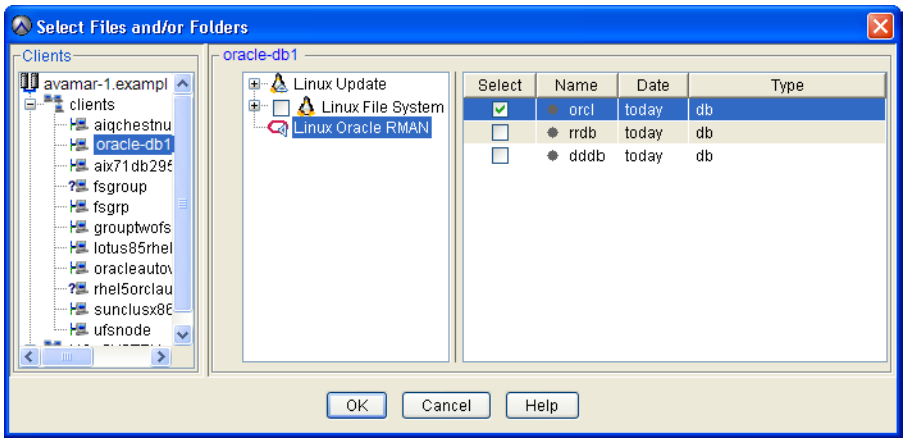
      A list of plug-ins appear in the pane to the right of the client's list.

c. Click the Oracle RMAN plug-in.

A list of databases appear in the table to the right of the plug-ins.

d. Select one or more databases to include in the dataset.

The following figure shows the **Select Files and/or Folders** dialog box after selecting the **orcl** database.



e. Click **OK**.

The **Select Files and/or Folders** dialog box closes and the **New Dataset** dialog box lists the files, folders, or databases that you selected.

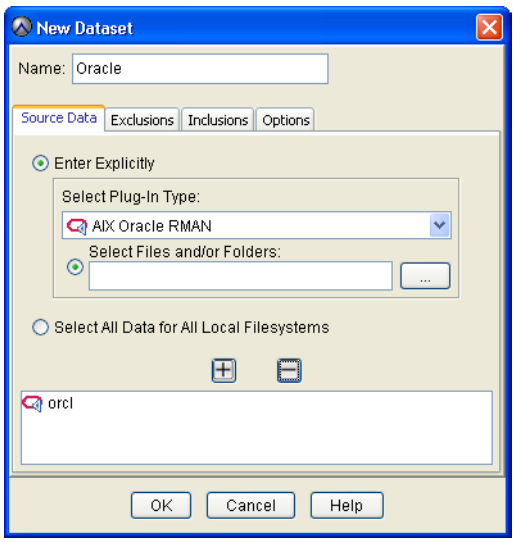
5. Remove all items from the source data list other than the Oracle databases:

a. Select an entry from the list.

b. Click the **Remove From List** button (–).

c. Repeat step a and step b to remove all other entries.

After removing non-database items, the **Source** tab should look similar to the following figure.



6. Leave **Inclusion** and **Exclusion** tabs as they are. The Avamar Plug-in for Oracle does not support include or exclude lists.

7. Click the **Options** tab.
8. Complete the setting on the **Options** tab:
   a. Select the Oracle RMAN plug-in from the **Select Plug-In Type** list.

      The Oracle RMAN plug-in options appear.

   b. Leave the **Oracle Instance Name** field blank. The Avamar Plug-in for Oracle determines the Oracle instance name when you browse and select a target to back up.

   c. Type the username to use to authenticate the Oracle database in the **Username** field. This is the user with `SYSDBA` privileges.

   d. Type the password for the username account in the **Password** field.

   e. Select the number of channels to allocate during the backup from the **Number of RMAN Channels** list. The maximum number is 10.

      "Backup options" on page 136 provides more information about the **Number of RMAN Channels** option.

   f. Select one or more backup options:

      – Select **Back up database** to back up the entire Oracle database.

      – Select **Back up archive logs** to back up only the archive logs.

        Archive backups are always full backups no matter what the backup level you choose in step j.

      – Select **Delete archive logs after backup** to automatically delete archive logs following a successful database backup.

      NOTICE

      The selection of multiple options is cumulative. To back up the entire database and the archive logs, for example, select **Back up database** and **Back up archive logs**.

   g. (Linux and UNIX only) If the application bitness and OS bitness are not the same, select the appropriate setting from the **Media Management Library Bitwidth** list.

      If the application bitness and OS bitness are the same, leave the **Media Management Library Bitwidth** set to the **Automatic**, the default setting.

      The **Media Management Library Bitwidth** option does not apply to Windows platforms.

   h. (Optional) Select **Exit a multiple target backup when any one backup fails** to prevent a multiple target backup from continuing after one of the backups fails.

   i. Type the number of files that RMAN can open concurrently per channel in the **Filesperset** field. The default value is 1.

   j. Select a backup level from the **Incremental Backup** group box:

      – **Full backup** backs up all the data in the database data files when the **Back up database** option is selected in step f.

      – **Level 0 backup** backs up all datafiles.

You must perform a level 0 backup before you perform a level 1 (differential or cumulative) backup.

- **Level 1 differential backup** backs up only changed blocks of the database.
- **Level 1 cumulative backup** backs up all database blocks that have changed since the most recent level 0 backup.

NOTICE

The Avamar Plug-in for Oracle supports incremental (level 0 and level 1) backups for Oracle 11*g* and later. To improve level 1 (differential or cumulative) backup performance, enable the `Block Change Tracking` feature. "Enabling Block Change Tracking" on page 66 provides more information.

k. (Optional) If you use a recovery catalog, select **Use recovery catalog** and complete the following fields:

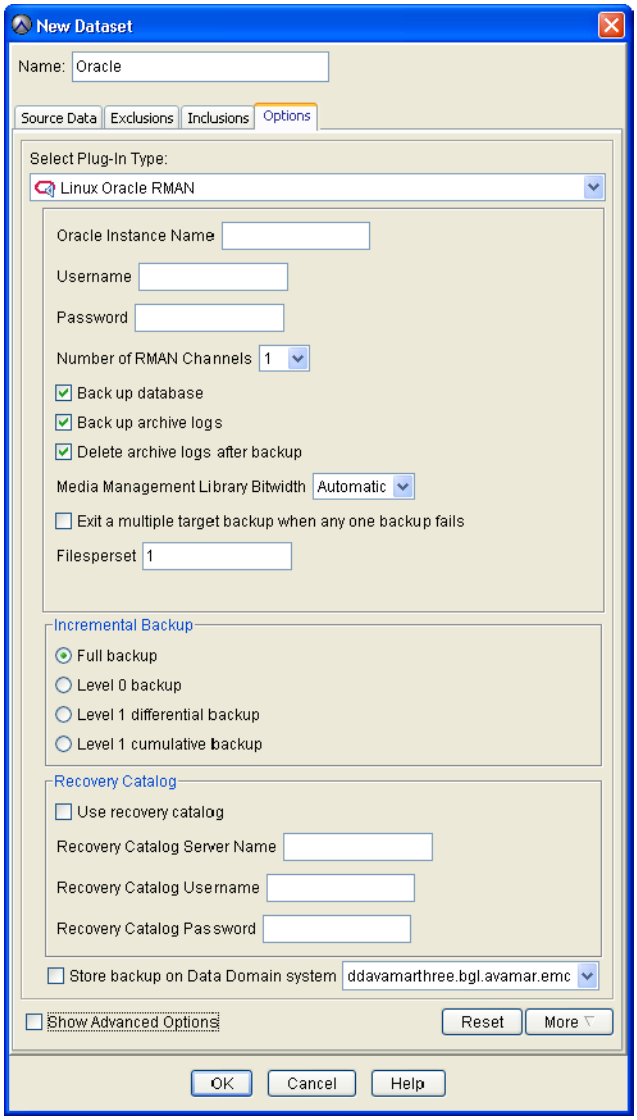
- Type the recovery catalog server name in the **Recovery Catalog Server Name** field.
- Type the recovery catalog username in the **Recovery Catalog User Name** field.
- Type the recovery catalog password in the **Recovery Catalog Password** field.

NOTICE

If you select the **Use recovery catalog** option, the **Recovery Catalog Server Name**, **Recovery Catalog User Name**, and **Recovery Catalog Password** settings are used to specify a recovery catalog server connection string for RMAN.

l. Select **Store backup on Data Domain system**, and then select the Data Domain system from the list to store the backup on a Data Domain system instead of the Avamar server.

The following figure shows an example of the **Options** tab.



NOTICE

Appendix B, "Plug-in Options," provides more information about the Avamar Plug-in for Oracle plug-in options, including information about advanced options.

9. Click **OK** to close the **New Dataset** dialog box.

   The new dataset is added to the list of datasets shown in the **Manage All Datasets** window.

10. Click **OK** to close the **Manage All Datasets** window.

Creating a group

NOTICE

You cannot edit schedules or retention policies from the **New Group** wizard. The *EMC Avamar Administration Guide* provides information about editing schedule properties or retention policies.

1. In Avamar Administrator, click the **Policy** tab.

   The **Policy** window appears.

2. Select the **Policy Management** tab.

3. Select the **Groups** tab.

4. Click the domain for the Oracle server.

   The **Policy** window displays a table that contains groups for the domain.

5. Select **Actions** › **New Group**.

   The **New Group** wizard appears.

6. Complete the settings in the **New Group** wizard:

   a. Type a name for the group in the **Name** field.

      The name can include alphanumeric characters (A-Z, a-z, 0-9) and the following special characters: period (.), hyphen (-), and underscore (_).

      Do not use Unicode characters or the following special characters: ` ~ ! @ # $ % ^ & * ( ) = + [ ] { } | \ / ; : ' " ‹ › , ?

   b. Clear the **Disabled** checkbox to use this group for scheduled client backups.

      Selecting the checkbox disables backups for the group.

   c. From the **Encryption method** list, select an encryption method to use for client/server data transfer during the backup.

      The exact encryption technology and bit strength used for client/server connection depend on several factors, including the client platform and Avamar server version. The *EMC Avamar Product Security Guide* provides more information.

   d. (Optional) Select **Override Schedule** to override the assigned schedule for this group.

      – To skip the next scheduled backup, select **Skip Next Backup**.

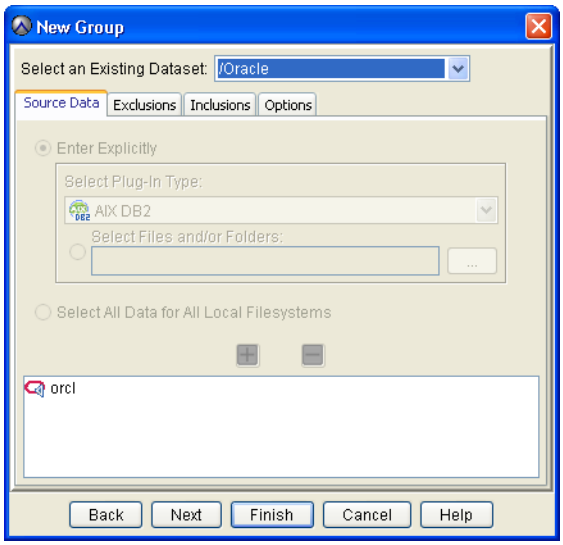
      – To perform the next scheduled backup one time only, select **Run Next Backup Once**.

7. Click **Next**.

   The next **New Group** page appears with dataset information.

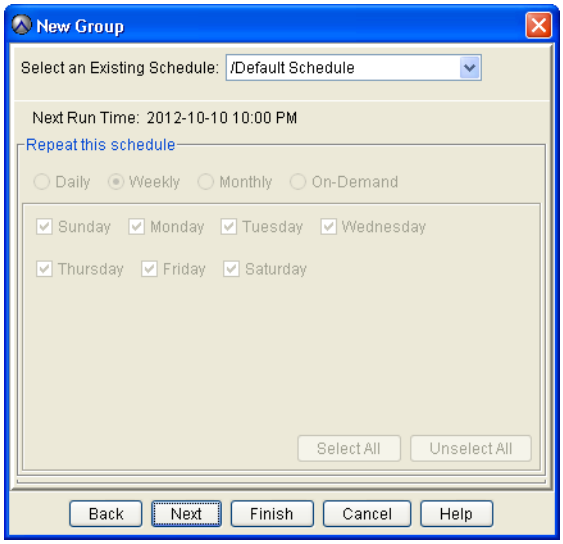
8. Select the dataset you created in “Creating a dataset” on page 74 from the **Select an Existing Dataset** list.

   The following figure shows the **New Group** window after you select the dataset.



9. Click **Next**.

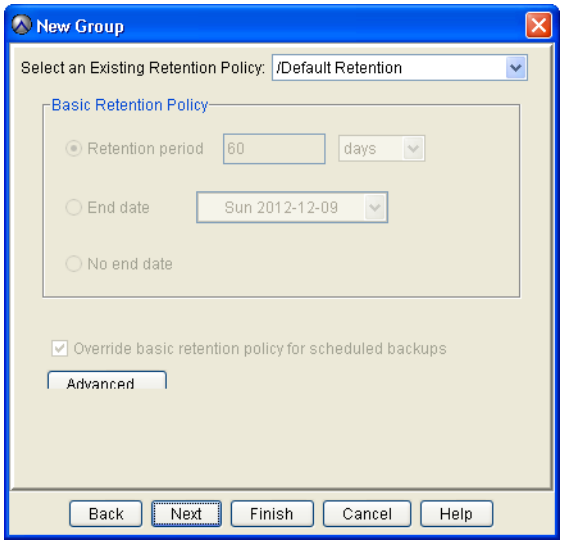
   The next **New Group** page appears with schedule information.



10. From the **Select an Existing Schedule** list, select a schedule.

11. Click **Next**.

    The next **New Group** page appears with retention policy information.



12. Select a retention policy for the group from the **Select an Existing Retention Policy** list.
13. Click **Next**.

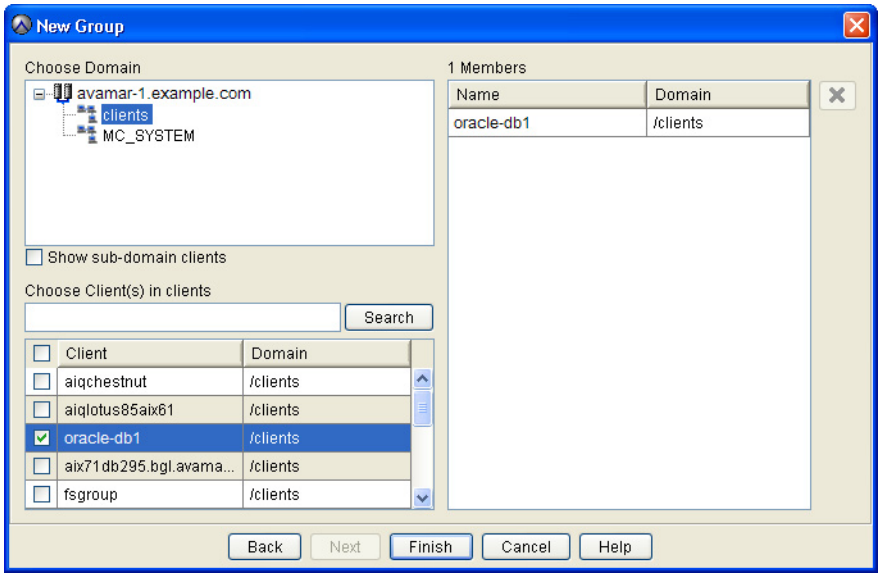
    The final **New Group** page appears. A list of domains appears in the **Choose Domain** pane.

14. Click the domain for the Oracle server.

    A list of Avamar clients appears in the pane below the **Choose Domain** pane.

15. Click the checkbox next to the clients to include in the group.

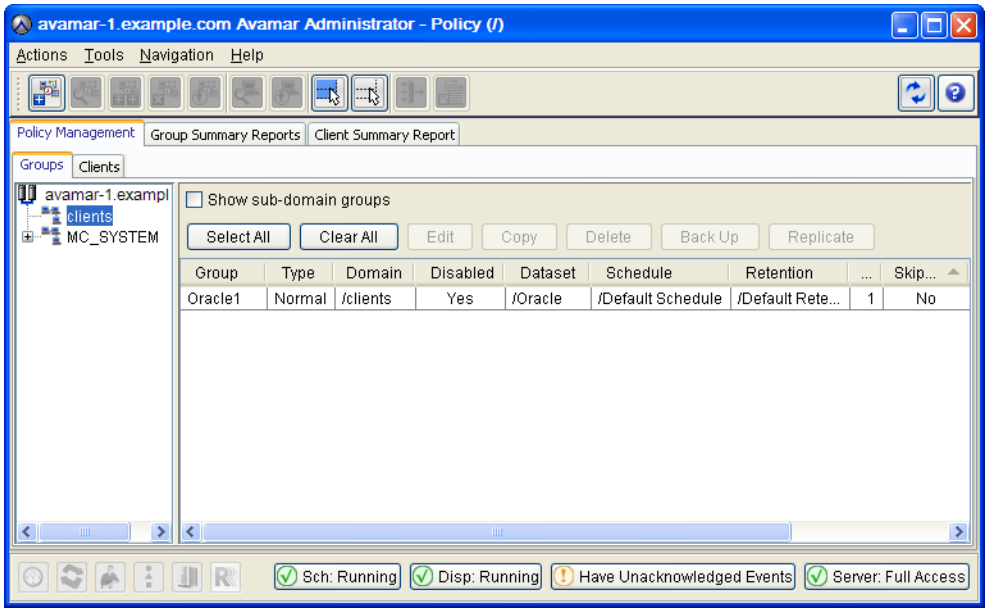
    The clients appears in the **Members** pane.



16. To remove a client from the group, select the client from the **Members** list, and then click the red **X**.

17. Click **Finish**.

    The **New Group** window closes and the new group appears in the **Policy** window.



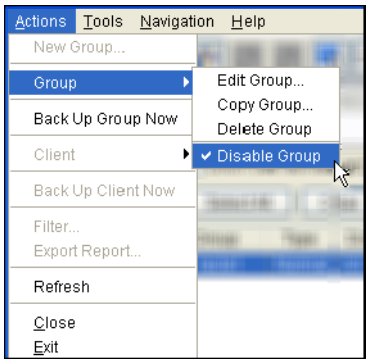
Enabling scheduled backups

1. In Avamar Administrator. click the **Policy** tab.

   The **Policy** window appears.

2. Click the **Policy Management** tab.
3. Click the **Groups** tab.
4. Click the domain for the Oracle server.
5. Select the group you created in "Creating a group" on page 80.
6. Enable the group, if required by selecting **Actions** › **Group** › **Disable Group**.

   Perform this step only if a check mark appears next to the **Disable Group** menu option.



   A confirmation message appears.

7. Click **Yes** to enable the group.

Oracle RAC backup failures

An Oracle RAC backup fails when the Oracle instance on the active node goes down or when a node goes down. For each type of failure, you must restart the backup.

Restarting the backup after the active node's instance goes down

1. Establish the active node by taking the appropriate action:
   - Restarting the instance on the active node.
   - Shutting down the current active node to enable one of the other nodes as the active node.
2. Start a new backup.

Restarting the backup after a node goes down

To restart a backup after a node goes down, use the appropriate resolution:

- If the `var` directory is located on a shared file system, another node automatically takes over as the active node. You can then restart the backup.

  NOTICE

  In this scenario, `EMCagent` is configured as an Oracle Clusterware resource.

- If `EMCagent` is not configured as an Oracle Clusterware resource and the `var` directory is not shared across all nodes:

  1. Activate the Avamar agent on one of the available nodes. Appendix A, "RAC Issues When Not Using Shared Var Directory," provides more information.
  2. Restart the backup.

CHAPTER 5
Restore and Recovery

The following topics describe how to use the Avamar Plug-in for Oracle to restore an entire database:

Preparing the database for recovery

The Avamar Plug-in for Oracle provides database recovery options that require preliminary configuration of the database. Complete the appropriate sections to set up the database for recovery:

- "Configuring Flashback Database recovery" on page 86
- "Configuring the database for corrupt block recovery" on page 86

Configuring Flashback Database recovery

To use Avamar Plug-in for Oracle to recover data blocks from the Flash Recovery Area (FRA) requires you to configure the Flashback Database:

1. Set the database to `ARCHIVELOG` mode.
2. Enable the flash recovery area.

   The Oracle documentation provides instructions.
3. (For RAC configurations only) Configure the flash recovery area in a clustered file system or in ASM.
4. Start the database in mount state by using the `STARTUP` command with the `MOUNT` option.

   After the restore completes successfully, Avamar issues the command to open the database.

Configuring the database for corrupt block recovery

Before you can recover corrupt data blocks, set the `DB_BLOCK_CHECKSUM` initialization parameter to `TYPICAL` for the Oracle database. This parameter setting enables RMAN to detect both physical and logical corruption.

Restore preparation

Before you restore an Oracle database, you must prepare the database. The following topic describes how to prepare the database before you restore backups.

1. (VCS clusters only) To restore the Oracle database to a Solaris VCS cluster, stop the listener and other dependent processes. Otherwise, skip this step and continue with step 3.
2. (Raw devices only) Before you restore datafiles on a raw device, back up the files in the flash recovery area. Otherwise, skip this step and continue with step 3.

   NOTICE

   For configurations in which you store the database on a raw file structure, Oracle recommends that you use a normal file system as the flash recovery area.

3. Ensure that ORACLE_SID is set correctly by typing the following command:

   echo $ORACLE_SID

   $ORACLE-SID must point to the correct system identifier to restore the Oracle database.

4. Complete the following steps to restore an Oracle Real Application Clusters (RAC) database:

   a. Shut down all database instances on all nodes by typing the following commands:

      ```
      sqlplus "/ as sysdba"
      shutdown immediate;
      exit
      ```

   b. Start an instance without mounting the database on the registered node by typing the following commands:

      ```
      startup nomount;
      exit
      ```

   c. Skip step 5 and continue with step 6.

5. To restore a non-clustered Oracle database, close the database and start an instance without mounting the database:

   a. Connect to the database by typing the following command:

      sqlplus "/ as sysdba"

      The following Information appears in the command shell:

      ```
      SQL*Plus: Release 11.1.0.7.0 - Production on Sat Jul 11 11:42:08
      2009

      Copyright (c) 1182, 2008, Oracle. All rights reserved.

      Connected to:
      Oracle Database 11g Enterprise Edition Release 11.1.0.7.0 -
      Production With the Partitioning, OLAP and Data Mining options
      ```

      The command prompt changes to the SQL prompt.

      ```
      SQL>
      ```

   b. Shut down the database by typing the following command:

      shutdown immediate;

      The following information appears in the command shell:

      ```
      Database closed.
      Database dismounted.
      ORACLE instance shut down.
      ```

c. Start the database by typing the following command:

```
startup nomount;
```

The following information appears in the command shell:

```
ORACLE instance started.

Total System Global Area          171966464 bytes
Fixed Size                        787988 bytes
Variable Size                     144964076 bytes
Database Buffers                  25165824 bytes
Redo Buffers                      1048576 bytes

Database mounted.
```

d. Disconnect from the database by typing the following command:

```
exit
```

The following information appears in the command shell:

```
Disconnected from Oracle Database 11g Enterprise Edition Release
11.1.0.7.0
```

6. Move the existing datafiles (`*.dbf`), control files (`*.ctl`), redo log files (`*.log`), archive log files (`*.arc`), and autobackup files (`*.bkp`).

NOTICE

The Oracle files can be in the default location or in a nondefault location. The default location of Oracle files varies depending on the version of Oracle.

The following commands use the default values for the directories.

To move the existing database files to a convenient location, type the following commands:

```
mkdir $ORACLE_HOME/oradata/DB_NAME.saved
mv $ORACLE_HOME/oradata/DB_NAME/* \
$ORACLE_HOME/oradata/DB_NAME.saved
mkdir $ORACLE_HOME/flash_recovery_area/DB_NAME.saved
mv $ORACLE_HOME/flash_recovery_area/DB_NAME/* \
$ORACLE_HOME/flash_recovery_area/DB_NAME.saved
```

where *DB_NAME* is the database name in uppercase.

For Oracle 11*g* R2, type the following additional commands:

```
mkdir $ORACLE_HOME/flash_recovery_area/db_name.saved
mv $ORACLE_HOME/flash_recovery_area/db_name/* \
$ORACLE_HOME/flash_recovery_area/db_name.saved
```

where *db_name* is the database name in lowercase.

NOTICE

Starting with Oracle 11*g* R2, `flash_recovery_area` is referred to as `fast_recovery_area`.

The following directories are the default directories of the datafiles (`*.dbf`), control files (`*.ctl`), redo log files (`*.log`), archive log files (`*.arc`), and autobackup files (`*.bkp`):

- `$ORACLE_HOME/oradata/DB_NAME`
- `$ORACLE_HOME/flash_recovery_area/DB_NAME`

7. Restore the database back to the `$ORACLE_HOME/oradata/DB_NAME` directory.

Restore types

Avamar Administrator supports the restore of a database backup from one system to another system or directory on the same system. The restore uses the same Oracle system identifier (SID) and database identification number (DBID) of the original database for the restored database.

NOTICE

To perform a restore to a different client, prepare the target system by completing the instructions in "Restore preparation" on page 86.

After preparing the database, you can restore database files to the original client or to a different client.

- To restore the database to the original client, complete the instructions in "Restoring a database to the original client" on page 89.
- To restore the database to a different client, complete the instructions in "Restoring a database to a different client" on page 95.

Restoring a database to the original client

1. Start Avamar Administrator and log in.
2. Click the **Backup & Restore** tab.

   The **Backup, Restore and Manage** window appears.
3. Click the **Restore** tab, and then select the domain and client:
   a. Click the domain in the upper-left pane that contains the Oracle server.

      A list of Avamar clients appears in the pane below the domains list.
   b. Click the client that runs the Oracle server.
4. Click the **By Date** tab.
5. Select a backup date from the calendar:
   a. Use the year and month navigational arrows to browse to a backup.

      Dates highlighted by yellow indicate a valid backup was performed on that date.
   b. Click a date highlighted by yellow.

      A list of backups that were performed on that date appears in the **Backups** table next to the calendar.

6. Select a backup from the **Backups** table.

   The backup contents appear in the **Contents of Backup** pane.

7. Expand the folders in the **Contents of Backup** pane to display database SIDs.

   NOTICE

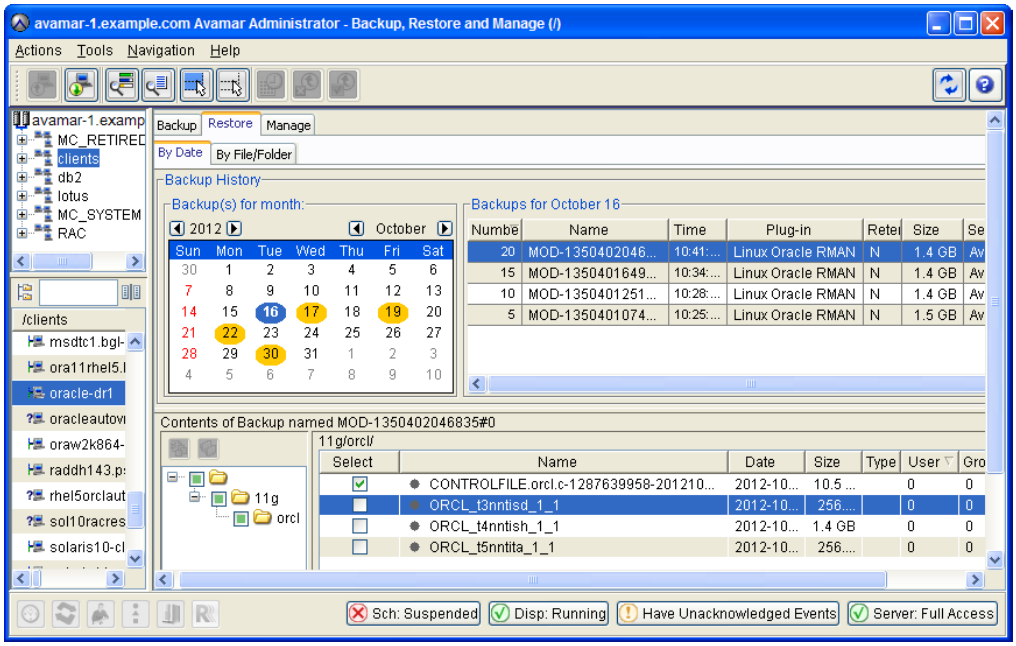
   For point-in-time recoveries, select only one database. Performing a point-in-time recovery of multiple databases is not supported.

8. Select a control file backup.

   NOTICE

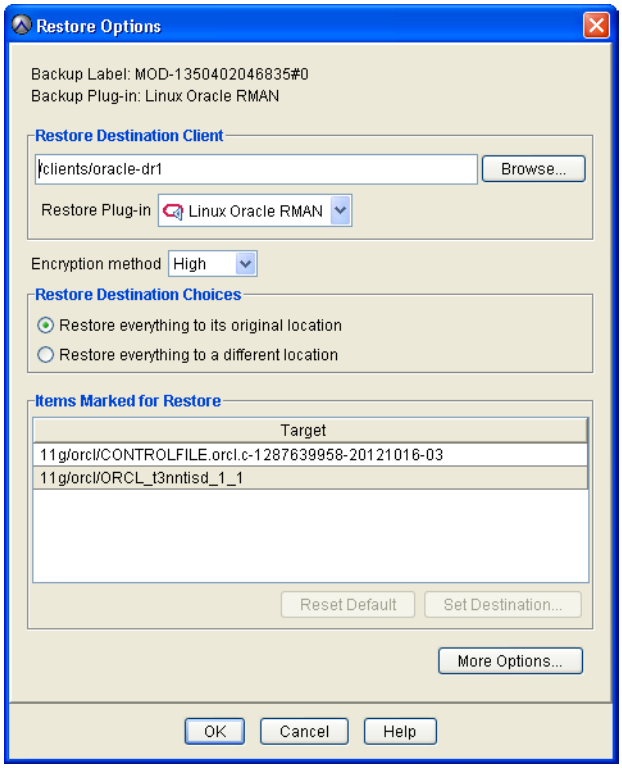
   You must select a control file for the restore to complete successfully.

   The following figure shows the **Backup, Restore and Manage** window after selecting a database and a control file.



9. Select **Actions › Restore Now**.

   The **Restore Options** window appears.



10. Complete the settings in the **Restore Options** dialog box:

    a. From the **Encryption method** list, select an encryption method to use for client/server data transfer during the restore.

       The exact encryption technology and bit strength used for client/server connection depend on several factors, including the client platform and Avamar server version. The *EMC Avamar Product Security Guide* provides more information.

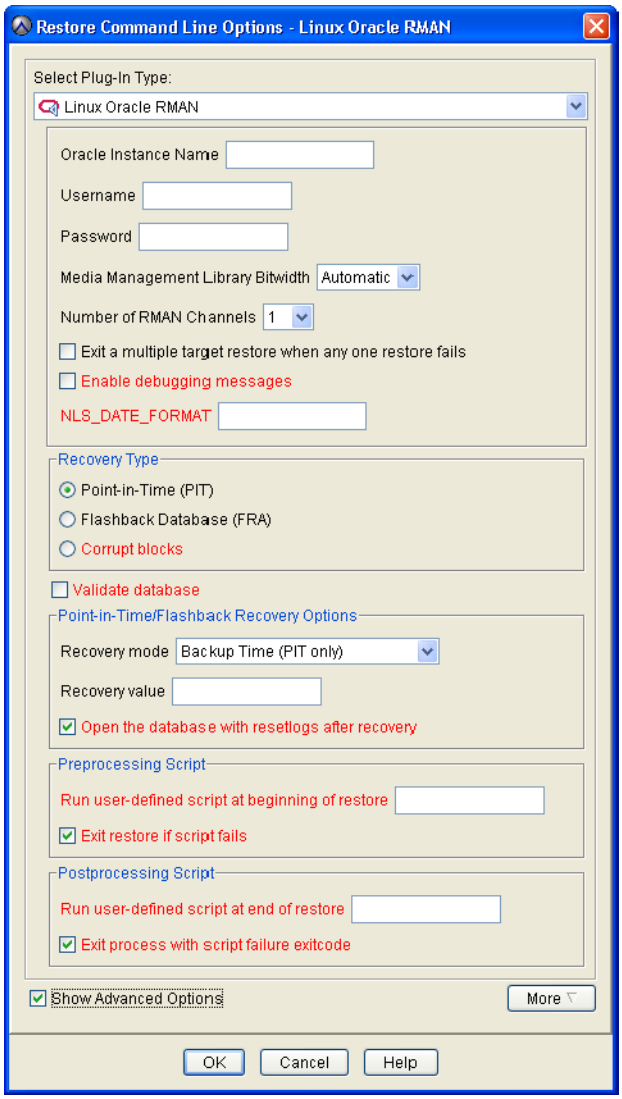
    b. Select **Restore everything to its original location**.

    c. Click **More Options**.

       The **Restore Command Line Options** dialog box appears.

11. Complete the settings in the **Restore Command Line Options** dialog box:

    a. Select **Show Advanced Options** at the bottom of the dialog box to view the advanced options.



    Advanced options appear in red text.

    b. Leave the **Oracle Instance Name** field blank. The Avamar Plug-in for Oracle determines the Oracle instance name when you browse and select a database to restore.

    c. Type the username to use to authenticate the Oracle database in the **User Name** field. This is the user with `SYSDBA` privileges.

    d. Type the password for the account In the **Password** field.

    e. (Linux and UNIX only) If the application bitness and OS bitness are not the same, select the appropriate setting from the **Media Management Library Bitwidth** list.

    If the application bitness and OS bitness are the same, leave the **Media Management Library Bitwidth** set to the **Automatic** (default).

    The **Management Library Bitwidth** option does not apply to Windows platforms.

f. Select the number of channels to allocate during the restore from the **Number of RMAN Channels** list. The maximum number is 10.

g. (Optional) Select **Exit a multiple target restore when any one restore fails** to prevent a multiple target restore from continuing after one of the restore operations fails.

h. (Advanced option) Do not select the **Enable debugging message** option. This option is for troubleshooting restore problems. When you select the **Enable debugging messages** option, the Avamar Plug-in for Oracle creates large log files.

i. (Advanced option) Type a timestamp format for the target database in the **NLS_DATE_FORMAT** field.

j. Select a **Recovery Type**:

   – To recover the database to the present time or to a point-in-time in the past, select **Point-in-Time (PIT)**.

     Do not select multiple databases for a point-in-time recovery. You must select only one database for the restore.

   – To recover data blocks from the Flash Recovery Area (FRA), select **Flashback Database (FRA)**.

     You must configure Flash Recovery Area before you can use the **Flashback Recovery (FRA)** recovery type. "Configuring Flashback Database recovery" on page 86 provides more information.

   – (Advanced option) To restore corrupt blocks only, and not the entire database, select **Corrupt blocks**.

     To use the **Corrupt blocks** recovery option, you must set the `DB_BLOCK_CHECKSUM` initialization parameter to `TYPICAL` for the Oracle database. The database must be in a mounted or open state.

k. (Advanced option) Select **Validate database** if you selected **Corrupt blocks** from the **Recovery Type** group box.

   The **Validate database** option is optional when you perform a corrupt block recovery. The restore operation is slower when you use the **Validate database** option.

l. Select an option from the **Recovery mode** list for the recovery type that you selected in step j.

   "Recovery modes and values" on page 142 provides more information about the **Recovery mode** options.

m. Specify the SCN, log sequence number, or timestamp in the **Recovery value** field. This value depends on the option you select from the **Recovery mode** list in step l.

n. To open the database after the recovery finishes, select **Open the database with resetlogs after recovery**.

   This option is selected by default.

Clear the **Open the database with resetlogs after recovery** option to disable this option. When you clear this option, the restore operation does not open the database with resetlogs. You can then apply archive logs to recover the database to the most current point-in-time that is available.

12. (Optional) Specify other advanced options in the **Restore Command Line Options** dialog box as appropriate:
    a. To run a user-defined script at the beginning of the restore, type the script name in the **Run user-defined script at beginning of restore** field.

       The script must be in the `avamar\etc\scripts` directory on the client.

    b. Select **Exit restore if script fails** to stop the script from processing when the script returns a non-zero status code.

       This option is selected by default.

    c. To run a user-defined script at the end of the restore, type the script name in the **Run user-defined script at end of restore** field.

       The script must be in the `avamar\etc\scripts` directory on the client.

    d. Select **Exit process with script failure exitcode** to exit the script when it fails with an exitcode from the script rather than an exitcode from the Avamar Plug-in for Oracle.

       This option is selected by default.

       "Preprocessing and postprocessing scripts and attributes" on page 143 provides more information about using scripts and specifying attributes.

13. Specify the `[avoracle]lang_format` attribute and value if the database backup contains datafiles that use the UTF-8 character set:
    a. Click **More**.

       The **Enter Attribute** and **Enter Attribute Value** fields appear.

    b. Type **`[avoracle]lang_format`** in the **Enter Attribute** field:

       NOTICE

       Precede all attributes you type in the **Enter Attribute** field with `[avoracle]`.

    c. Type the appropriate value in the **Enter Attributes Value** field:

       *`language_territory`***`.`***`charset`*

       where:

       – *language* specifies the language. For example Japanese.
       – *territory* specifies the country. For example, Japan.
       – *charset* specifies the character set. For example, JA16SJIS.

       The following example is the correct syntax for Japanese:

       `Japanese_Japan.JA16SJIS`

NOTICE

The use of the `[avoracle]lang_format` attribute and value, sets the `NLS_LANG` environment variable for the restore. The Oracle documentation provides more information about `NLS_LANG`.

d. Click the **Add to List** button (**+**).

The `[avoracle]lang_format` attribute and value appear in the box below the **Add to List** (+)and **Remove From List** (-) buttons.

"ORA-19870: error while restoring backup piece" on page 156 provides more information about restoring datafiles that use the UTF-8 character set.

e. Click **OK** to close the **Restore Command Line Options** dialog box.

14. Click **OK** to close the **Restore Options** dialog box.

The following status message appears:

```
Restore initiated.
```

15. Click **OK**.

NOTICE

If the restore process fails, manual recovery steps can be necessary. "Restore fails to complete successfully" on page 161 provides details.

16. (Solaris only) Restart the listener and other dependent processes if you restored a database to a Solaris VCS cluster.

Restoring a database to a different client

The following procedure restores a database to a different client.

1. Prepare the system:

a. Ensure that the following items on the target client match the source client:

- `ORACLE_HOME`
- `oradata`
- `flash_recovery_area` pathnames
- Database SID

b. Prepare the target client by following the instructions in "Restore preparation" on page 86.

2. Start Avamar Administrator and log in.
3. Click the **Backup & Restore** tab.

The **Backup, Restore and Manage** window appears.

4. Click the **Restore** tab, and then select the domain and client:
   a. Click the domain in the upper-left pane that contains the Oracle server.

      A list of Avamar clients appears in the pane below the domains list.

   b. Click the client that runs the Oracle server.
5. Click the **By Date** tab.
6. Select a backup date from the calendar:
   a. Use the year and month navigational arrows to browse to a backup.

      Dates highlighted by yellow indicate a valid backup was performed on that date.

   b. Click a date highlighted by yellow.

      A list of backups that were performed on that date appears in the **Backups** table next to the calendar.
7. Select a control file backup.

   The backup contents appear in the **Contents of Backup** pane.
8. Expand the folders in the **Contents of Backup** pane to display database SIDs.

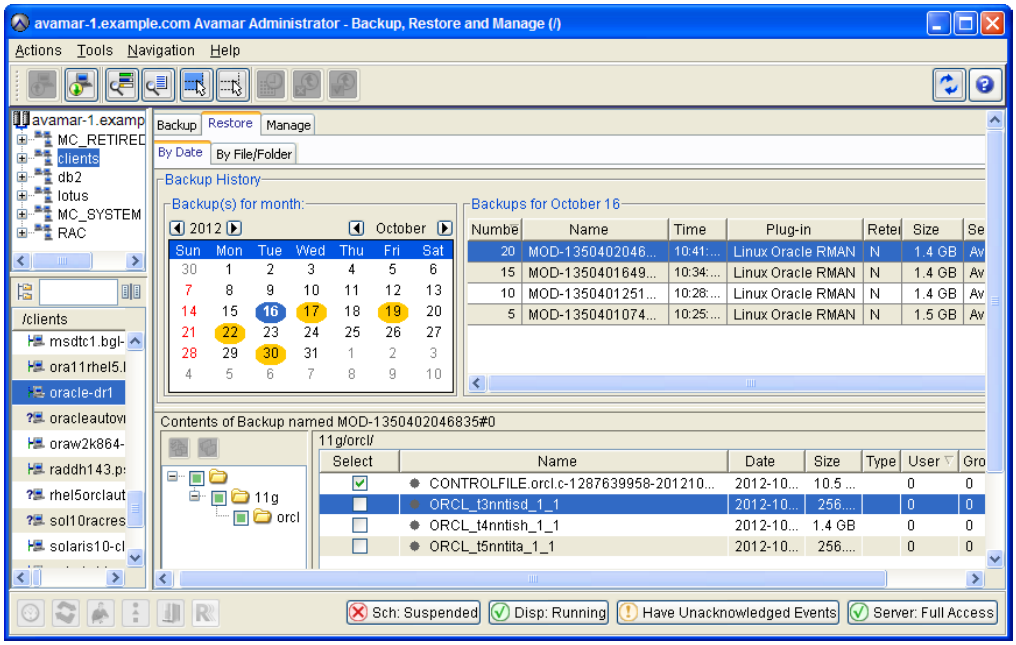
   NOTICE

   For point-in-time recoveries, select only one database. The Avamar Plug-in for Oracle does not support a point-in-time recovery of multiple databases.
9. Select one or more databases and a control file.

   NOTICE

   You must select a control file for the restore to complete successfully.

The following figure shows the **Backup, Restore and Manage** window after selecting databases and a control file.



10. Select **Actions › Restore Now**.

    The **Restore Options** dialog box appears.

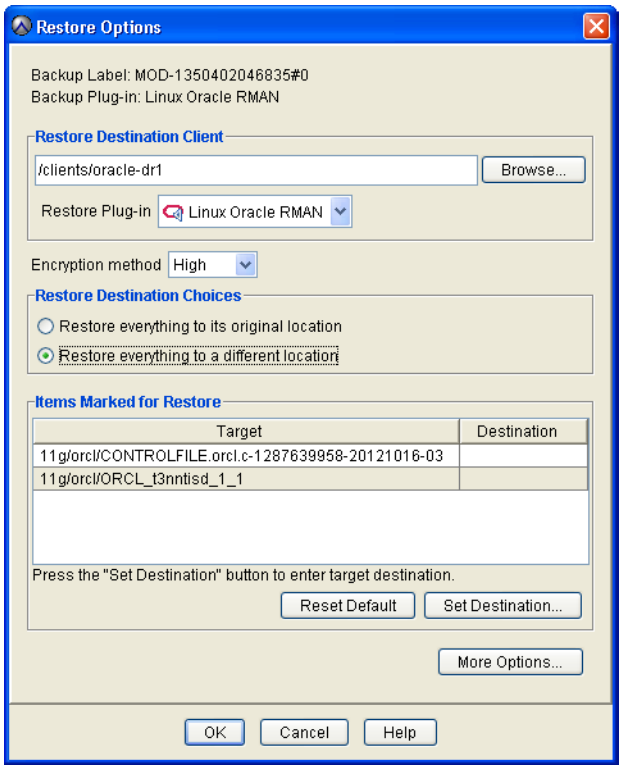
11. Complete the settings in the **Restore Options** dialog box:

    a. From the **Encryption method** list, select an encryption method to use for client/server data transfer during the restore.

       The exact encryption technology and bit strength used for client/server connection depend on several factors, including the client platform and Avamar server version. The *EMC Avamar Product Security Guide* provides more information.

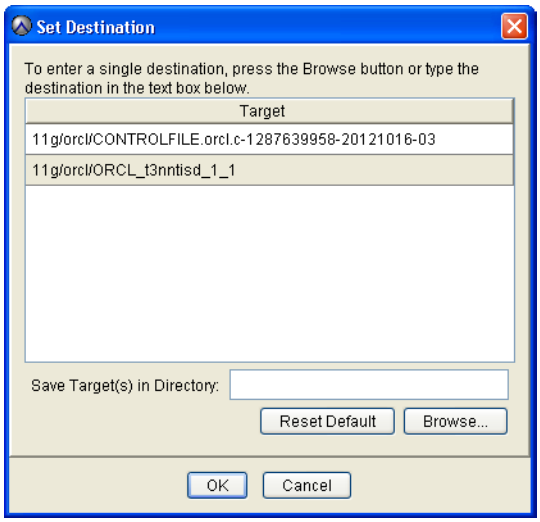
    b. Select **Restore everything to a different location**.

Selecting **Restore everything to a different location** activates the **Reset Default** and **Set Destination** buttons.



c. Click **Set Destination**.

The **Set Destination** dialog box appears.



d. Click **Browse**.

The **Browse for File, Folder, or Directory** dialog box appears.

e. Select the target destination for the restore, and then click **OK**.

The target appears in the **Save Target(s) in Directory** field.

f. Click **OK** to close the **Set Destination** dialog box.

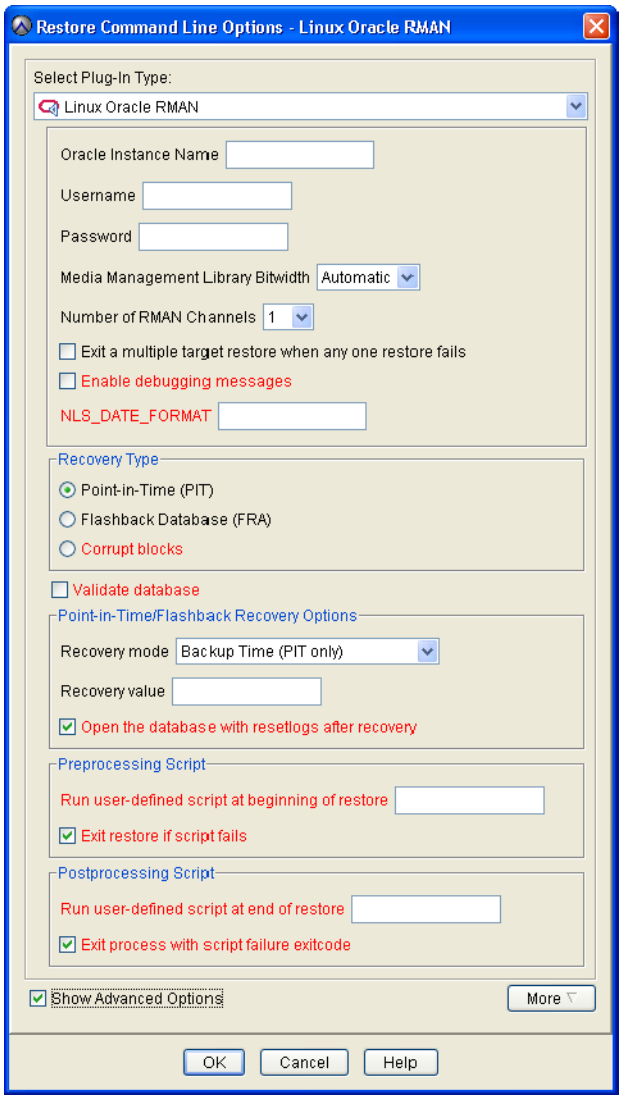
The **Destination** column in the **Items Marked for Restore** table contains the target destination you selected in step e.

g. Click **More Options**.

The **Restore Command Line Options** dialog box appears.

12. Complete the settings in the **Restore Command Line Options** dialog box:

a. Select **Show Advanced Options** at bottom of the dialog box to view advanced options.



Advanced options appear in red text.

b. Leave the **Oracle Instance Name** field blank. The Avamar Plug-in for Oracle determines the Oracle instance name when you browse and select a database to restore.

c. Type the username to use to authenticate the Oracle database in the **Username** field.

d. Type the password for the account In the **Password** field.

e. (Linux and UNIX only) If the application bitness and OS bitness are not the same, select the appropriate setting from the **Media Management Library Bitwidth** list.

   If the application bitness and OS bitness are the same, leave the **Media Management Library Bitwidth** set to the **Automatic** (default).

   The **Media Management Library Bitwidth** option does not apply to Windows platforms.

f. Select the number of channels to allocate during the backup from the **Number of RMAN Channels** list. The maximum number is 10.

g. (Optional) Select **Exit a multiple target restore when any one backup fails** to prevent a multiple target restore from continuing after one of the restore operations fail.

h. (Advanced option) Do not select the **Enable debugging message** option. This option is for troubleshooting restore problems. When you select the **Enable debugging messages** option, the Avamar Plug-in for Oracle creates large log files.

i. (Advanced option) In the **NLS_DATE_FORMAT** field, type a timestamp format for the target machine.

j. Select a **Recovery Type**:

   – To recover the database to the present time or to a point-in-time in the past, select **Point-in-Time (PIT)**.

     Do not select multiple databases for a point-in-time recovery. You must select only one database for the restore.

   – To recover data blocks from the Flash Recovery Area (FRA), select **Flashback Database (FRA)**.

     You must configure Flash Recovery Area before you can use the **Flashback Recovery (FRA)** recovery type. "Configuring Flashback Database recovery" on page 86 provides more information.

   – (Advanced option) To restore corrupt blocks only, and not the entire database, select **Corrupt blocks**.

     To use the **Corrupt blocks** recovery option, you must set the `DB_BLOCK_CHECKSUM` initialization parameter to `TYPICAL` for the Oracle database. The database must be in a mounted or open state.

k. (Advanced option) Select **Validate database** if you selected **Corrupt blocks** from the **Recovery Type** group box.

l. Select an option from the **Recovery mode** list for the recovery type that you selected in step j.

   "Recovery modes and values" on page 142 provides more information about the **Recovery mode** options.

m. Specify the SCN, log sequence number, or timestamp in the **Recovery value** field. This value depends on the option that you selected from the **Recovery mode** list in step l.

n. To open the database after the recovery finishes, select **Open the database with resetlogs after recovery**.

This option is selected by default.

Clear the **Open the database with resetlogs after recovery** option to disable this option. When you clear this option, the restore operation does not open the database with resetlogs. You can then apply archive logs to recover the database to the most current point-in-time that is available.

13. (Optional) Specify other advanced options as appropriate:

a. To run a user-defined script at the beginning of the restore, type the script name in the **Run user-defined script at beginning of restore** field.

The script must be in the `avamar\etc\scripts` directory on the client.

b. Select **Exit restore if script fails** to stop the script from processing when the script returns a non-zero status code.

This option is selected by default.

c. To run a user-defined script at the end of the restore, type the script name in the **Run user-defined script at end of restore** field.

The script must be in the `avamar\etc\scripts` directory on the client.

d. Select **Exit process with script failure exitcode** to exit the script when it fails with an exitcode from the script rather than an exitcode from the Avamar Plug-in for Oracle.

This option is selected by default.

"Preprocessing and postprocessing scripts and attributes" on page 143 provides more information about using scripts and specifying attributes.

14. Specify the `[avoracle]lang_format` attribute and value if the database backup contains datafiles that use the UTF-8 character set:

a. Click **More**.

The **Enter Attribute** and **Enter Attribute Value** fields appear.

b. Type **`[avoracle]lang_format`** in the **Enter Attribute** field:

NOTICE

Precede all attributes you type in the **Enter Attribute** field with **`[avoracle]`**.

c. Type the appropriate value in the **Enter Attributes Value** field:

language_territory.charset

where:

- *language* specifies the language. For example Japanese.
- *territory* specifies the country. For example, Japan.
- *charset* specifies the character set. For example, JA16SJIS.

The following example is the correct syntax for Japanese:

Japanese_Japan.JA16SJIS

NOTICE

The use of the `[avoracle]lang_format` attribute and value, sets the NLS_LANG environment variable for the restore. The Oracle documentation provides more information about NLS_LANG.

d. Click the **Add to List** button (**+**).

The `[avoracle]lang_format` attribute and value appear in the box below the **Add to List** (**+**)and **Remove From List** (**-**) buttons.

"ORA-19870: error while restoring backup piece" on page 156 provides more information about restores datafiles that use the UTF-8 character set.

e. Click **OK** to close the **Restore Command Line Options** dialog box.

15. Click **OK** to close the **Restore Options** dialog box.

The following status message appears:

```
Restore initiated.
```

16. Click **OK**.

NOTICE

If the restore process fails, manual recovery steps can be necessary. "Restore fails to complete successfully" on page 161 provides details.

17. (Solaris only) Restart the listener and other dependent processes if you restored a database to a Solaris VCS cluster.

Disaster recovery

The following procedure recovers an Oracle server from a complete loss.

1. Replace hardware if required.

   The hostname and IP address must be same as that of the original server.

2. Install the same version of the Avamar file system client and Avamar Plug-in for Oracle. Chapter 2, "Installation," provides instructions.

3. Register and activate the client with the same Avamar server.

   NOTICE

   To resolve registration problems, retire the client and reregister it with the Avamar server.

   The *EMC Avamar Administration Guide* provides instructions for registering, retiring, and activating clients.

4. Install the same version of the Oracle software that was previously installed.

5. Set up the Oracle database:

   a. Ensure that you set the `ORACLE_HOME` to the same location as it was set to previously.

   b. Create the Oracle database with the same SID name that was used previously.

      Ensure that the `ORACLE_SID`, `oradata`, and `flash_recovery_area` pathnames are exactly the same as in the previous configuration.

6. Start the database in the "no mount" state by typing the following command:

   ```
   STARTUP NOMOUNT
   ```

7. Restore the server parameter file (`spfile`) by using the following RMAN script:

   ```
   connect target "/";
   set dbid=DBID;
   run{
   restore spfile to '/HOME/ORACLE/spfiletestdb.ora' from autobackup
   MAXSEQ=SEQ
   until time = "TO_DATE('DATE','YYYYMMDD')";
   }
   ```

   where:

   - *DBID* is the database ID.
   - */HOME/ORACLE* is the path for the spfile.
   - *SEQ* is the highest sequence number for the control file autobackup search.
   - *DATE*, *YYYYMMDD* is the backup date.

8. Restore the Oracle database by completing the steps in "Restoring a database to a different client" on page 95.

CHAPTER 6
Backup and Restore with Oracle RMAN

The following topics describe how to use Oracle Recovery Manager (RMAN) scripts to back up and restore Oracle to or from an Avamar server or a Data Domain system:

Overview

The Avamar Plug-in for Oracle supports RMAN backup and restore scripts. You can run RMAN restore scripts only from the command line.

The avtar flag file

All RMAN backup and restore scripts in this chapter require an `avtar` flag file. When you use RMAN to back up Oracle rather than Avamar Administrator, for example, you must specify the backup expiration time. Otherwise, backups stored on the Avamar server never expire. You specify the backup expiration by including the `--expires` option for the `avtar` command in the `avtar` flag file. The `avtar` process reads the `avtar` flag file during RMAN backups and restores.

"Creating an avtar flag file" on page 106 provides more information about the `avtar` flag file.

Supported target systems

You can use either an Avamar server or a Data Domain system as the target system for RMAN backup or restore scripts.

Preparing the system for RMAN backups and restores

The following topics describe how to set up the system to run RMAN scripts to back up and restore Oracle data.

Creating an avtar flag file

When you use RMAN to back up or restore Oracle data, you must pass specific `avtar` options by using the `send` command. You include these `avtar` options in the `avtar` flag file, which is a text file.

NOTICE

Do not include the `avtar -c` and `-x` options in the `avtar` flag file. The `-c` and `-x` options might conflict with other `avtar` options specified for backup or restore operations that Avamar Administrator runs.

The following procedure creates an `avtar` flag file.

1. Create a plain text file with a text editor.

   The remaining steps use `my-avtar-flags.txt` file as an example flag file.

2. Add the following entries to the text file:

```
--pidname=Oracle
--pidnum=pidnum
--logfile=install-dir/var/avtar.log
--vardir=install-dir/var
--id=user
--ap=password
--path=/clients/my-db-client
--expires={num-days |timestamp}
```

where:

- *pidnum* is the correct PID number for the operating system:
  - For Linux, use PID 1002.
  - For Solaris, use 2002.
  - For Windows, use 3002.
  - For HP-UX, use 4002.
  - For AIX, use 5002.
- *install-dir* is the base installation directory for the platform. For example, specify `/usr/local/avamar` on Linux, `/opt/AVMRclnt` on Solaris, `C:\Progra~1\avs\bin` on `Windows`, and so forth.
- *user* is an Avamar administrative user account.
- *password* is the Avamar administrative password.
- *my-db-client* is the Oracle database hostname.
- {*num-days*|*timestamp*} specifies backup expiration as the number of days from today (*num-days*) or an absolute *timestamp*.

3. To use an RMAN script to back up Oracle to Data Domain systems, add the following Data Domain-specific entries:

   --ddr
   --ddr-index=*ddr-index*

   where *ddr-index* is the index number (1, 2, 3, and so forth) that you assign to the Data Domain system when you add it to the Avamar server configuration.

   NOTICE

   Skip this step if you do not use a Data Domain system.

4. Save the file to `/oracle` or another convenient place in the search path.

Specifying the SBT_LIBRARY parameter

To use RMAN backup and restore scripts with the Avamar software requires you to define backup channels by using the `allocate channel` command. The `allocate channel` command must include a `PARMS` clause, which specifies the `SBT_LIBRARY` parameter. The `SBT_LIBRARY` parameter points to the directory that contains the `libobk_avamar.so` file for 32-bit installations or the `libobk_avamar64.so` file for 64-bit installations:

`SBT_LIBRARY=`*`install-dir`*`/lib/libobk_avamar.so`

where *install-dir* is the base installation directory for the platform. For example, specify `/usr/local/avamar` on Linux, `/opt/AVMRclnt` on Solaris, `C:\Progra~1\avs\bin` on Windows, and so forth.

For 64-bit Oracle installations, use `libobk_avamar64.so` in place of `libobk_avamar.so`. On Windows, the equivalent libraries are `libobk_avamar64.dll` and `libobk_avamar.dll`.

The following command is an example of the `allocate channel` command for IBM AIX:

```
allocate channel c1 type sbt
    PARMS="SBT_LIBRARY=/usr/local/avamar/lib/libobk_avamar.so";
```

The following command is an example of the `allocate channel` command for 64-bit Oracle on HP-UX:

```
allocate channel c1 type sbt
    PARMS="SBT_LIBRARY=/opt/AVMRclnt/lib/libobk_avamar64.so";
```

Specifying the library path settings

When RMAN loads `libobk_avamar.so` or `libobk_avamar64.so`, the path to the RMAN-dependent libraries must be communicated to the dynamic loader.

The dynamic loader exits with a failure when it is unable to locate the libraries that `libobk_avamar.so` or `libobk_avamar64.so` requires. RMAN channel allocation, therefore, fails.

You use an environment variable to specify the location of the libraries. You must set the correct environment variable before an Avamar backup or restore operation runs an RMAN script. The location and the environment variable vary with each operating system. Table 3 on page 108 lists the operating systems and the environment variables.

Table 3 Environment variables for libobk

Operating system	Environment variable
AIX	`LIBPATH`
HP-UX	`SHLIB_PATH`
Linux, Solaris	`LD_LIBRARY_PATH`

The library path is typically *`install-dir`*`/lib`, where *install-dir* is the base installation directory for the system. For example:

- On Linux, the path is `/usr/local/avamar`.
- On Solaris, the path is `/opt/AVMRclnt`.
- On Windows, the path is `C:\Progra~1\avs\bin`.

Use the `set` and `export` commands (for the sh, ksh, or bash shell) or the `setenv` command (for the csh or bash shell) to set the library path variable.

Set the appropriate environment variable on the system. For example, to set the `LD_LIBRARY_PATH` variable on Solaris, use one of the following methods depending on the operating system shell:

- For the sh, ksh, or bash shell, type the following commands:

  ```
  set LD_LIBRARY_PATH=/opt/AVMRclnt/lib
  export LD_LIBRARY_PATH
  ```

- For the csh or bash shell, type the following command:

  ```
  setenv LD_LIBRARY_PATH /opt/AVMRclnt/lib
  ```

Specifying RMAN parameters to improve performance

This topic describes RMAN parameters that you can use to improve data deduplication performance.

Specifying the maxopenfiles parameter

The `maxopenfile` parameter specifies the number of files that RMAN can open concurrently per channel. To set the `maxopenfiles` parameter in an RMAN backup script, use the `allocate channel` or `configure channel` command. The following example uses the `allocate channel` command:

```
allocate channel c0 maxopenfiles = 1 device type sbt;
```

RMAN compares the value of the `maxopenfiles` parameter with the number of files in each backup set and uses the level of multiplexing as a minimum of two.

Set the `maxopenfiles` parameter to 1 to disable multiplexing, which increases data deduplication performance. Disabling RMAN multiplexing results in more time to back up Oracle data because RMAN reads a single file instead of multiple files simultaneously.

Specifying the filesperset parameter

The `filesperset` parameter specifies the number of files that RMAN can include in each backup set. To set the `filesperset` parameter in an RMAN backup script, use the `backup` command. The following example uses the `backup database` command:

```
backup filesperset = n database ...;
```

where *n* is the number of files RMAN includes in a backup set. The default value is 8.

RMAN compares the value of the `filesperset` parameter with number of files to be backed up divided by the number of allocated channels, and then uses the lower of the two values.

For example, if the total number of files to be backed up is 8, the number of channels is 1, and `filesperset` is 4, RMAN creates two backup sets each with four files.

Enabling RMAN backup optimization

Backups that use RMAN backup optimization skip any file that has not changed and has already been backed up to the allocated device type. A file can be a dbf file, an archived redo log, or an RMAN backup set.

RMAN skips backups of offline or read-only datafiles only when there are *r*+1 backups of the files to SBT:

```
CONFIGURE RETENTION POLICY TO REDUNDANCY r
```

Where *r* is the redundancy setting.

Setting backup optimization

To reduce backup time, enable the RMAN backup optimization feature.

1. Open a command shell.
2. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.
3. Connect to the Oracle database to back up.
4. Type the following command:

   `configure backup optimization on;`

Guidelines for using RMAN backup optimization

The following guidelines apply to backups that use RMAN backup optimization:

- Allocate only one type of channel. Do not mix disk and SBT channels in the same RMAN `backup` command.
- Run the `crosscheck` command periodically to synchronize the RMAN backup catalog with Avamar backups.

  Running the `crosscheck` command also ensures that RMAN does not skip a backup that has already expired in Avamar.
- Override RMAN backup optimization by specifying the `force` option with the RMAN `backup` command.

The Oracle documents provide more information about the RMAN backup optimization feature.

Specifying before and after flags to increase index lookup speed

The Avamar Plug-in for Oracle uses the `avtar --history` command to perform index lookups. This command can sometimes run slowly. Compounding this problem, the Avamar Plug-in for Oracle also runs the `avtar --history` command for each CLI backup and for each backup a restore retrieves. When a backup or restore involves hundreds of backups, the `avtar --history` command may take hours to run.

The `avtar --history` command supports two time-range CLI flags:

- The `--before` flag instructs the `avtar` process to search only for backups that were created before the time specified by the `--before` flag.
- The `--after` flag instructs the `avtar` process to search only for backups that were created after the time specified by the `--after` flag.

The Avamar Plug-in for Oracle library, `libobk_avamar.x`, enables you to set the `--before` and `--after` flags for operations that perform an index lookup. The `libobk_avamar.x` uses the `--before` and `--after` flags to increase index lookup performance.

Do not set the `--before` or `--after` flags for backups. The `libobk_avamar.x` automatically sets these flags to the backup start time, which enables the backup index lookup to search only for backups created after the backup began.

Set the --before or --after flags for restores with the send command in an RMAN script. The following RMAN script shows how to set the --before and --after flags:

```
connect target user/password@SID;
run {
   allocate channel c1 type sbt
   PARMS="SBT_LIBRARY=install-dir/lib/libobk_avamar.so";
   send '"--after=2012-11-07 00:30:00" "--before=2012-11-11 01:00:00"
   "--bindir=install-dir/avamar/bin" "--flagfile=my-avtar-flags.txt"';
   restore datafile 4;
   release channel c1;
```

Use the following time format for the --before and --after flags:

YYYY-MM-DD HH:MM:SS

NOTICE

The smaller the time range between the --before and --after flags, the faster the searches.

In addition to the --before and --after flags use the --nohist flag to disable all index lookups for all operations. Set the --nohist flag with the send command in an RMAN script:

```
send '"--nohist" "--bindir=install-dir/avamar/bin"
   "--flagfile=my-avtar-flags.txt"';
```

The --nohist flag does not require a value.

When a backup or restore specifies all three flags, the --nohist flag takes precedence. The --before and --after flags are ignored.

Backing up Oracle data with RMAN

This topic describes how to back up an Oracle database, a tablespace, or a single datafile by using RMAN.

All RMAN backup scripts in this topic require an avtar flag file. "Creating an avtar flag file" on page 106 provides more information.

All Windows paths that you specify with the RMAN send command must use the 8.3 format.

NOTICE

Avamar uses the RMAN interface to perform hot and cold backups. RMAN requires the Oracle database to be running to perform a hot backup.

Backing up a database

The following procedure uses an RMAN script to back up a database.

1. Open a command shell.

   NOTICE

   To back up the database by using a database control file instead of a recovery catalog, start RMAN by using the `nocatalog` option.

2. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.

3. Connect to the Oracle database to back up.

4. Back up the Oracle database by typing RMAN commands similar to the following commands:

   ```
   run {
   configure controlfile autobackup on;
   allocate channel c1 type sbt\
    PARMS="SBT_LIBRARY=install-dir/lib/libobk_avamar.so"\
    format '%d_%U';
   set controlfile autobackup format for device type sbt\
    to "CONTROLFILE.%F";
   send '"--flagfile=/oracle/my-avtar-flags.txt"\
   "--bindir=install-dir/bin"';
   backup database plus archivelog;
   release channel c1;
   }
   ```

   where *install-dir* is the base installation directory for the platform. For example, specify `/usr/local/avamar` on Linux, `/opt/AVMRclnt` on Solaris, `C:\Progra~1\avs\bin` on Windows, and so forth.

Backing up a tablespace

The following procedure uses an RMAN script to back up a tablespace to an Avamar server or a Data Domain system. An `avtar` flag file for the RMAN script specified in this procedure contains the following entries:

```
--debug
--pidname=Oracle
--pidnum=3002
--logfile=C:\test\rman\bacupdb.log
--vardir=C:\test\rman\var
--id=testuser@/clients/oraw2k864-mc2.bgl-avamar.emc
--password=testuser
--path=/clients/oraw2k864-mc2.bgl-avamar.emc
--server=avamar-1.emc.com
```

The following procedure backs up a tablespace.

1. Open a command shell.

2. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.

3. Connect to the Oracle database to back up.

4. Back up the Oracle tablespace by typing commands similar to the following RMAN commands:

```
run {
configure controlfile autobackup on;
set controlfile autobackup format for device type sbt to
'CONTROLFILE.ANT.%F';
allocate channel c0 type sbt
PARMS="SBT_LIBRARY=c:\PROGRA~1\avs\bin\orasbt64.dll"\
format '%d_%U';
send '"--prefix=11g/ANT/"
"--flagfile=c:\anant\rman\avtar-flags.txt"
"--bindir=c:\PROGRA~1\avs\bin"';
backup tablespace ant_ts;
release channel c0;
}
```

   In the sample script, the database name is ANT and the tablespace name is ant_ts. The script backs up the tablespace and the database control file by using the `autobackup` option.

To view the contents of a tablespace backup, use the `list backup` command. The `list backup` command lists all the datafiles and the control file that are part of the tablespace backup.

Backing up a datafile

The following procedure backs up a datafile.

1. Open a command shell.
2. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.
3. Connect to the Oracle database to back up.
4. Back up the Oracle datafile by typing RMAN commands similar to the following commands:

```
run {
configure controlfile autobackup on;
allocate channel c1 type sbt\
 PARMS="SBT_LIBRARY=install-dir/lib/libobk_avamar.so"\
 format '%d_%U';
set controlfile autobackup format for device type sbt\
 to "CONTROLFILE.%F";
send '"--flagfile=/oracle/my-avtar-flags.txt"\
"--bindir=install-dir/bin"';
backup datafile "MyFile.dbf";
release channel c1;
}
```

   where:

   - *install-dir* is the base installation directory for the platform. For example, specify `/usr/local/avamar` on Linux, `/opt/AVMRclnt` on Solaris, `C:\Progra~1\avs\bin` on Windows, and so forth.
   - *MyFile.dbf* is the Oracle datafile to back up.

Restoring Oracle data with RMAN

This topic describes how to restore an Oracle database, a tablespace, or a single datafile.

The restore procedures in this topic require an `avtar` flag file. "Creating an avtar flag file" on page 106 provides more information.

NOTICE

The Oracle database you select to restore must be offline.

Restoring a database

The default control file name that RMAN generates uses the following format:

```
c.DBID-DATE-SEQ
```

You can modify this format by passing directives to RMAN scripts.

Avamar Administrator generates scripts that contain the RMAN directive, `%F`:

```
set controlfile autobackup format for device type sbt\
    to "CONTROLFILE.%F";
```

The `%F` directive combines the DBID, date, and sequence to form the following control file name:

```
CONTROLFILE.c.DBID-DATE-SEQ
```

The sample scripts in this guide assume this format for the control file name.

The control file name contains a prefix when you use a backup that you created with Avamar Administrator for the restore. You must then add the prefix to the `send` command. The prefix must be the first directive. The following `send` command specifies "11g/orcl" as the prefix for an Oracle 11*g* database with a SID of orcl:

```
send '"--prefix=11g/orcl/" "--flagfile=/oracle/my-avtar-flags.txt"\
    "--bindir=install-dir/bin"';
```

The path that you specify by the `--prefix` option must contain a trailing slash (/). The direction of the slash does not change on Windows platforms.

The following procedure uses an RMAN script to restore an Oracle control file and database.

1. Open a command shell.
2. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.
3. Connect to the Oracle database to restore.
4. List all available backups by typing the `list backup` command:

   ```
   list backup;
   ```

5. From the backup to be restored, retrieve the following information from the control file:

   a. Examine the database backup control file name.

   b. Note the values for the following variables:

      - DATE
      - DBID
      - SEQ

   Use the values of the DATE, DBID, and SEQ variables in the RMAN restore script.

6. Restore the Oracle control file by typing the following RMAN commands:

```
set dbid=DBID;
set controlfile autobackup format for device type sbt to\
 'CONTROLFILE.%F';
run {
   allocate channel c1 type sbt\
    PARMS="SBT_LIBRARY=install-dir/lib/libobk_avamar.so"\
    format '%d_%U';
   send '"--flagfile=/oracle/my-avtar-flags.txt"\
    "--bindir=install-dir/bin"';
   restore controlfile from autobackup MAXSEQ=SEQ\
    until time = "TO_DATE('DATE','YYYYMMDD')";
   startup mount;
   release channel c1;
list backup;
}
```

   where:

   - *DBID* is the database ID.
   - *install-dir* is the base installation directory for the platform. For example, specify `/usr/local/avamar on` Linux, `/opt/AVMRclnt` on Solaris, `C:\Progra~1\avs\bin` on Windows, and so forth.
   - *YYYYMMDD* is a date.

   The restore process copies the control file and puts the database in a mount state.

   A listing of available database backups and corresponding system change numbers (SCN) appears in the command shell.

7. Locate and note the SCN that corresponds to the backup to use for the recover:

   - To recover an archive log backup, locate and note the next SCN for the archive log.
   - To recover from a database backup, locate and note the SCN for the database.

8. Log out of the RMAN session by typing the following command:

```
exit
```

9. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.

10. Connect to the Oracle database to restore.

11. Restore the Oracle database by typing the following RMAN commands:

```
run {
   allocate channel c1 type sbt PARMS="SBT_LIBRARY=install-dir\
    /lib/libobk_avamar.so" format '%d_%U';
   send '"--flagfile=/oracle/my-avtar-flags.txt"\
    "--bindir=install-dir/bin"';
   set until scn scn;
   restore database;
   recover database;
   release channel c1;
}
alter database open resetlogs;
```

where:

- *scn* is the next SCN value (noted in step 7) for the archive log recovery or the SCN value for the database.
- *install-dir* is the base installation directory for the platform. For example, specify `/usr/local/avamar` on Linux, `/opt/AVMRclnt` on Solaris, `C:\Progra~1\avs\bin` on Windows, and so forth.

NOTICE

If the restore process fails, you may need to perform manual recovery steps. "Restore fails to complete successfully" on page 161 provides more information.

Restoring a tablespace

The following procedure uses an RMAN script to restore a tablespace from an Avamar server or a Data Domain system.

1. Open a command shell.
2. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.
3. Connect to the Oracle database to restore.
4. Restore the Oracle tablespace by typing the following RMAN commands:

```
run {
allocate channel c1 type sbt\
 PARMS="SBT_LIBRARY=install-dir/lib/libobk_avamar.so"\
 format '%d_%U';
send '"--flagfile=/oracle/my-avtar-flags.txt"\
"--bindir=install-dir/bin"';
restore tablespace "USERS";
recover tablespace "USERS";
release channel c1;
}
```

where:

- *install-dir* is the base installation directory for the platform. For example, specify `/usr/local/avamar` on Linux, `/opt/AVMRclnt` on Solaris, `C:\Progra~1\avs\bin` on Windows, and so forth.
- *USERS* is the tablespace to restore.

Restoring a tablespace to a specific time

This topic describes how to use RMAN scripts to restore a tablespace to a specific point-in-time. You can restore a tablespace from an Avamar server or a Data Domain system.

The instructions to recover a tablespace to a specific point-in-time, require one or more of the following parameters:

- `DB ID` (database identification number)
- Control file `MAXSEQ` number
- `SCN` of the datafiles
- Latest timestamp

Listing information about the backup

Use the `list backup` command to obtain the parameters you need to recover a tablespace.

1. Open a command shell and type the following `set` command:

   set ORACLE_SID=*DB SID*

   where *DB SID* is the database system ID (SID).

2. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.

3. Connect to the Oracle database.

4. Type the `list backup` command:

   list backup;

   The `list backup` command lists information similar to the following output:

```
BS Key    Type LV Size  Device Type   Elapsed Time  Completion Time
------    ---- -- ----  -----------   ------------  ---------------
173       Full   2.25M      SBT_TAPE       00:00:08       07-OCT-12
BP Key: 173 Status: AVAILABLE  Compressed: NO  Tag: TAG20121007T232319
   Handle: ANT_6knn6l37_1_1   Media: avtar007
List of Datafiles in backup set 173
File LV   Type   Ckp SCN   Ckp Time     Name
---- --   ----   --------  --------     -----
5         Full   1935412   07-OCT-12 C:\ORACLE\ORADATA\ANT\ANT_TS_DF.DBF
6         Full   1935412   07-OCT-12 C:\ORACLE\ORADATA\ANT\ANT_TS_DF2.DBF

BS Key  Type LV Size       Device Type Elapsed Time Completion Time
------- ---- -- ---------- ----------- ------------ ---------------
174     Full    9.75M      SBT_TAPE    00:00:08     07-OCT-12
   BP Key: 174  Status: AVAILABLE  Compressed: NO  Tag: TAG20121007T232335

   Handle: CONTROLFILE.ANT.c-107988049-20121007-0e   Media: avtar007
SPFILE Included: Modification time: 07-OCT-12
SPFILE db_unique_name: ANT
Control File Included: Ckp SCN:1935425   Ckp time: 07-OCT-12
```

From the `list backup` output, note the values for the `DB ID`, `MAXSEQ`, `SCN`, and timestamp parameters. For example, the sample output includes the following parameters values:

- `DB ID` is 107988049.
- Control file `MAXSEQ` number is 0e (14 in decimal).
- `SCN` is 1935412.
- Timestamp is 20121007T232335.

You use these parameters in the tablespace restore script.

Restoring a tablespace to a specific point-in-time

1. Start SQL*Plus.
2. Type the following SQL*Plus command to take the tablespace offline:

   `alter tablespace` *`tablespace-name`* **`offline;`**

   where *tablespace-name* is the name of the tablespace.
3. Type the following SQL*Plus command to shut down the database:

   `shutdown immediate`
4. Remove the tablespace datafiles and the control file from the `oradata` directory.
5. Type the following SQL*Plus command to start the Oracle instance in nomount mode:

   `startup nomount;`
6. Run the restore script to restore the control file. Then run the restore script to restore the tablespace. For more information about the restore scripts, review the following sample scripts:

   - "Sample script to restore the control file" on page 119
   - "Sample script to restore the tablespace by using an SCN" on page 119
   - "Sample script to restore the tablespace by using a timestamp" on page 119
7. Run the RMAN `recover database` command to recover the database:
   a. Log in to Oracle RMAN by using the Oracle user ID and password.

      The command prompt changes to an RMAN prompt.
   b. Connect to the Oracle database to restore.
   c. Type the recover database command:

      `recover database;`
8. Run the RMAN command to reset the logs and open the database:

   `alter database open resetlogs;`

Sample script to restore the control file

```
connect target "/";
set dbid=107988049;
run{
set controlfile autobackup format for device type sbt to
'CONTROLFILE.ANT.%F';
allocate channel c0 type sbt\
PARMS="SBT_LIBRARY=c:\PROGRA~1\avs\bin\orasbt64.dll"format '%d_%U';
send '"--prefix=11g/ANT/" "--flagfile=c:\anant\rman\avtar-flags.txt"
"--bindir=c:\PROGRA~1\avs\bin"';
restore controlfile from autobackup MAXSEQ=14 until
time="TO_DATE('20121007','YYYYMMDD')";
}
startup mount;
```

Sample script to restore the tablespace by using an SCN

```
connect target "/";
run {
allocate channel c0 type sbt
PARMS="SBT_LIBRARY=c:\PROGRA~1\avs\bin\orasbt64.dll" format '%d_%U';
send '"--prefix=11g/ANT/" "--flagfile=c:\anant\rman\avtar-flags.txt"
"--bindir=c:\PROGRA~1\avs\bin"';
set until scn 1935412;
restore tablespace ant_ts;
}
```

Sample script to restore the tablespace by using a timestamp

```
connect target "/";
run {
allocate channel c0 type sbt
PARMS="SBT_LIBRARY=c:\PROGRA~1\avs\bin\orasbt64.dll" format '%d_%U';
send '"--prefix=11g/ANT/" "--flagfile=c:\anant\rman\avtar-flags.txt"
"--bindir=c:\PROGRA~1\avs\bin"';
set until time "TO_DATE ('20121007 23:23:35','YYYYMMDD HH24:MI:SS')";
restore tablespace ant_ts;
}
```

Restoring datafiles

1. Open a command shell.
2. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.
3. Connect to the Oracle database to restore.

4. Restore the Oracle datafile by typing the following RMAN commands:

```
run {
allocate channel c1 type sbt\
 PARMS="SBT_LIBRARY=install-dir/lib/libobk_avamar.so"\
 format '%d_%U';
send '"--flagfile=/oracle/my-avtar-flags.txt"\
 "--bindir=install-dir/bin" "--labelnum=num"';
restore datafile "MyFile.dbf";
recover datafile "MyFile.dbf";
release channel c1;
}
```

   where:

   - *install-dir* is the base installation directory for the platform. For example, specify `/usr/local/avamar` on Linux, `/opt/AVMRclnt` on Solaris, `C:\Progra~1\avs\bin` on Windows, and so forth.
   - *num* is the backup number from which you want to restore.
   - *MyFile.dbf* is the Oracle datafile you want to restore.

Using advanced restore commands

This topic describes how to restore a database by using the recovery catalog and how to restore a database to a different client system.

The restore procedures in this topic require an `avtar` flag file. "Creating an avtar flag file" on page 106 provides more information.

Using the catalog for backup and restores

To use a catalog for backup or recovery, add the catalog connect string after the target connect string:

```
connect target user/password@mydb;
connect catalog catuser/catpassword@catalog;
```

The following procedure restores a database by using the recovery catalog.

1. Open a command shell.
2. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.

3. Restore the Oracle database by typing the following RMAN commands:

```
Connect catalog user/passwd@CATALOG;
run {
allocate channel c1 type sbt\
 PARMS="SBT_LIBRARY=install-dir/lib/libobk_avamar.so"\
 format '%d_%U';
send '"--flagfile=/oracle/my-avtar-flags.txt"\
"--bindir=install-dir/bin"';
restore database;
recover database;
release channel c1;
}
```

   where:

   - *user* and *passwd* are the credentials for the recovery catalog (CATALOG).
   - *install-dir* is the base installation directory for the platform. For example, specify `/usr/local/avamar` on Linux, `/opt/AVMRclnt` on Solaris, `C:\Progra~1\avs\bin` on Windows, and so forth.

Performing a redirected restore

The system environment must meet the following requirements to restore Oracle to a different client system:

- Both the source and target platforms must be similar types with the same configuration.
- The version of RMAN on the target platform must be compatible with the version of RMAN that was used to create the backup.

The following procedure uses RMAN to perform a redirected restore from the original client system to a different client system.

1. Open a command shell.
2. On the target system, create an `avtar` flag file.

   This file is the same as the one described in "Creating an avtar flag file" on page 106, except for the `--id`, `--ap`, and `--path` entries, which refer to the original client system (where the backup was originally performed), not the target system.
3. Save the changes.
4. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.
5. Create an empty database on the target system with the same SID as the original database.
6. Shut down the database and delete all control files, datafiles, logs, and FRA contents corresponding to the database.
7. Restart the database with the `nomount` option.
8. Restore the database by using the flag file. "Restoring a database" on page 114 provides instructions.

Managing backup retention

RMAN supports two types of retention policies, recovery window and redundancy:

- The recovery window policy specifies a period of time that begins with the current time and extends backward in time to the point of recoverability. For example, a recovery window policy can be seven days.
- The redundancy policy specifies the number of backups that are kept for the database. The default retention policy keeps one backup.

As backups accumulate, older backups become obsolete according to the retention policy. RMAN uses `crosscheck` and `delete` operations to manage backups stored on the Avamar server:

- Crosscheck operations verify that backups on the Avamar server exist. Crosscheck operations also work for backups created by Avamar Administrator.
- Delete operations remove expired backups from the Avamar server if the backups are marked as obsolete. Delete operations do not work for backups created by Avamar Administrator.

Configuring retention policies

To use `crosscheck` to verify backups performed by Avamar Administrator, you must configure an Avamar retention policy and an RMAN retention policy.

Configuring an Avamar retention policy

1. Start Avamar Administrator and log in.
2. In Avamar Administrator, select **Tools** › **Manage Retention Policies**.

   The **Manage All Retention Policies** dialog box appears.
3. Click **New**.

   The **New Retention Policy** dialog box appears.
4. Type a name in the **Name** field for the retention policy.

   Do not use any of the following characters in the retention policy name: ~!@$^%(){}[]|,`;#\/:*?‹›'"&.
5. Select the basic retention setting for the policy:
   - To automatically delete backups after a specific number of days, weeks, months, or years, select **Retention period** and specify the number of days, weeks, months, or years.
   - To automatically delete backups on a specific calendar date, select **End date** and browse to that date on the calendar.
   - To keep backups for as long as a client remains active, select **No end date**.

6. (Optional) Specify advanced retention settings:
   a. Select **Override basic retention policy for scheduled backups**.
   b. Click **Advanced**.

      The **Edit Advanced Retention Policy** dialog box appears.
   c. Specify the maximum number of daily, weekly, monthly, and yearly backups to retain.
   d. Click **OK**.

      The **Edit Advanced Retention Policy** dialog box closes.
7. Click **OK**.

   The new retention policy appears in the **Manage All Retention Policies** dialog box.

Configuring an RMAN retention policy

1. Open a command shell.
2. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.
3. Connect to the Oracle database.
4. Create a retention policy by using the appropriate command. The following commands are examples:

   ```
   CONFIGURE RETENTION POLICY TO REDUNDANCY 2;
   CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF 3 DAYS;
   ```

   Ensure that the RMAN retention period and the Avamar retention policy are as close as possible to the same length of time.

   NOTICE

   To ensure that the RMAN retention policy does not expire before the Avamar retention policy, set the time for the Avamar retention policy to be longer than the RMAN retention policy.

Crosschecking backups

The `crosscheck` command verifies that backups on the Avamar server exist. RMAN marks the backup as available or expired upon successful completion of this command. When the `crosscheck` command is unable to connect to the Avamar server, the operation fails.

When you back up a database from Avamar Administrator, the Avamar Plug-in for Oracle adds a prefix to the name of the backup file. To crosscheck this type of a backup, ensure that you add the prefix to the `avtar` flag file. The prefix you specify by the `avtar` flag file must match the prefix of the Avamar Administrator backup.

The following procedure uses the `crosscheck` command to verify a backup. This procedures requires an `avtar` flag file. "Creating an avtar flag file" on page 106 provides more information.

1. Open a command shell.

2. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to and RMAN prompt.

3. Connect to the Oracle database.

4. Verify a backup by typing the following RMAN commands:

```
allocate channel for maintenance type sbt
 PARMS="SBT_LIBRARY=install-dir/lib/libobk_avamar.so";
send '"--flagfile=/oracle/my-avtar-flags.txt"\
 "--bindir=/usr/local/avamar/bin"';
crosscheck backup device type sbt;
```

   where *install-dir* is the base installation directory for the platform. For example, specify `/usr/local/avamar` on Linux, `/opt/AVMRclnt` on Solaris, `C:\Progra~1\avs\bin` on Windows, and so forth.

Deleting backups

To successfully delete backups, the Avamar user account, which corresponds to the `--id` value in the `avtar` flag file, must have the delete privilege. When you run the `delete` command from an account that does not have the delete privilege, the `avtar` program issues a warning, not an error. To add the delete privilege to the Avamar user account, use the `avmgr` command:

```
avmgr chgv --u=name --pv=delete
```

where *name* is the name of the user account.

NOTICE

Use the `delete` command only to manage RMAN backups. The use of the `delete` command to manage backups originally created by Avamar Administrator can cause unpredictable system behavior.

The `delete` command deletes expired backups from the Avamar server if the backups are marked as obsolete.

The following procedure deletes expired backups. This procedures requires an `avtar` flag file. "Creating an avtar flag file" on page 106 provides more information.

1. Open a command shell.

2. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to an RMAN prompt.

3. Connect to the Oracle database.

4. Delete an expired backup by typing the following RMAN commands:

```
run {
allocate channel c1 type sbt
 PARMS="SBT_LIBRARY=/install-dir/lib/libobk_avamar.so";
send '"--flagfile=/oracle/my-avtar-flags.txt"\
 "--bindir=/usr/local/avamar/bin"';
delete expired backupset;
}
```

where *install-dir* is the base installation directory for the platform. For example, specify `/usr/local/avamar` on Linux, `/opt/AVMRclnt` on Solaris, `C:\Progra~1\avs\bin` on Windows, and so forth.

Mixing RMAN and Avamar Administrator backups

Do not back up Oracle by using both RMAN and Avamar Administrator. You can, however, recover backups you create with Avamar Administrator by using RMAN.

Synchronizing the RMAN catalog

To keep the RMAN catalog synchronized with the Avamar server, use either of the following methods:

- The `report obsolete` command followed by the `delete obsolete` command.

  RMAN determines which backups have fallen outside of the retention policy, and then deletes them from its catalog and the Avamar server.

- The `crosscheck` command followed by the `delete expired` command.

  RMAN determines which backups are available on the Avamar server, and then updates its catalog accordingly.

Allocating multiple channels

An RMAN backup script that specifies multiple channels runs multiple instances of the `avtar` program in parallel. The maximum number of channels is 10. To avoid cache file collisions, specify a separate cache file for each channel including cases where you only use one channel. The `cacheprefix` directive determines the name of the cache file. Use a separate set of cache files for each database.

You may lock out processes by allocating too many channels, which can result in a time-out error. If a time-out error occurs, retry the operation by using fewer channels.

The following procedure creates an RMAN script to use multiple channels.

1. Disable the file cache by adding the following entry to the `avtar` flag file:

   ```
   --enable-filecache=false
   ```

2. Create an RMAN script that includes `allocate channel` commands similar to the following commands:

   ```
   allocate channel c0 type sbt
    PARMS="SBT_LIBRARY=/usr/local/avamar/lib/libobk_avamar64.so"
    format '%d_%U';
   allocate channel c1 type sbt
    PARMS="SBT_LIBRARY=/usr/local/avamar/lib/libobk_avamar64.so"
    format '%d_%U';
   allocate channel c2 type sbt
    PARMS="SBT_LIBRARY=/usr/local/avamar/lib/libobk_avamar64.so"
    format '%d_%U'
   ```

3. Repeat the `allocate channel` command to allocate more channels, if required.

4. Add a `send` command to the RMAN script for each channel. For example, the following `send` commands correspond to the channels specified in step 2.

   ```
   send channel='c0' '"--flagfile=/oracle/my-avtar-flags.txt"
    "--bindir=install-dir/bin" "--cacheprefix=orcl-c0"';
   send channel='c1' '"--flagfile=/oracle/my-avtar-flags.txt"
    "--bindir=install-dir/bin" "--cacheprefix=orcl-c1"';
   send channel='c2' '"--flagfile=/oracle/my-avtar-flags.txt"
    "--bindir=install-dir/bin" "--cacheprefix=orcl-c2"';
   ```

   The script specifies a `cacheprefix` directive for each channel. If the `send` command is split into multiple instances, specify the `cacheprefix` directive only once for each channel.

5. Before running an RMAN script that allocates multiple channels, ensure the user account has permissions to create files in the *`install-dir`*`/var` directory or the cache files exists and has the correct permissions.

APPENDIX A
RAC Issues When Not Using Shared Var Directory

The following topics describe how to set up the Avamar Plug-in for Oracle in a multi-node RAC configuration that does not use a shared `var` directory:

Configuring the plug-in without a shared var directory

Complete the following tasks to configure the Avamar Plug-in for Oracle for RAC environments that do not use a shared `var` directory:

- "Installing the Avamar software" on page 128
- "Running the rac_config script" on page 128
- "Registering and activating the Avamar client" on page 129

Installing the Avamar software

Install the Avamar client software and the Avamar Plug-in for Oracle for the platform on all nodes. Chapter 2, "Installation," provides instructions.

Running the rac_config script

1. Log in to one of the RAC nodes as root.
2. Change to the directory that contains the `rac_config` script.
3. Start the script by typing the following command:

   `./rac_config`

   The following output appears in the command shell:

   ```
   sles11asm2:~ # /usr/local/avamar/bin/rac_config
   Enter the path of Oracle Clusterware Home :
   ```

4. Type the path for the Oracle Clusterware Home, and then press **Enter**.

   The following output appears in the command shell:

   ```
   Using ORACLE_HOME : /u01/grid/product/11gR2/crs/
   Setting PATH set for Oracle commands
   Oracle cluster version 11 R2
   Do you want to configure on a cluster shared filesystem? [y/n] [y]:
   ```

5. Type **`n`**, and then press **Enter**.

   The following output appears in the command shell:

   ```
   Not configuring EMCagent as cluster resource... Automatic failover
   not available...
   Enter the full path of var directory location[]:
   ```

6. Type the full path to the `var` directory, and then press **Enter**.

   The following output appears in the command shell:

   ```
   Using /home/oracle/lvar1 as var directory location
   Make sure the Cluster scan name is same across all nodes.
   Enter the cluster scan name [sles11-asmscan.bgl.avamar.emc]:
   ```

7. Type the cluster scan name (or the virtual name for Oracle versions 11*g* R1 and before), and then press **Enter**.

   The following output appears in the command shell:

   ```
   Using sles11-asmscan.bgl.avamar.emc as hostname
   ```

8. Repeat step 2 through step 7 for all other RAC nodes.

   In step 7, ensure that you type in the same scan name or virtual name for all nodes.

Registering and activating the Avamar client

The following task registers and activates the Avamar client with the Avamar server. Run the `avregister` command on one cluster node.

1. Log in to the first cluster node as root.
2. Change the directory to `/usr/local/avamar/ora_rac/bin` by typing the following command:

   `cd /usr/local/avamar/ora_rac/bin`
3. Start the registration script by typing the `avregister` command:

   `./avregister`

   The following output appears in the command shell:

   ```
   === Client Registration and Activation
   This script will register and activate the client with the
   Administrator server.
   Enter the Administrator server address (DNS text name or numeric IP
   address, DNS name preferred):
   ```
4. Type the DNS hostname or IP address of the Administrator server, and then press **Enter**.

   The following output appears in the command shell:

   ```
   Enter the Avamar server domain [clients]:
   ```
5. Press **Enter** to accept the default domain, or type the appropriate domain name, and then press **Enter**.

   The following output appears in the command shell:

   ```
   avagent.d Info: Client Agent not running.
   avagent Info <5241>: Logging to
   /usr/local/avamar/ora_rac/var/avagent.log
   avagent Info <5174>: - Reading
   /usr/local/avamar/ora_rac/var/avagent.cmd
   avagent.d Info: Client activated successfully.
   avagent Info <5241>: Logging to
   /usr/local/avamar/ora_rac/var/avagent.log
   avagent Info <5174>: - Reading
   /usr/local/avamar/ora_rac/var/avagent.cmd
   avagent Info <5417>: daemonized as process id 25264
   avagent.d Info: Client Agent started.
   avagent.d Info: Stopping Avamar Client Agent (avagent)...
   avagent.d Info: Client Agent stopped.
   avagent Info <5241>: Logging to
   /usr/local/avamar/ora_rac/var/avagent.log
   avagent Info <5174>: - Reading
   /usr/local/avamar/ora_rac/var/avagent.cmd
   avagent Info <5417>: daemonized as process id 25294
   avagent.d Info: Client Agent started.
   Registration Complete.
   ```

The registration and configuration is complete. You can now back up and restore this node's RAC databases. Chapter 4, "Backup," and Chapter 5, "Restore and Recovery," provide more information.

Restoring a backup to the inactive node

Complete the following tasks to deactivate the active node, and then register and activate the inactive node:

- "Deactivating the active node" on page 130
- "Registering and activating the inactive node" on page 131

Deactivating the active node

1. Start Avamar Administrator and log in.

   The **Avamar Administrator** window appears.

2. Click the **Policy** tab.

   The **Policy** window appears.

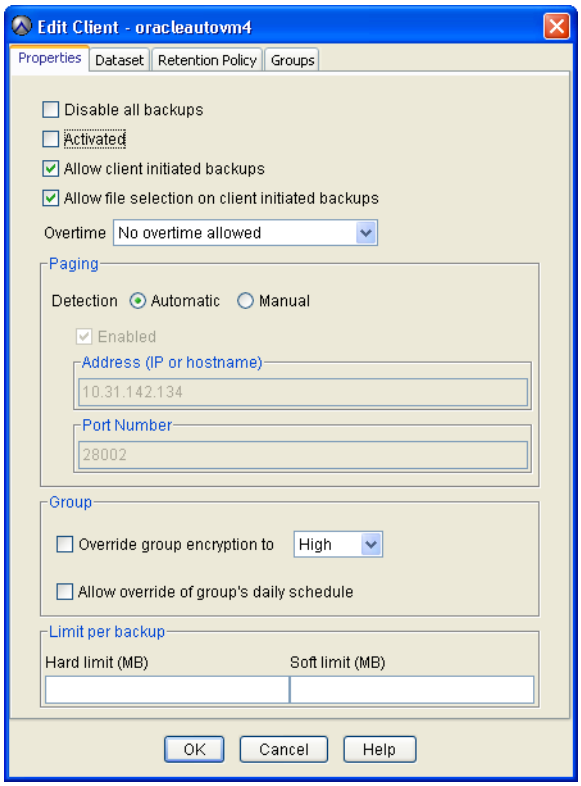
3. Click the **Clients** tab.

4. Click the domain that includes the active node client.

5. Select the active node client, and then click **Edit**.

   The **Edit Client** dialog box appears.

6. Clear the **Activated** option.



7. Click **OK**.

8. Log in to the active node as root.
9. Change the directory to `/usr/local/avamar/bin` by typing the following command:

   `cd /usr/local/avamar/bin`

10. Run the `rac_deconfig` script by typing the following command:

    `./rac_deconfig`

    The following output appears in the command shell:

    ```
    avagent.d Info: Stopping Avamar Client Agent (avagent)... avagent.d
    Info:
    Client Agent stopped.
    avagent.d Info: Client Agent not running.
    [PASSED]
    ```

Registering and activating the inactive node

1. Log in to the inactive node as root.
2. Change the directory to `/usr/local/avamar/ora_rac/bin` by typing the following command:

   `cd /usr/local/avamar/ora_rac/bin`

3. Start the registration script by typing the `avregister` command:

   `./avregister`

   The following output appears in the command shell:

   ```
   === Client Registration and Activation
   This script will register and activate the client with the
   Administrator server.
   Enter the Administrator server address (DNS text name or numeric IP
   address, DNS name preferred):
   ```

4. Type the DNS hostname or IP address of the Administrator server, and then press **Enter**.

   The following output appears in the command shell:

   ```
   Enter the Avamar server domain [clients]:
   ```

5. Type the same domain name that you specified for the first cluster node, and then press **Enter**.

   The following output appears in the command shell:

   ```
   avagent.d Info: Client Agent not running.
   avagent Info <5241>: Logging to
   /usr/local/avamar/ora_rac/var/avagent.log
   avagent Info <5174>: - Reading
   /usr/local/avamar/ora_rac/var/avagent.cmd
   avagent.d Info: Client activated successfully.
   avagent Info <5241>: Logging to
   /usr/local/avamar/ora_rac/var/avagent.log
   avagent Info <5174>: - Reading
   /usr/local/avamar/ora_rac/var/avagent.cmd
   avagent Info <5417>: daemonized as process id 25264
   avagent.d Info: Client Agent started.
   avagent.d Info: Stopping Avamar Client Agent (avagent)...
   avagent.d Info: Client Agent stopped.
   ```

```
avagent Info <5241>: Logging to
/usr/local/avamar/ora_rac/var/avagent.log
avagent Info <5174>: - Reading
/usr/local/avamar/ora_rac/var/avagent.cmd
avagent Info <5417>: daemonized as process id 25294
avagent.d Info: Client Agent started.
Registration Complete.
```

6. Restore the backup. Chapter 5, "Restore and Recovery," provides instructions.

NOTICE

After you run `rac_deconfig` on a node, you must run `rac_config` before you register and activate the same node again.

Removing the Avamar Plug-in for Oracle configuration

The following tasks describe how to remove the Avamar Plug-in for Oracle configuration from each node:

- "Removing the plug-in from the active node" on page 132
- "Removing the plug-in from the inactive node" on page 132

Removing the plug-in from the active node

1. Log in to the active node as root.
2. Change the directory to `/usr/local/avamar/bin` by typing the following command:

   `cd /usr/local/avamar/bin`
3. Run the `rac_deconfig` script by typing the following command:

   `./rac_deconfig`

   The following output appears in the command shell:

   ```
   . avagent.d Info: Stopping Avamar Client Agent (avagent)... avagent.d
   Info:
   Client Agent stopped.
   avagent.d Info: Client Agent not running.
   [PASSED]
   ```
4. Uninstall the Avamar Plug-in for Oracle. Chapter 2, "Installation," provides specific uninstall instructions for each Linux or UNIX operating system.

Removing the plug-in from the inactive node

1. Log in to the inactive node as root.
2. Change the directory to `/usr/local/avamar/bin` by typing the following command:

   `cd /usr/local/avamar/bin`

3. Run the `rac_deconfig` script by typing the following command:

   `./rac_deconfig`

   The following output appears in the command shell:

   ```
   avagent.d Info: Client Agent not running.
   [PASSED]
   ```

4. Uninstall the Avamar Plug-in for Oracle. Chapter 2, "Installation," provides specific instructions for each operating system.

APPENDIX B
Plug-in Options

The following topics provide information about backup and restore plug-in options for the Avamar Plug-in for Oracle:

How to set plug-in options

Plug-in options enable you to control specific actions for on-demand backups, restores, and scheduled backups. The plug-in options that are available depend on the operation type and client plug-in type.

You specify plug-in options for on-demand backup or restore operations, or when you create a dataset for a scheduled backup. You set plug-in options in Avamar Administrator with the graphical user interface (GUI) controls such as text boxes, checkboxes, and radio buttons. In addition to using the GUI controls, you can type an option and its value in the **Enter Attribute** and **Enter Attribute Value** fields.

NOTICE

The Avamar software does not check or validate the information you type in the **Enter Attribute** and **Enter Attribute Value** fields. In addition, the values in the **Enter Attribute** and **Enter Attribute Value** fields override settings that you specify with the GUI controls.

Detailed instructions on how to access and set plug-in options during a backup or restore are available in Chapter 4, "Backup," and Chapter 5, "Restore and Recovery."

Backup options

Table 4 on page 136 lists options that you can use when you perform a backup with the Avamar Plug-in for Oracle or when you configure a dataset for scheduled backups.

Table 4 Backup plug-in options (page 1 of 4)

Setting	Description
Oracle Instance Name	Leave this field blank. The Avamar Plug-in for Oracle determines the Oracle instance name when you browse and select a target to back up.
Username	Specifies the username that is used to authenticate the Oracle database. If left blank, RMAN tries to log in with the same username and password that the Avamar client agent uses and attempts to assume `SYSDBA` privileges. Typically, this field should contain the special account name (backupuser). "Creating the Oracle user account" on page 66 provides more information. Username and password comprise a connection string to Oracle. The connection string must specify a user that has backup privileges for the database.
Password	Specifies the password for the username account.

Table 4 Backup plug-in options (page 2 of 4)

Setting	Description
Number of RMAN Channels	Specifies the number of channels to allocate during a backup or restore. The maximum number is 10. The default is 1. This option impacts the number of streams that Data Domain systems use. The formula that determines the number of streams is: NUMBER OF RMAN CHANNELS x NUMBER OF DATA DOMAIN STREAMS **Notice:** The number of Data Domain streams is set when you add a Data Domain system to the Avamar configuration. **Notice:** Allocating multiple channels for backups and restores may improve performance. Performance improvements for backups and restores, however, depend on the Oracle server configuration. In some instances, allocating too many channels may lock out processes, which can result in a time-out error. This problem does not occur when using RMAN scripts.
Back up database	Backs up the Oracle database. You can use this option by itself or with the **Backup archive logs** option.
Back up archive logs	Backs up Oracle archive logs. You can use this option by itself or with the **Back up database** option. **Notice:** The backup process does not use **Incremental Backup** options if you select only the **Back up archive logs** option.
Delete archive logs after backup	Automatically deletes Oracle archive logs after a successful database backup.
Media Management Library Bitwidth	Specifies Media Management Library (MML) bitwidth. Select an option: • **Automatic** (default) • **32-bit** • **64-bit** If the application bitness and OS bitness are not the same, select the appropriate setting from the **Media Management Library Bitwidth** list. If the application bitness and OS bitness are the same, leave the **Media Management Library Bitwidth** set to the **Automatic**. **Notice:** The **Media Management Library Bitwidth** option is available for Linux and UNIX Oracle RMAN plug-ins. This option does not apply to Windows platforms.
Exit a multiple target backup when any one backup fails	If selected, prevents a multiple target backup from continuing after one of the backups fails.
Enable debugging messages (advanced option)	Writes maximum information to log files. Use with caution.
NLS_DATE_FORMAT (advanced option)	Specifies a valid timestamp format for the target machine. For example: *MM/DD/YYYY*.

Table 4 Backup plug-in options (page 3 of 4)

Setting	Description
Enhanced Data Deduplication (advanced option)	Enables or disables data compression. During backups, enhanced data deduplication can reduce the amount of client data that is sent to the server, but might require additional client CPU resources. Select an option: • Select **Default** to use the global data compression setting already set on the server. This is the default setting. • Select **Disabled** to back up the datafiles without using compression. • Select **Enabled** to use enhanced data deduplication for the backup.
Incremental Backup	
Full backup	If selected, the Avamar Plug-in for Oracle backs up all datafiles, redo logs, and archive logs. Full backups do not use the `Block Change Tracking` option. This option is the default.
Level 0 backup	If selected, the Avamar Plug-in for Oracle performs a level 0 backup. Level 0 backups back up all datafiles, redo logs, and archive logs. You must perform a level 0 backup before you perform a level 1 backup.
Level 1 differential backup	Backs up all database blocks that have changed since the most recent level 1 or level 0 backup. You must perform a level 0 backup before you perform a level 1 backup. Selecting the Level 1 backup option before creating a level 0 backup results in a level 0 backup.
Level 1 cumulative backup	Backs up all database blocks that have changed since the most recent level 0 backup.
Recovery Catalog	
Use recovery catalog	Select this option to use the values in the **Recovery Catalog Server Name**, **Recovery Catalog Username**, and **Recovery Catalog Password** fields to form a recovery catalog server connection string for RMAN. Using a recovery catalog server enables you to use specialized features of RMAN. A thorough discussion of these features is beyond the scope of this guide. The Oracle documentation provides more information.
Recovery Catalog Server Name	Specifies the recovery catalog server name.
Recovery Catalog Username	Specifies the recovery catalog username.
Recovery Catalog Password	Specifies the recovery catalog password.
Prepocessing Script	
Run user-defined script at beginning of backup (advanced option)	Specifies the name of a script that runs at the beginning of the backup. The preprocessing script must be in the `/avamar/etc/scripts` directory on the client.
Exit backup if script fails (advanced option)	Stops processing the script when the script returns a non-zero status code.

Table 4 Backup plug-in options (page 4 of 4)

Setting	Description
Postprocessing Script	
Run user-defined script at end of backup (advanced option)	Specifies the name of a script that runs at the end the backup. The postprocessing script must be in the `/avamar/etc/scripts` directory on the client.
Exit process with script failure exitcode (advanced option)	Exits the script with an exitcode from the script rather than with the standard `avoracle` exitcode.
RMAN Backup Tuning Options	
Filesperset	Specifies the number of files that RMAN can include in each backup set. The default is 1.
Store backup on Data Domain system	Select the checkbox, and then choose a Data Domain system from the list. If selected, the Avamar Plug-in for Oracle backs up the data to the Data Domain system rather than to the Avamar server.
Show Advanced Options	Displays advanced options.

Specifying the channel_maxopenfiles option as normal text

The `MAXOPENFILES` parameter defines the number of files that RMAN can read and write simultaneously in each backup piece per channel. You can specify RMAN parameters for backups in Avamar Administrator by using `avoracle` flags in the `avoracle.cmd` file.

To modify the `MAXOPENFILES` value, specify the `--channel_maxopenfiles` flag in the `avoracle.cmd` file:

`'--channel_maxopenfiles=`*`value`*`.`

To specify the `MAXOPENFILES` value in the **Backup Command Line Options** dialog box:

1. From the **Backup Command Line Options** dialog box, click the **More** button.

   The dialog box expands to display the **Enter Attribute** and **Enter Attribute Value** fields.

2. Type the **`[avoracle]channel_maxopenfiles`** option in the **Enter Attribute** field:
3. Type the number of files in the **Enter Attribute Value** field.
4. Click the **Add to List** button (**+**).

   The option and value appear in the box below the **Add to List** (+) and **Remove From List** (-) buttons.

Tune the `MAXOPENFILES` value appropriately for the databases and hardware configuration.

Restore options

Table 5 on page 140 lists options that you can use when you perform a restore with the Avamar Plug-in for Oracle.

Table 5 Restore plug-in options (page 1 of 2)

Setting	Description
Oracle Instance Name	Leave this field blank. The Avamar Plug-in for Oracle determines the Oracle instance name when you browse and select a target to restore.
Username	Specifies the username that is used to authenticate the Oracle database. If left blank, RMAN tries to log in with the same username and password that the Avamar client agent is running under, and attempts to assume `SYSDBA` privileges. Typically, this field should contain the special account name (backupuser), "Creating the Oracle user account" on page 66 provides more information. Username and password comprise a connection string to Oracle. The connection string must specify a user that has backup privileges for the database.
Password	Specifies the password for the username account.
Media Management Library Bitwidth	Specifies Media Management Library (MML) bitwidth. Choices are: • **Automatic** (default) • **32-bit** • **64-bit** If the application bitness and OS bitness are not the same, select the appropriate setting from the **Media Management Library Bitwidth** list. If the application bitness and OS bitness are the same, leave the **Media Management Library Bitwidth** set to the **Automatic**. **Notice:** The **Media Management Library Bitwidth** option is available for Linux and UNIX Oracle RMAN plug-ins. This option does not apply to Windows platforms.
Number of RMAN Channels	Specifies the number of channels to allocate during a backup or restore. The maximum number is 10. The default is 1. This option impacts the number of streams that Data Domain systems use. The formula that determines the number of streams is: NUMBER OF RMAN CHANNELS x NUMBER OF DATA DOMAIN STREAMS **Notice:** The number of Data Domain streams is set when you add a Data Domain system to the Avamar configuration. **Notice:** Allocating more channels may not always improve performance. Performance improvement depends on the Oracle server configuration. In some instances, allocating too many channels may lock out processes, which can result in a time-out error. This problem does not occur when using RMAN scripts.

Table 5 Restore plug-in options (page 2 of 2)

Setting	Description
Exit a multiple target restore when any one restore fails	Prevents a multiple target restore from continuing after one of the restores fails.
Enable debugging messages (advanced option)	Writes maximum information to log files. Use with caution.
NLS_DATE_FORMAT (advanced option)	Specifies a valid timestamp format for the target machine. For example: *MM*/*DD*/*YYYY*.
Recovery Type	
Point-in-Time (PIT)	Enables a point-in-time recovery. Do not specify a point-in-time option if you selected multiple databases for the restore. Before using a point-in-time recovery option, ensure that relevant backups are available on the Avamar server. The recovery operation fails if a backup has expired or has been deleted from the Avamar server.
Flashback Database (FRA)	Enables a flashback restore.
Corrupt blocks (advanced option)	Recovers corrupt blocks only, and not the entire database. To use the Corrupt blocks only option, you must set the `DB_BLOCK_CHECKSUM` initialization parameter to `TYPICAL` for the Oracle database. The database must be in a mounted or open state.
Validate database (advanced option)	Validates the database only if the option is selected during a corrupt blocks recovery
Point-in-Time/Flashback Recovery Options	
Recovery mode	Lists recovery modes for the **Point-in-Time (PIT)** and **Flashback Database (FRA)** recovery types. Select an option from the **Recovery mode** list. "Recovery modes and values" on page 142 provides more information.
Recovery value	Specifies the SCN, log sequence number, or timestamp, depending on which recovery mode is selected.
Open the database with resetlogs after recovery	Select this option to open the database after the recovery. Clear this option to enable a roll-forward operation to recover the database with archive log transactions.
Show Advanced Options	Displays advanced options.

Recovery modes and values

The **Point-in-Time (PIT)** and **Flashback Database (FRA)** recovery types share recovery mode options. Table 6 on page 142 describes the recovery mode options and shows the relation each option has to each recovery type.

Table 6 Recovery mode options

Recovery mode options	Recovery value	Point-in-Time (PIT)	Flashback Database (FRA)
Backup Time (PIT only)	Recovers the database to the most recent SCN. The Avamar Plug-in for Oracle automatically determines the SCN from the control file.	✗	
SCN	Recovers the database to the specified SCN: • To recover an archive log backup, type the next SCN for the archive log. • To recover only from a database backup, type the SCN for the database. Type the SCN in the **Recovery value** field.	✗	✗
Log Sequence	Recovers the database to the specified log sequence number. Specify the log sequence number in the **Recovery value** field.	✗	✗
Time Stamp	Recovers the database to the specified timestamp. The timestamp format must conform to the localization settings on the target machine and locale configuration setting for the Oracle server.	✗	✗
Restore Point	Recovers the database to the SCN associated with the specified restore point. The restore point can be an ordinary restore point or a guaranteed restore point.	✗	✗
Before SCN (FRA only)	Recovers the database to its state just before the specified SCN. Any changes at an SCN lower than that specified are applied. If there is a change associated with the specified SCN, it is not applied.		✗
Before Log Sequence (FRA only)	Specifies a redo log sequence number and thread as an upper limit. RMAN applies changes up to (but not including) the last change in the log with the specified sequence and thread number.		✗
Before Resetlogs (FRA only)	Recovers the database to its state including all changes up to the SCN of the most recent OPEN RESETLOGS.		✗
Before Time Stamp (FRA only)	Recovers the database to its state including all changes up to but not including changes at the specified time.		✗

Timestamp order of precedence rules

The timestamp order of precedence rules from highest to lowest are:

- Highest—A timestamp format specified by the **NLS_DATE_FORMAT** field (advanced option).
- Lower—A timestamp format specified by the `NLS_DATE_FORMAT` variable in environment settings.
- Lowest—The built-in default timestamp format uses american_america.us7asci.

The format is *MM DD YYYY* HH24:*MI*:*SS*:

- *MM* is a two-digit month.
- *DD* is a two-digit day of the month.
- *YYYY* is a four-digit year.
- HH24 is the hour using a 24-hour format.
- *MI* is minutes.
- *SS* is seconds.

Preprocessing and postprocessing scripts and attributes

You specify preprocessing or postprocessing scripts and attributes in the **Backup Command Line Options** dialog box or the **Restore Command Line Options** dialog box. To specify preprocessing or postprocessing scripts, you must select **Show Advanced Options** in either of the two dialog boxes.

To view the preprocessing and postprocessing advanced options:

1. From the **Backup Command Line Options** or **Restore Command Line Options** dialog box, select **Show Advanced Options**.

   The dialog box shows advanced options in red text.

2. Click **More**.

   The dialog box shows the **Enter Attribute** and **Enter Attribute Value** fields.

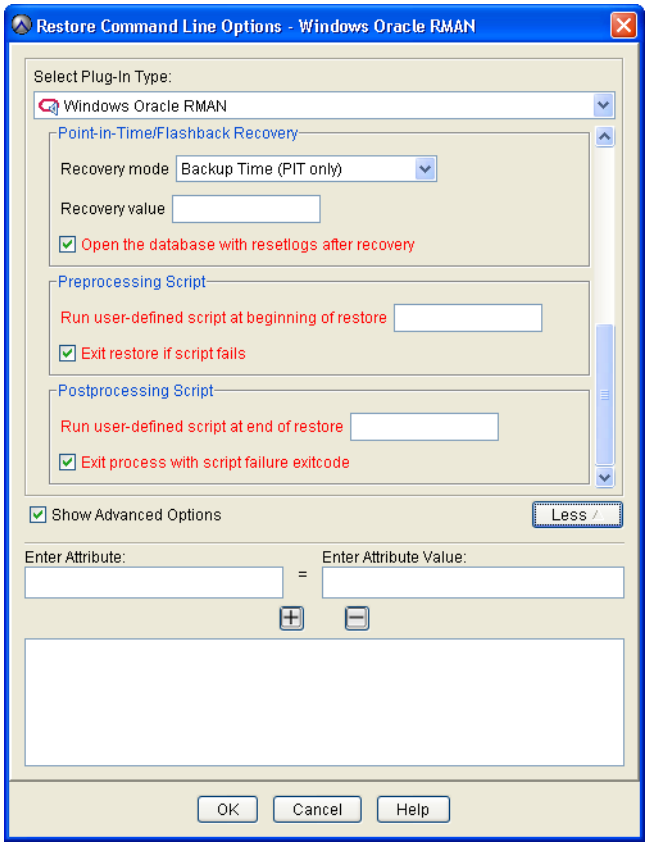


Table 7 on page 144 describes the attributes that you specify in the **Enter Attribute** and **Enter Attributes Value** fields.

Table 7 Preprocessing and postprocessing attributes

Attribute	Description
`run_at_start=`*`script_name`*	Specifies a script to run before a backup or restore operation. The user interface includes the Run user-defined script at beginning of backup and Run user-defined script at beginning of restore fields for this attribute.
`run_at_start_clause=`*`flags`*	Specifies flags to use with the `run_at_start` script.
`run_at_end=`*`script_name`*	Specifies a script to run after a backup or restore operation. The user interface includes the **Run user-defined script at end of backup** and Run user-defined script at end of restore fields for this attribute.
`run_at_end_clause=`*`flags`*	Specifies flags to use with the `run_at_end` script.
`run_before_database=`*`script_name`*	Specifies a script to run before a database backup or restore operation. When you specify multiple targets, the script runs for each database operation.
`run_before_database_clause=`*`flags`*	Specifies flags to use with the `run_before_database` script.
`run_after_database=`*`script_name`*	Specifies a script to run after a database backup or restore operation. When you specify multiple targets, the script runs for each database operation.
`run_after_database_clause=`*`flags`*	Specifies flags to use with the `run_after_database` script.

Table 8 on page 144 describes flags that you specify for `run_at_start_clause`, `run_at_end_clause`, `run_before_database_clause`, and `run_after_database_clause` attributes.

Table 8 Attribute flags (page 1 of 2)

Flag	Description
`desc`	Specifies a description for the script. Usage: `desc`=”text string” Default value: Type of script being executed.
`env`	Specifies an environment variable to use. Usage: `env=variable_name=value` Default value: None
`exit_on_error`	Set to “true” to exit the process if the preprocessing or postprocessing script fails. Usage: `exit_on_error=true` Default value: False

Table 8 Attribute flags (page 2 of 2)

Flag	Description
`skip_on_error`	Set to “true” to skip the next backup or restore component. The `skip_on_error` flag clause is valid only with the `run_before_database` attribute. Usage: `skip_on_error=true` Default value: False
`use_cscript` (Windows only)	Set to “true” to run the script with Microsoft `cscript.exe`. Usage: `use_cscript=true` Default value: False
`use_cscript_raw` (Windows only)	Set to “true” to run the script with Microsoft `cscript.exe/nologo`. Usage: `use_cscript_raw=true` Default value: False
`timeout_seconds`	Specifies the number of seconds a script has to complete before the plug-in considers the script as failed. The plug-in then terminates the script. Usage: `timeout_seconds=`*num* Default value: 1 hour (60 * 60 seconds)
`create_stdout_pipe`	Creates a `stdout` pipe for the script and sends output to the `avoracle` log file. Usage: `create_stdout_pipe=true` Default value: True
`create_stderr_pipe`	Creates a `stderr` pipe for the script and sends output to the `avoracle` log file. Usage: `create_stderr_pipe=true` Default value: True

`stringlist_args`	Set to “false” (default value) to split the specified argument’s string into separate arguments.
	Set to “true” to use each argument’s string as a separate argument to the script.
	Usage: `stringlist_args=true`
	Default value: False
	
	Example of `stringlist_args=false`:
	`[avoracle]run_at_start=script.bat First Second Third`
	
	The plug-in passes `First`, `Second`, and `Third` as three command-line parameters to `script.bat`.
	
	Example of `stringlist_args=true`:
	`[avoracle]run_at_start=script.bat First Second Third`
	
	The plug-in considers the script as a single file name. The arguments are not split. To pass arguments the correct way, use commas:
	`[avoracle]run_at_start=script.bat,First,Second,Third`

Preprocessing and postprocessing usage examples

The following examples show how to specify preprocessing and postprocessing attributes in Avamar Administrator.

Running a preprocessing script before the backup

The **Run user-defined script at beginning of backup** field specifies a script that runs before the backup. Specifying a script in this field is equivalent to specifying a script with the `run_at_start` attribute.

To pass flags to a prepocessing script requires you to type attributes and values in the **Enter Attribute** and **Enter Attribute Value** fields. For example, the following procedure specifies attributes and flags that provide a description for the prepocessing script and a time-out of 60 seconds:

1. From the **Backup Command Line Options** dialog box, select **Show Advanced Options**.
2. Type the name of the script in the **Run user-defined script at beginning of backup** field. This example uses `Avamar.bat` for the script:

   `Avamar.bat`

3. Type the following text after the name of the script:

   `First Second`

   `First` and `Second` correspond to the attributes and flags you pass to the script.

   The field now contains the following text:

   ```
   Avamar.bat First Second
   ```

   NOTICE

   To pass a third attribute and flag, you append **`Third`** to the text string.

4. Click **More**.

   The **Enter Attribute** and **Enter Attribute Value** fields appear.

5. Add attributes and flags:

   a. Type the **run_at_start_clause** attribute in the **Enter Attribute** field:

      `[avoracle]run_at_start_clause`

      You precede all attributes with **`[avoracle]`**.

   b. Type the **desc** flag and value in the **Enter Attribute Value** field:

      `desc="Avamar Pre Script"`

      Enclose the text string in quotation marks.

   c. Click the **Add to List** button (**+**).

   d. Type the **run_at_start_clause** attribute in the **Enter Attribute** field:

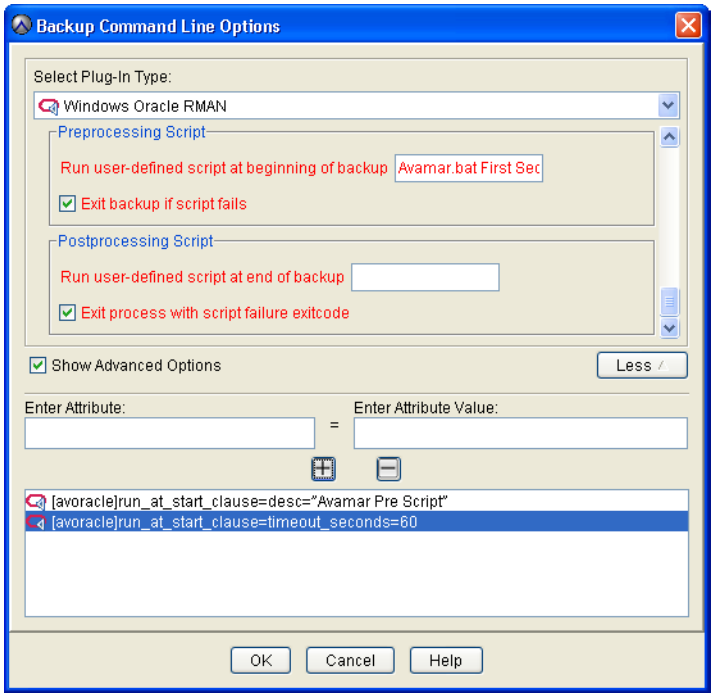
      `[avoracle]run_at_start_clause`

e. Type the **timeout_seconds** flag and value in the **Enter Attribute Value** field:

```
timeout_seconds=60
```

f. Click the **Add to List** button (**+**).

The `run_at_start_clause` attributes and flags appear in the box below the **Add to List** (**+**) and **Remove From List** (**-**) buttons.



6. Clear the **Exit backup if script fails** option to enable the backup to proceed if the script fails.

Running a postprocessing script after the backup

The **Run user-defined script at end of backup** field specifies a script that runs after the backup. Specifying a script in this field is equivalent to specifying a script with the `run_at_end` attribute. The instructions for running a `run_at_end` script are the same as "Running a preprocessing script before the backup" on page 146.

Running a postprocessing script after each database backup

To run a postprocessing script after each backup requires you to type attributes and values in the **Enter Attribute** and **Enter Attribute Value** fields. For this type of operation you leave the **Run user-defined script at end of backup** field blank.

The following procedure specifies attributes and flags that run the `dbpostscript.bat` script after a database backup, set the time-out to 200 seconds, specify a description, and prevent the script's output from being written to the log file.

1. From the **Backup Command Line Options** dialog box, select **Show Advanced Options**.
2. Click **More**.

   The **Enter Attribute** and **Enter Attribute Value** fields appear.

3. Add attributes and flags:
   a. Type the **run_after_database** attribute in the **Enter Attribute** field:

      [avoracle]run_after_database

   b. Type the script name, **first**, **second**, and **third** in the **Enter Attributes Value** field:

      dbpostscript.bat first second third

   c. Click the **Add to List** button (**+**).
   d. Type the **run_after_database_clause** attribute in the **Enter Attribute** field:

      [avoracle]run_after_database_clause

   e. Type the **desc** flag and value in the **Enter Attribute Value** field:

      desc="Avamar post script after database"

   f. Click the **Add to List** button (**+**).
   g. Type the **run_after_database_clause** attribute in the **Enter Attribute** field:

      [avoracle]run_after_database_clause

   h. Type the **timeout_seconds** flag and value in the **Enter Attribute Value** field:

      timeout_seconds=200

   i. Click the **Add to List** button (**+**).
   j. Type the **run_after_database_clause** attribute in the **Enter Attribute** field:

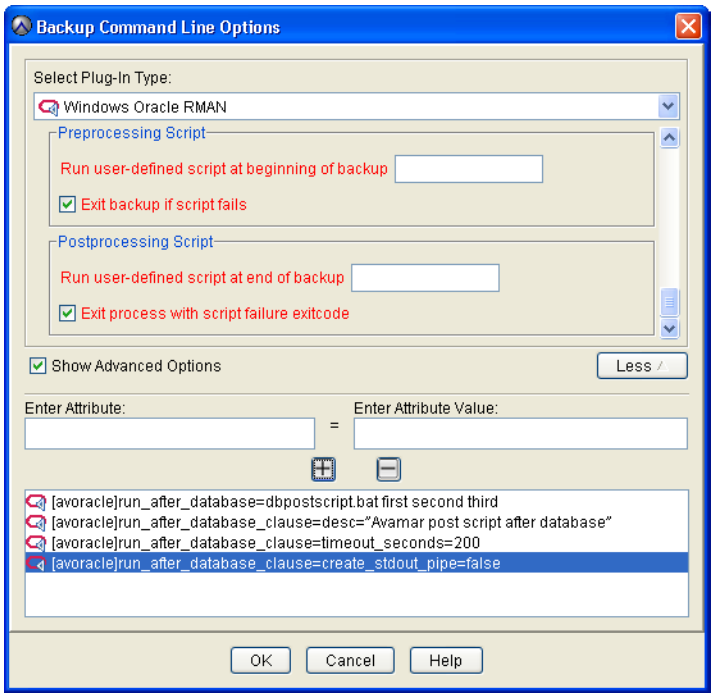
      [avoracle]run_after_database_clause

   k. Type the **create_stdout_pipe** flag and value in the **Enter Attribute Value** field:

      create_stdout_pipe=false

   l. Click the **Add to List** button (**+**).

The attributes and flags appear in the box below the **Add to List** (+) and **Remove From List** (-) buttons.



NOTICE

You do not need to specify the `exit_on_error` flag, because it is set to false by default.

APPENDIX C
Troubleshooting

The following topics describe how to resolve common problems and includes a configuration checklist:

NOTICE

In addition to the material in this chapter, refer to Oracle documentation for troubleshooting information specific to Oracle databases and RMAN. Oracle documentation is available from the Oracle website.

Common problems and solutions

The following topics include only the most common problems and solutions for the Avamar Plug-in for Oracle:

avoracle Error ‹7936›: No valid targets found

A database restore fails with the following error:

```
avoracle Error <7936>: No valid targets found. Aborting the operation
```

To work around this problem, increase the `snapupbrowsetimeoutsecs` option in Avamar Administrator:

1. From the **Restore Command Line Options** dialog box, click the **More** button.

   The dialog box expands to display the **Enter Attribute** and **Enter Attribute Value** fields.

2. Type the **`[avoracle]snapupbrowsetimeoutsecs`** option in the **Enter Attribute** field.

3. Type the number of seconds in the **Enter Attribute Value** field.

4. Click the **Add to List** button (**+**).

   The option and value appear in the box below the **Add to List** (**+**) and **Remove From List** (**-**) buttons.

5. Restart the restore.

Backups fail when backup copies is set to more than 1

In RMAN, you can use the `BACKUP ... COPIES` command to make identical copies of backups. This ability to make copies is also known as backup duplexing. If you configure backup copies to be more than 1 in RMAN, backups you perform with the Avamar Plug-in for Oracle fail.

For example, the following RMAN command sets backup copies to 3:

```
CONFIGURE ARCHIVELOG BACKUP COPIES FOR DEVICE TYPE SBT_TAPE TO 3;
```

Backups that you run from Avamar Administrator or RMAN scripts that you run from the command line fail after setting backup copies to 3:

- For backups from Avamar Administrator, an error message similar to the following error appears in the `sbtio.log`:

  ```
  error 7501: Could not connect to avoracle
  ```

- For backups from the RMAN command line, an error message similar to the following error appears in the `avtar` log file:

  ```
  avtar Error <5064>: Cannot open file cache_filename
  ```

The Avamar Plug-in for Oracle does not support the RMAN backup copies feature.

To prevent this backup failure, do not configure backup copies to be more than 1. The Oracle RMAN documentation provides more information about the backup copies feature.

NOTICE

To further protect the Oracle data beyond performing regular backups, consider using Avamar replication. The *EMC Avamar Administration Guide* provides more information about the Avamar replication feature.

Backups unavailable after registering secondary Oracle RAC node

Backups are unavailable after the following occurs:

- The Avamar `var` directory is accidentally deleted.
- You registered the secondary RAC node with a virtual hostname other than the original virtual hostname.

This problem applies only to Oracle 11*g* R1.

To prevent this problem, register the secondary node by using the original virtual hostname.

Cannot open file f_cache.dat error

The Avamar `activity.log` file contains `avtar` errors similar to the following:

```
avtar Info <5586>: Loading cache files from /usr/local/avamar/var
avtar Info <8650>: Opening cache file
   /usr/local/avamar/var/f_cache2.dat
avtar Error <5064>: Cannot open file
   "/usr/local/avamar/var/f_cache2.dat"
avtar Error <0000>: Invalid cache file header for
   /usr/local/avamar/var/f_cache2.dat, clearing the cache
avtar Info <5065>: Creating new paging cache file
   /usr/local/avamar/var/f_cache2.dat
avtar Error <5803>: Error writing 32-byte header to cache file
   /usr/local/avamar/var/f_cache2.dat.
```

These errors occur if the specified `/var` directory does not have sufficient permissions for the Oracle user. The Oracle user requires read, write, and execute permissions for the `/var` directory.

Specify the `/var/avamar/clientlogs` directory for backups that you perform from the RMAN CLI.

Backups with Avamar Administrator automatically access the cache files from the `/var/clientlogs` directory.

Cannot Sync error

If an RMAN session stops responding and a “Cannot Sync” message appears, try restarting RMAN by using `svrmgr`.

Cluster Configuration Tool fails to start

Starting the Cluster Configuration Tool fails with an error if the Windows system does not have Microsoft .NET Framework 4 installed.

On Windows 2008, the Cluster Configuration Tool returns the following error message:

```
To run this application, you must install one of the following versions
of the .NET Framework: v4.0.30319

Contact your application publisher for instructions about obtaining
the appropriate version of the .NET Framework
```

On Windows 2003, the Cluster Configuration Tool returns the following error message:

```
The application failed to initialize properly (0xc0000135). Click on
OK to terminate the application.
```

The Cluster Configuration Tool requires Microsoft .NET Framework 4. You can download and install the .NET Framework 4 from the Microsoft Download Center.

Hot backup fails with Oracle not available error

The Avamar Plug-in for Oracle uses Oracle RMAN for a hot backup. Oracle RMAN requires the Oracle database to be running for a hot backup. If the database is not running, a hot backup will fail. Oracle RMAN then returns the following error:

```
Oracle not available
```

To start the Oracle database before a hot backup, use SQL*Plus:

1. Connect to the Oracle database by typing the following command:

   sqlplus "/as sysdba"

   Screen output similar to the following output appears.

   ```
   SQL*Plus: Release 11.1.0.7.0 - Production on Thu Mar 19 14:59:53 2009
   Copyright (c) 1982, 2009, Oracle. All rights reserved.

   Connected to an idle instance.
   ```

2. Start the Oracle database by typing the following command:

   ```
   SQL> startup;
   ```

   The following screen output appears.

   ```
   ORACLE instance started.
   Total System Global Area1     023410176 bytes
   Fixed Size                    1223224 bytes
   Variable Size                 234882504 bytes
   Database Buffers              784334848 bytes
   Redo Buffers                  2969600 bytes
   Database mounte
   ```

Hot backup fails with Not in archive log mode error

The Avamar Plug-in for Oracle uses Oracle RMAN for hot backups. Oracle RMAN requires the database to be in ARCHIVELOG mode to run a hot backup. If the database is not running in ARCHIVELOG mode, a hot backup will fail. Oracle RMAN then returns the following error"

```
Not in archive log mode
```

To determine if the Oracle database is in ARCHIVELOG mode, use SQL*Plus:

1. Connect to the Oracle database by typing the following command:

   sqlplus "/as sysdba"

   Screen output similar to the following output appears.

   ```
   SQL*Plus: Release 11.1.0.7.0 - Production on Thu Mar 19 14:59:53 2009
   Copyright (c) 1982, 2009, Oracle. All rights reserved.
   ```

2. Determine if the Oracle database is in ARCHIVELOG mode by typing the following command:

   select log_mode from v$database;

   Screen output similar to the following output appears.

   ```
   LOG_MODE
   ----------
   ARCHIVELOG
   ```

"Backup preparation" on page 67 provides instructions for setting a database in NOARCHIVELOG mode.

ORA-19870: error while restoring backup piece

The restore of a database that contains datafiles that uses the UTF-8 character set fails with the following error messages:

```
channel c0: ORA-19870: error while restoring backup piece

ORCL_0vnahoeh_1_1ORA-19504: failed to create file
"/home/oracle/app/oracle/oradata/orcl/home/oracle/app/oracle/product/1
1.2.0/dbhome_1/home/oracle/app/oracle/product/11.2.0/dbhome_1/home/ora
cle/app/oracle/product/11.2.0/dbhome_1.dbf"

ORA-27040: file create error, unable to create file

Solaris-AMD64 Error: 2: No such file or directory failover to previous
backup released channel: c0

RMAN-00571: ===========================================
RMAN-00569: ===== ERROR MESSAGE STACK FOLLOWS =====
RMAN-00571: ===========================================
RMAN-03002: failure of restore command at 05/09/2012 10:01:35
RMAN-06026: some targets not found - aborting restore
RMAN-06023: no backup or copy of datafile 3 found to restore
RMAN-06023: no backup or copy of datafile 2 found to restore
RMAN-06023: no backup or copy of datafile 1 found to restore
```

Oracle requires you to set the `NLS_LANG` environment variable to the correct language, territory, and character set when the following configuration settings are true:

- The operating system is in a locale other than English.
- The database contains datafiles that use the UTF-8 character set.

Resolving the problem in Avamar Administrator

To resolve this problem in Avamar Administrator, add the `[avoracle]lang_format` attribute and value to the **Enter Attribute** and **Enter Attribute Value** fields. The `[avoracle]lang_format` attribute and values set the `NLS_LANG` environment variable for the restore.

1. From the **Backup Command Line Options** dialog box, select **Show Advanced Options**.
2. Click **More**.

   The **Enter Attribute** and **Enter Attribute Value** fields appear.
3. Type **`[avoracle]lang_format`** in the **Enter Attribute** field:

   Precede all attributes you type in the **Enter Attribute** field with **`[avoracle]`**.
4. Type the appropriate value in the **Enter Attributes Value** field:

   `language_territory.charset`

   where:

   - *language* specifies the language. For example Japanese.
   - *territory* specifies the country. For example, Japan.
   - *charset* specifies the character set. For example, JA16SJIS.

   The following example is the syntax for Japanese:

   `Japanese_Japan.JA16SJIS`

5. Click the **Add to List** button (**+**).

   The `[avoracle]lang_format` attribute and value appear in the box below the **Add to List** (**+**) and **Remove From List** (**-**) buttons.

Resolving the problem from the RMAN command line interface

To resolve this problem from the RMAN command line interface, set the `NLS_LANG` parameter to the correct setting:

- For French, set `NLS_LANG` to FRENCH_FRANCE.WE8ISO8859P1.
- For Japanese, set `NLS_LANG` to JAPANESE_JAPAN.JA16SJIS.
- For other locales, use the Oracle documentation to obtain `NLS_LANG` values.

ORA-25153: Temporary Tablespace is Empty

If you encounter a "ORA-25153 Temporary Tablespace is Empty" message, you must manually re-create the temporary tablespace. The *Oracle Database Backup and Recovery Advanced User's Guide* provides more information about creating tablespaces.

ORA-27211: Failed to load Media Management Library

While backing up or restoring from either Avamar Administrator or the command line, RMAN fails to load the Media Management Library. In both cases, RMAN writes output similar to the following in the log file:

```
RMAN-00571: ===========================================
RMAN-00569: ========== ERROR MESSAGE STACK FOLLOWS ===========
RMAN-00571: ===========================================
RMAN-03009: failure of allocate command on c1 channel at 2012-9-4
20:27:34
ORA-19554: error allocating device, device type: SBT_TAPE, device
name: ORA-27211: Failed to load Media Management Library
Additional information: 25
Recovery Manager complete.
```

Reasons for this failure when using Avamar Administrator

- The bitwidth is inconsistent for the operating system, Oracle database, or libobk. For example, if you use a 64-bit operating system, install the 64-bit version of the Avamar client software and the 64-bit version of the RMAN package.
- The libobk library file is missing.
- On UNIX clients, the `libobk_avamar.so` file is missing from the *`install-dir`*`/lib` directory.
- On Windows clients, the `libobk_avamar.dll` file is missing from the *`install-dir`*`/lib` folder.
- *install-dir* is the base installation directory for the platform (for example, `/usr/local/avamar` on Linux, `/opt/AVMRclnt` on Solaris, and `C:\Program Files\avs\bin` on Windows).

- On UNIX clients, the libobk bitwidth does not match the bitwidth of the Oracle database.
- The `libobk` and the `libstdc++` library files do not have read and execute permissions.

The permissions for `libobk` must include read and execute. To view the permissions for `libobk`, use the method or command for the operating system. For example, the following output from a Solaris platform shows permissions for the `libobk` files:

```
ls -lrd /opt/AVMRclnt/lib/
drwxr-xr-x   2   root      root      512    Step 15 10:56
   /opt/AVMRclnt/lib/
ls -art libobk*
-rwxr-xr-x   1   root      root      5556   Aug 8 05:31
   libobk_avamar.so
-rwxr-xr-x   1   root      root      66280  Aug 8 05:31
   libobk_avamar64.so
```

Reasons for this failure when using the command line

- The bitwidth of `libobk` does not match the operating system (Solaris, AIX, or HP-UX) and Oracle database.
- The correct permissions for `libobk_avamar` are not set.
- The environment variable for the library path is not set. "Specifying the library path settings" on page 108 provides instructions about setting the environment variable.
- The library directory does not contain the `libstdc++` file.

  Check for the `libstdc++` file on the system. Table 9 on page 158 lists library directories for Linux and UNIX operating systems:

Table 9 Library directories for Linux and UNIX operating systems

Operating system	Directory
IBM AIX	`/usr/AVMRclnt`
HP-UX, Solaris	`/opt/AVMRclient`
Linux	`/usr/local/avamar`

The bitwidth of `libobk` must match the operating system and the Oracle database. To verify the bitwidth, use the method or command for the specific operating system. For example, on a Solaris platform type the `file` command to verify the bitwidth:

`file libobk*`

The following output appears in the command shell:

```
libobk_avamar64.so ELF 64-bit MSB dynamic lib SPARCV9 Version 1,
   dynamically linked, not stripped
libobk_avamar.so: ELF 32-bit MSB dynamic lib SPARC Version 1,
   dynamically linked, not stripped
```

Oracle RAC database failover

If the registered Oracle RAC node fails over to another node, you must manually start the `avagent` program on the other cluster nodes.

1. Log in to the failover node as root.
2. Change the directory by typing the following command:

   `cd /usr/local/avamar/ora_rac/etc`

3. Start `avagent` by typing the following command:

   `./avagent.d restart`

   The following information appears in the command shell.

```
avagent Info <5241>: Logging to
/usr/local/avamar/ora_rac/var/avagent.log
avagent Info <5174>: - Reading
/usr/local/avamar/ora_rac/var/avagent.cmd
avagent Info <5417>: daemonized as process id 15603
avagent.d Info: Client Agent started.
[OK]
```

RMAN backup script fails with media management errors

An RMAN script that you create from the **Schedule Backup** page in the Oracle Enterprise Manager does not include the RMAN **send** command. For example, the following script was generated by using the Oracle Enterprise Manager user interface:

```
run {
allocate channel oem_sbt_backup1 type 'SBT_TAPE' format '%U' parms
   '"SBT_LIBRARY=/usr/local/avamar/lib/libobk_avamar64.so"';
backup incremental level 1 cumulative database;
backup archivelog all not backed up;
}
allocate channel for maintenance device type 'SBT_TAPE' parms
   '"SBT_LIBRARY=/usr/local/avamar/lib/libobk_avamar64.so"';
delete noprompt obsolete recovery window of 31 days device type
   'SBT_TAPE';
```

The script is missing the RMAN **send** command.

To work around this problem, use the **Edit RMAN Script** button from the Oracle Enterprise Manager to add the appropriate RMAN **send** command. Chapter 6, "Backup and Restore with Oracle RMAN," provides more information about creating RMAN scripts.

RMAN backup script fails with ORA-19511

An RMAN script that backs up Oracle fails with ORA-19511. RMAN writes output similar to the following to the log file:

```
RMAN-00571: ===========================================================
RMAN-00569: =========== ERROR MESSAGE STACK FOLLOWS ===========
RMAN-00571: ===========================================================
RMAN-03009: failure of backup command on ORA_SBT_TAPE_1 channel at
   2012-9-4 16:02:37
ORA-19506: failed to create sequential file, name="06jtv7ks_1_1",
   parms=""
ORA-27028: skgfqcre: sbtbackup returned error
ORA-19511: Error received from media manager layer, error text:
 sbtbackup: avtar exited, trying to create 06jtv7ks_1_1
```

Reasons for this failure

- The `/var/avamar` directory does not have correct permissions to start a backup.

  Use the `/var/avamar/clientlogs` directory instead of the `/var/avamar` directory.

- Either RMAN or libobk cannot locate `avtar`.

  The `allocate channel` command in the RMAN backup or restore script must include *`Avamar-home`*`/bin` as the `PATH` variable or include `bindir="/usr/local/avamar/bin"`.

- An Oracle instance is running as a nonstandard user or group.

  To determine if Oracle is installed as a nonstandard user or group, check the file permissions for the Oracle home directory. For example, use the following commands:

  ```
  cd /home/oracle/oracle/product/10.2.0/db_1/oradata
  ls -l
  total 28
  drwxr-x--- 2 oracle oinstall 4096 Aug 26 2009 cataloged
  drwxr-x--- 2 oracle oinstall 4096 Mar 9 18:05 db2
  drwxr-xr-x 2 oracle oinstall 4096 Mar 30 17:21 orcl
  drwxr-xr-x 2 oracle oinstall 4096 Mar 30 16:26 orcl.w
  drwxr-xr-x 2 oracle oinstall 4096 Mar 10 15:50 plargedb
  drwxr-xr-x 2 oracle oinstall 4096 Feb 6 16:20 plargedb.w
  -rw-r--r-- 1 oracle oinstall 696 Dec 28 16:58 sqlnet.log
  ```

  In the example, “oracle” is the user and “oinstall” is the group.

  If a user other than oracle installs the Oracle database, the `avoracle` program must use the `--storageapp_username=`*`username`* option. For example, if the user named emc installs the Oracle database, *`username`* is emc.

RMAN-06056: could not access datafile n error on AIX

The `avoracle` program runs as root. If you encounter an “RMAN-06056: could not access datafile n” error, it means `avoracle` was unable to open the file for processing.

This error on IBM AIX systems occurs when the default `ulimit` is set to 2097151. This default setting limits the maximum file size that the root user can read to 1 GB.

To resolve this issue, change the `ulimit` setting for the root user to unlimited. This unlimited setting allows `avoracle` to process large files.

RMAN script fails with WriteFile failed error

When you specify `C:\Program Files\avs\bin` for the `--bindir` variable in an RMAN script, the script fails with the following errors:

```
RMAN-03009: failure of backup command on c1 channel at 07/20/2012
   13:56:49
ORA-19502: write error on file "sample_1_1", blockno 1 (blocksize=512)
ORA-27030: skgfwrt: sbtwrite2 returned error
ORA-19511: Error received from media manager layer, error text:
stream->WriteFile failed
```

To resolve this issue, ensure that all variables in the RMAN script that specify the Windows installation directory use `Progra~1`, the short name for the `Program Files` folder. The parser cannot process spaces in folder names.

For example, the correct syntax for the `--bindir` variable is `--bindir=C:\Progra~1\avs\bin`.

Restore fails to complete successfully

In rare situations, the restore process for a full database may fail to complete successfully because of the internal state of the database when the backup occurred. When this happens, additional manual recovery steps may be necessary.

To restore a database after an unsuccessful restore attempt:

1. Restore the control file. "Restoring Oracle data with RMAN" on page 114 provides more information.
2. Note the system change number (SCN) that corresponds to the backups that you need to restore.
3. Log in to Oracle RMAN by using the Oracle user ID and password.

   The command prompt changes to the RMAN prompt.
4. Connect to the Oracle database to restore.
5. Type the following command:

   ```
   allocate channel c1 type sbt PARMS="SBT_LIBRARY=install-dir\
   /lib/libobk_avamar.so" format '%d_%U';
   send '"--flagfile=/oracle/my-avtar-flags.txt"\
   "--bindir=install-dir/bin"';
   restore database;
   restore archivelog until scn scn;
   release channel c1;
   }
   ```

   where:

   - *install-dir* is the base installation directory for the platform (for example, /usr/local/avamar on Linux, `/opt/AVMRclnt` on Solaris, and `C:\Program Files\avs\bin` on Windows).
   - *scn* is an SCN value noted in step 2.
6. Use Oracle documentation to perform other necessary recovery steps.

Stopping Avamar Administrator processes

NOTICE

Only administrators, who understand the consequences of stopping Avamar Administrator processes, should perform the following procedure. Use this procedure for emergencies only.

The following procedure runs the UNIX `kill` command to stop `avoracle` processes, which were started by the Avamar Administrator interface. The `avoracle` processes are automatically started by Avamar Administrator for browse, backup, and restore operations. Stop these `avoracle` processes only when you determine that something is wrong with a browse, backup, or restore operation.

1. Log in to the Oracle server.
2. Show all Avamar processes by typing the following command:

   `ps -ef|grep avoracle`

   The command shell displays a list of active processes. Some of them are `avoracle` processes for the Avamar Plug-in for Oracle.
3. Locate the `avoracle` processes in the list and note the process ID numbers (PIDs).
4. Terminate the process by typing the following command:

   `kill` *`pid`*

   where *pid* is a process ID displayed in step 2.
5. Repeat step 4 until all `avoracle` processes are stopped.

Time-out errors when using multiple RMAN channels

Allocating too many channels from Avamar Administrator may lock out processes. The backup or restore can then fail with a time-out error. If a time-out error occurs, retry the operation by using fewer channels.

This problem does not occur when using RMAN scripts.

Unable to browse Oracle databases with Avamar Administrator

The **Browse for Files, Folder, or Directories** option in Avamar Administrator does not display Oracle databases. To verify the browse problem, use the following command:

`./avoracle --browse`

If this browse problem exists, the output from the `avoracle` program contains the following message:

```
avoracle Info <7908>: browse returning with 0 items
```

All of the following circumstances can prevent you from browsing the Oracle databases:

- The Avamar client and Oracle databases use two separate NIC cards, each with different IP addresses and hostnames.
- The `oratab` file contains invalid entries.

Unable to process snapview workorder

The Avamar Plug-in for Oracle is unable to process the snapview workorder because the wait time for the snapview workorder times out.

To work around this problem, increase the `[avoracle]subprocesstimeoutsecs` option in Avamar Administrator:

1. From the **Backup Command Line Options** dialog box, click the **More** button.

   The dialog box expands to display the **Enter Attribute** and **Enter Attribute Value** fields.

2. Type the **`[avoracle]subprocesstimeoutsecs`** option in the **Enter Attribute** field.

3. Type the number of seconds in the **Enter Attribute Value** field.

4. Click the **Add to List** button (**+**).

   The option and value appear in the box below the **Add to List** (**+**) and **Remove From List** (**-**) buttons.

5. Restart the backup.

Unable to send CTL message

A backup or restore fails with one of the following error messages:

```
avoracle Error <6629>: INTERNAL: Unable to send CTL message (n=-1,
   retcode=1, errno=0)
avoracle Error <6629>: INTERNAL: Unable to send CTL message (n=-1,
   retcode=3, errno=0)
```

These errors can occur when you allocate too many channels for a backup or restore from Avamar Administrator.

To resolve this issue, EMC recommends that you set the number of channels to no more than two times the number of processors. If the problem persists after making this change, further reduce the number of channels.

The **Number of RMAN Channels** option is available from the following dialog boxes:

- **Backup Command Line Options**
- **Restore Command Line Options**
- **New Dataset**

This problem does not apply to backups or restores started by an RMAN script.

Configuration checklist

The following topics address common configuration problems and their solutions.

Supported versions of Oracle

Avamar 7.0 supports Oracle 11*g* and later.

To determine the version of Oracle installed:

1. Log in to the Oracle server.
2. Start SQL*Plus:

   sqlplus "/ as sysdba"
3. View version information by typing the following command:

   select * from v$version;

   Content similar to the following appears in the command shell:

   ```
   Oracle Database 11g Enterprise Edition Release 11.1.0.7.0 - Prod
   PL/SQL Release 11.1.0.7.0 - Production
   CORE 11.1.0.7.0 Production
   TNS for Linux: Version 11.1.0.7.0 - Production
   NLSRTL Version 11.1.0.7.0 - Production
   ```

RMAN executable file and Oracle versions

The RMAN executable file version must match the Oracle database version. For example, the `ORACLE_HOME/bin` directory contains the RMAN executable file. Linux systems have a default RMAN file in the `/usr/X11R6/bin` directory. An RMAN backup or restore script that uses the default RMAN causes the backup or restore operation to fail.

For multiple versions of Oracle, RMAN executables must point to the correct `ORACLE_HOME/bin` directory.

To determine whether the default RMAN executable points to the correct RMAN executable in the `ORACLE_HOME/bin` directory, type the following commands:

```
which rman
/usr/X11R6/bin/rman
rpm -qf /usr/X11R6/bin/rman
xorg-x11-devel-6.8.2-1.EL.33
xorg-x11-devel-6.8.2-1.EL.33
more oratab
catalogdb:/home/oracle/oracle/product/10.2.0/db_1:N
largedb:/home/oracle/OraHome:N
orcl:/home/oracle/oracle/product/10.2.0/db_1:N
```

The sample output from the `oratab` file includes a database named largedb. This database has both Oracle 9*i* and Oracle 10*g* homes. Because largedb is an Oracle 9*i* instance, the correct RMAN executable is in `/home/oracle/OraHome/bin/rman`.

Set the `PATH` variable to the `ORACLE_HOME/bin` directory to ensure RMAN uses the correct executable file. Before running RMAN scripts, run `/usr/local/bin/oraenv`.

Microsoft Windows service pack

Microsoft Windows 2003 must have the required service packs installed.

To check the system's service pack level, select **Start** › **Control Panel** › **System**. The **General** tab in the **System Properties** dialog box shows the current server pack.

Bitwidth of Avamar Plug-in for Oracle and Oracle

The bitwidth of the Oracle software, the Avamar Plug-in for Oracle, and the platform must match. Ensure you download the correct software packages for the platform and version of Oracle. "Checking the system requirements" on page 30 provides more information.

NOTICE

64-bit operating systems do not support the 32-bit versions of Oracle 10*g* and later versions. You can find additional information about Oracle on the Oracle website.

To check the bitwidth of Oracle, navigate to the `$ORACLE_HOME/bin` and type the following command:

`file ~/oracle/product/`*`version`***`/`***`db-name`***`/bin/rman`**

where:

- *version* is the version of Oracle.
- *db-name* is the name of the Oracle database.

The following output appears in the command shell:

```
/home/oracle/oracle/product/10.2.0/db_1/bin/rman: ELF 64-bit LSB
   executable, AMD x86-64, version 1 (SYSV), for GNU/Linux 2.4.0,
   dynamically linked (uses shared libs), not stripped
```

To check the bitwidth of RMAN, navigate to the `$ORACLE_HOME/bin` and type the following command:

`file ~/oracle/product/`*`version`***`/`***`db-name`***`/bin/sqlplus`**

where:

- *version* is the version of Oracle.
- *db-name* is the name of the Oracle database.

The following output appears in the command shell:

```
/home/oracle/oracle/product/10.2.0/db_1/bin/sqlplus: ELF 64-bit LSB
   executable, AMD x86-64, version 1 (SYSV), for GNU/Linux 2.4.0,
   dynamically linked (uses shared libs), not stripped
```

The text string "ELF 64-bit LSB executable" in the command output confirms that both Oracle and RMAN are 64-bit.

Requirements for libobk_avamar.so and libobk_avamar.dll

The `libobk_avamar.so` file (on UNIX) and `libobk_avamar.dll` file (on Windows) implement the Oracle SBT interface specification, which Avamar Plug-in for Oracle and RMAN require for successful backup and restore operations. The following requirements apply to both files:

- They must provide read and execute access to the Oracle user.
- They must be in the *Avamar-home*`/lib` directory.
- They must be the same bitwidth as Oracle.

To verify that the correct `libobk_avamar` file is installed in the *Avamar-home*`/lib` directory on a UNIX platform, type the following commands:

```
cd Avamar-home/lib
file *
```

The text strings "ELF 64-bit LSB shared object" and "ELF 32-bit LSB shared object" in the following command output confirm that both 64-bit and 32-bit libraries are present:

```
libobk_avamar64.so: ELF 64-bit LSB shared object, AMD x86-64, version
   1 (SYSV), not stripped
libobk_avamar.so: ELF 32-bit LSB shared object, Intel 80386, version 1
   (SYSV), not stripped
```

Avamar client and Avamar Plug-in for Oracle installation

For all supported platforms, install the Avamar client before installing the Avamar Plug-in for Oracle. The versions of the Avamar client and Avamar Plug-in for Oracle must be the same.

Table 10 on page 166 includes methods to verify the installation of the Avamar client:

Table 10 Avamar client installation verification

Platform	Method
Microsoft Windows	Use the Windows Explorer to verify that the `C:\Program files\avs` folder exists and contains `libobk_avamar.dll`.
Oracle Linux, Red Hat Linux, or SUSE Linux	Use the `rpm` command: **`rpm -qa |grep -i avamar`**
HP-UX	Use the `swinstall` command: **`swinstall -list`**
IBM AIX	Use the `smitty` command to list all software or to search for the Avamar client software package.
Solaris	Use the `pkginfo` command: **`pkginfo|grep -i AVMRclnt`**

Avamar client and Avamar Plug-in for Oracle registration

To back up or restore Oracle by using the Avamar Plug-in for Oracle, you must register the Avamar client with the Avamar server. The registration process can fail for either of the following conditions:

- The Avamar *plug-in*_catalog.xml does not support the Avamar Plug-in for Oracle version.
- An administrator disabled the Avamar Plug-in for Oracle.

After you register the Avamar client, Avamar Administrator lists the client in the Oracle databases. In addition, the avagent.log file (in the/var/avamar directory, by default) contains information that verifies a successful registration:

```
****** Current MCS name 'avamar-1.example.com' ******
2012-9-4 15:08:37 avagent Info <7452>: Registration of client
   /clients/Oracle-client.example.com with MCS
   avamar-1.example.com:28001 successful.
2012-9-4 15:08:37 avagent Info <5928>: Registration of plugin 1002
   Oracle successful.
2012-9-4 15:08:37 avagent Info <5928>: Registration of plugin 1001
   Unix successful.
2012-9-4 15:08:37 avagent Info <5619>: Registration of client and
   plugins complete.
2012-9-4 15:08:37 avagent Info <7150>: first work request delayed for
   180 seconds.
2012-9-4 15:11:37 avagent Info <7151>: first work request delay
   finished.
```

Disk space for the /var/avamar directory

The /var/avamar directory must have sufficient disk space for RMAN scripts and log files. Backups and restores fail if the /var/avamar directory does not have enough space. Check the /var/avamar directory for free space by using the applicable method for the system.

The following example shows output from the df -h command on a Red Hat Enterprise Linux system:

```
Filesystem                              Size      Used   AvailUse%
   Mounted on
/dev/mapper/VolGroup00-LogVol00         985G      310G   625G34%/
```

The RMAN scripts, RMAN log files, and the avoracle log files require a minimum of 100 MB of disk space.

GLOSSARY

This glossary provides definitions for terms used in this guide.

A

activation See "client activation".

administrator The person who installs, configures, and maintains software on network computers, and who adds users and defines user privileges.

archive logs Log files that contain a copy of one of the filled members of an online redo log group. The archiving process requires that the database be set to `ARCHIVELOG` mode. Oracle terminology refers to archive logs as archive redo logs.

Avamar Administrator A graphical management console software application that remotely administers an Avamar system from a supported Windows or 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. An Avamar server is a fault-tolerant, high-availability system that efficiently stores the backups from all protected clients. The Avamar server provides processes and services 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 directories, or as entire file systems. Although more efficient than a conventional incremental backup, a backup is always a full copy of client data that can be restored immediately from an Avamar server.

C

client activation The process of passing the client ID (CID) back to the client, where it is stored in an encrypted file on the client file system.

client agent A platform-specific software process that runs on the client and communicates with the "Management Console Server (MCS)" and with any plug-ins installed on that client.

client registration The process of establishing an identity with the Avamar server. When Avamar recognizes the client, it assigns a unique client ID (CID), which it passes back to the client during activation.

cold backup A backup of database objects that you perform while the corresponding database or instance is shut down and unavailable to users. Also known as an offline backup.

D

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

database A collection of data arranged for ease and speed of update, search, and retrieval by computer software.

database files Oracle database files include datafiles, control files, and online redo logs.

dataset A policy that defines a set of files, directories, and file systems to include or exclude from a backup. A dataset is a persistent and reusable Avamar policy that you create and specify for multiple groups.

DD Boost 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.

disaster recovery Recovery from any disruptive situation, such as hardware failure or software corruption, in which ordinary data recovery procedures are not sufficient to restore a system and its data to normal day-to-day operations.

DNS Domain Name System. A dynamic and distributed directory service for assigning domain names to specific IP addresses.

domain A feature in Avamar Administrator that organizes large numbers of clients into named areas of control and management.

F

file system A software interface used to save, retrieve, and manage files on storage media by providing directory structures, data transfer methods, and file association.

G

group A level of organization in Avamar Administrator for one or more Avamar clients. All clients in an Avamar group use the same group policies, which include the dataset, backup schedule, and retention policy.

group policy The dataset, schedule, and backup retention policy that you create and specify for a group. All clients in the group uses the group policy unless an administrator overrides policy settings at the client level.

H

hot backup A backup of database objects performed while the corresponding database or instance is running and available to users. Also known as an online backup.

L

LAN Local Area Network.

M

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

Media Manager (MM) A third-party networked backup system. MM works with Recovery Manager so that database backups can be written directly to tertiary storage.

Media Management Library (MML) A software library used by RMAN to back up data to tertiary storage. The MML for the Avamar Plug-in for Oracle is libobk_avamar.

metadata Hash information that identifies stored sub-file information for deduplication, and is required to revert deduplicated client backup data to the regular non-deduplicated format.

O

oratab file A text file that contains the system identifier and home directory of the Oracle database. A typical `oratab` entry is similar to the following: ora91:/space/local/oracle/ora901. The default location for the `oratab` file is `/var/opt/oracle` on Solaris and `/etc` on other systems.

Oracle instance A memory structure and a group of Oracle Server processes running on a node.

P

plug-in A software process that works with Avamar software to back up and restore data on a client.

point-in-time restore Restore of a backup to a specific point in time.

policy Rules for client backups that you create and specify for multiple groups. Groups have dataset, schedule, and retention policies.

R

recovery catalog A key component of the RMAN backup and recovery mechanism. The recovery catalog contains critical information required to recover an Oracle database from a backup.

The recovery catalog is typically stored in another Oracle database (on another physical machine if possible). It can also be stored in a database control file, which is backed up with the original database.

Recovery Manager (RMAN) A software application that provides a command line interface for hot and cold backups, as well as cold recovery of a supported Oracle database.

redirected restore The process of restoring backed up data to a location other than to its original location.

registration See “client registration.”

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 ability to control the length of time that you keep backups in an Avamar server before automated deletion. You can specify a retention policy as permanent for backups that must not be deleted from an Avamar server. A retention policy is a persistent and reusable Avamar policy that you create and specify for multiple groups.

S

schedule A schedule controls the frequency in which backup occur for clients in a group. A schedule is a persistent and reusable Avamar policy that you create and specify for multiple groups.

System Backup to Tape An Oracle architecture that supports directly writing backups to tape (and reading them) by using the Media Management Library.

T

tablespace A logical storage unit in a database, which groups related logical structures together.

transaction logs A record of database transactions or list of changed files in a database, stored in a log file to execute quick restore and rollback transactions.

U

User Account Control (UAC) A Windows feature available in Windows 7, Windows Server 2008, Windows Server 2008 R2, Windows Vista. UAC helps prevent unauthorized changes to your computer. When functions that could potentially affect a computer's operation are made, UAC prompts the user for permission or for an administrator's password before continuing with the task.

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