

Oracle® Identity Management

Integration Guide

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Preface

Oracle Identity Management Integration Guide describes the features, architecture, and administration of Oracle Internet Directory.

Audience

Oracle Identity Management Integration Guide is intended for anyone who performs administration tasks for Oracle Internet Directory. You need to be familiar with either the UNIX/Linux operating systems or Microsoft Windows to understand the commands and examples in this guide.

To use this guide, you need some familiarity with the [Lightweight Directory Access Protocol \(LDAP\)](#).

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This documentation may contain links to Web sites of other companies or organizations that Oracle does not own or control. Oracle neither evaluates nor makes any representations regarding the accessibility of these Web sites.

TTY Access to Oracle Support Services

Oracle provides dedicated Text Telephone (TTY) access to Oracle Support Services within the United States of America 24 hours a day, seven days a week. For TTY support, call 800.446.2398.

Related Documentation

For more information, see:

- Online help available through Oracle Directory Manager, Oracle Delegated Administration Services, and Oracle Enterprise Manager 10g.
- The Oracle Application Server and Oracle Database documentation sets, especially:
 - *Oracle Identity Management Infrastructure Administrator's Guide*
 - *Oracle Internet Directory Administrator's Guide*
 - *Oracle Identity Management Guide to Delegated Administration*
 - *Oracle Identity Management Application Developer's Guide*
 - *Oracle Application Server Single Sign-On Administrator's Guide*
 - *Oracle Application Server Certificate Authority Administrator's Guide*
 - *Oracle Identity Management User Reference*
 - *Oracle Application Server High Availability Guide*
 - *Oracle Application Server Administrator's Guide*
 - *Oracle9i Database Administrator's Guide*
 - *Oracle9i Net Services Administrator's Guide*
 - *Oracle9i Real Application Clusters Administration*
 - *Oracle9i Advanced Replication*
 - *Oracle Advanced Security Administrator's Guide*

For additional information, see:

- Chadwick, David. *Understanding X.500—The Directory*. Thomson Computer Press, 1996.
- Howes, Tim and Mark Smith. *LDAP: Programming Directory-enabled Applications with Lightweight Directory Access Protocol*. Macmillan Technical Publishing, 1997.
- Howes, Tim, Mark Smith and Gordon Good, *Understanding and Deploying LDAP Directory Services*. Macmillan Technical Publishing, 1999.
- Internet Assigned Numbers Authority home page at <http://www.iana.org> for information about object identifiers.
- Internet Engineering Task Force (IETF) documentation available at: <http://www.ietf.org>, especially:
 - LDAPEXT charter and LDAP drafts
 - LDUP charter and drafts
 - RFC 2254, "The String Representation of LDAP Search Filters"
 - RFC 1823, "The LDAP Application Program Interface"

- The OpenLDAP Community at <http://www.openldap.org>

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
<i>italic</i>	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
<code>monospace</code>	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

What's New in Oracle Identity Management Integration?

This section provides a brief description of new features introduced with the latest releases of Oracle Internet Directory, and points you to more information about each new feature. It contains these topics:

- [New Features Introduced with Oracle Application Server 10g \(10.1.4.2.0\)](#)
- [New Features Introduced with Oracle Application Server 10g \(10.1.4.0.1\)](#)
- [New Features Introduced with Oracle Application Server 10g Release 2 \(10.1.2\)](#)
- [New Features Introduced with Oracle Internet Directory 10g \(9.0.4\)](#)
- [New Features Introduced with Oracle Internet Directory Release 9.0.2](#)
- [New Features Introduced with Oracle Internet Directory Release 3.0.1](#)
- [New Features Introduced with Oracle Internet Directory Release 2.1.1](#)

New Features Introduced with Oracle Application Server 10g (10.1.4.2.0)

In Oracle Application Server 10g (10.1.4.2.0), you can now construct mapping rules by using the Oracle Directory Integration Server Administration tool. For more information, see ["Managing Synchronization Profiles"](#) on page 7-1.

New Features Introduced with Oracle Application Server 10g (10.1.4.0.1)

This section describes the features introduced with Oracle Application Server 10g (10.1.4.0.1).

- **Express configuration of the Sun Java System Directory Connector**—You can now perform an express configuration of the Sun Java System Directory connector. Express configuration uses default mappings and filtering to synchronize changes between Oracle Internet Directory and Sun Java System Directory server. Two synchronization profiles are created with express configuration: one profile that synchronizes changes from Sun Java System Directory to Oracle Internet Directory and another profile that synchronizes changes from Oracle Internet Directory to Sun Java System Directory. For more information, see [Chapter 21, "Integrating with Sun Java System Directory"](#).
- **Support for Microsoft Exchange Server with the Microsoft Active Directory Connector**—The Microsoft Active Directory connector now supports integration with Microsoft Exchange Server. For more information, see [Chapter 19, "Integrating with Microsoft Active Directory"](#).

- **Integration with Novell eDirectory and OpenLDAP**—Oracle Directory Integration Platform now supports integration between Oracle Internet Directory and Novell eDirectory or OpenLDAP. For more information, see [Chapter 22, "Integrating with Novell eDirectory or OpenLDAP"](#).
- **Synchronization of passwords from Microsoft Active Directory**—When synchronizing users from Microsoft Active Directory to Oracle Internet Directory, you can now also synchronize passwords by using Oracle Password Filter for Microsoft Active Directory. For more information, see [Chapter 20, "Deploying the Oracle Password Filter for Microsoft Active Directory"](#).
- **Directory Integration Assistant support for SSL**—The Directory Integration Assistant (diassistant) now supports Secure Sockets Layer (SSL).
- **Oracle Directory Integration Platform**—Oracle Directory Integration and Provisioning is now called Oracle Directory Integration Platform.

New Features Introduced with Oracle Application Server 10g Release 2 (10.1.2)

This section describes the new features introduced with Oracle Application Server 10g Release 2 (10.1.2).

- **Enhanced provisioning capabilities and functionality**—This release includes enhanced capabilities and functionality with Oracle Directory Integration Platform Provisioning. You can also use the new Oracle Internet Directory Provisioning Console, a graphical interface for administrators to provision users in Oracle Internet Directory. The Oracle Internet Directory Provisioning Console was created with Oracle Delegated Administration Services, and works alongside the Oracle Internet Directory Self-Service Console. For more information, see [Part IV, "Provisioning with the Oracle Directory Integration Platform"](#).
- **Graphical administration of Oracle Directory Integration Platform**—You can now use the new Oracle Directory Integration Server Administration tool, a Java-based utility for graphically administering the Oracle directory integration platform. For more information, see [Chapter 3, "Oracle Directory Integration Platform Administration Tools"](#).
- **Express configuration of the Microsoft Active Directory Connector**—You can now perform an express configuration of the Microsoft Active Directory Connector. Express configuration uses default settings to automatically perform all required configurations, and also creates two synchronization profiles, one for import and one for export.

See Also:

- [Chapter 3, "Oracle Directory Integration Platform Administration Tools"](#)
- [Chapter 19, "Integrating with Microsoft Active Directory"](#)
- **Simplified configuration of Windows Native Authentication**—This guide now includes detail instructions for configuring Windows Native Authentication. For more information, see [Chapter 19, "Integrating with Microsoft Active Directory"](#).

New Features Introduced with Oracle Internet Directory 10g (9.0.4)

This section describes the new features introduced with Oracle Internet Directory Release 10g (9.0.4).

- **Integration with the Microsoft Windows environment**—You can integrate the Oracle Application Server infrastructure with the Microsoft Windows operating system—including Microsoft Active Directory and Microsoft Windows NT 4.0. This integration is achieved by using the Microsoft Active Directory Connector in Oracle Directory Integration Platform and plug-ins.

See Also: [Chapter 19, "Integrating with Microsoft Active Directory"](#)

- **External authentication support**—You can store user security credentials in a repository other than Oracle Internet Directory—for example, a database or another LDAP directory such as Microsoft Active Directory or Sun Java System Directory. You can then use these credentials for user authentication.

See Also:

- The chapter on setting up the customized external authentication password in *Oracle Internet Directory Administrator's Guide*
- ["Choose Where to Store Passwords"](#) on page 17-13

New Features Introduced with Oracle Internet Directory Release 9.0.2

This section describes the new features introduced with Oracle Internet Directory Release 9.0.2.

- **New directory integration capabilities**—Oracle Internet Directory Release 9.0.2 introduces new kinds of connectivity with other applications and repositories, both Oracle-built and otherwise. The new Oracle Directory Integration Platform Service and Oracle Directory Synchronization Service are built upon Oracle Directory Integration Platform (introduced with Oracle Internet Directory Release 2.1.1.1 in the Oracle8i Release 3 time frame).
 - **Oracle Directory Integration Platform Service**—Provisioning is the process of granting or revoking a user's access to application resources based on business rules. The user can be either a human user or an application.

The Oracle Directory Integration Platform Service ensures that subscribing applications or business entities are alerted to updates in Oracle Internet Directory for keeping local repositories synchronized. It enables you to synchronize local, application-specific information by using Oracle Internet Directory as the primary repository.
 - **Oracle Directory Synchronization Service and the LDAP connector**—The Oracle Directory Synchronization Service enables near-complete leveraging of previously deployed infrastructure, including but not limited to ERP and CRM systems, third-party LDAP directories, and network operating system (NOS) user repositories. It enables you to synchronize information among enterprise directories and Oracle Internet Directory. This allows for centralized administration, thereby reducing administrative costs. It ensures that data is consistent and up-to-date across the enterprise.

See Also: [Chapter 1, "Introduction to Oracle Identity Management Integration"](#)

New Features Introduced with Oracle Internet Directory Release 3.0.1

This section describes the new features introduced with Oracle Internet Directory Release 3.0.1.

- **Oracle Directory Integration Platform**—This feature enables you to synchronize various directories with Oracle Internet Directory. It also makes it easier for third party metadirectory vendors and developers to develop and deploy their own connectivity agents.

New Features Introduced with Oracle Internet Directory Release 2.1.1

This section describes the features introduced with Oracle Internet Directory Release 2.1.1.

- **Synchronization with multiple directories in a metadirectory environment (release 2.1.1 only)**—If you are working in a metadirectory environment, then this feature enables you to synchronize multiple directories with Oracle Internet Directory.

Note: This feature was replaced in Release 3.0.1 by Oracle Directory Integration Platform. See [Chapter 1, "Introduction to Oracle Identity Management Integration"](#) for more information.

Part I

Getting Started with Oracle Directory Integration Platform

Part I discusses the concepts, components, architecture, and security features of Oracle Directory Integration Platform. It contains these chapters:

- [Chapter 1, "Introduction to Oracle Identity Management Integration"](#)
- [Chapter 2, "Security Features in Oracle Directory Integration Platform"](#)

Introduction to Oracle Identity Management Integration

This chapter introduces Oracle Identity Management integration, its components, structure, and administration tools.

This chapter contains these topics:

- [Why Oracle Identity Management Integration?](#)
- [Oracle Identity Management Installation Options](#)
- [Synchronization, Provisioning, and the Differences Between Them](#)
- [Components Involved in Oracle Identity Management Integration](#)

See Also: [Appendix B, "Case Study: A Deployment of Oracle Directory Integration Platform"](#) for an example of how you can deploy Oracle Identity Management integration

Why Oracle Identity Management Integration?

Oracle Identity Management enables you to reduce administrative time and costs by integrating your applications and directories—including third-party LDAP directories—with Oracle Internet Directory. It does this by using Oracle Directory Integration Platform. For example, you might need to do the following:

- Keep employee records in Oracle Human Resources consistent with those in Oracle Internet Directory. Oracle Directory Integration Platform provides this synchronization through the Oracle Directory Synchronization Service.
- Notify certain LDAP-enabled applications—such as Oracle Application Server Portal (OracleAS Portal)—whenever changes are applied to Oracle Internet Directory. The Oracle Directory Integration Platform provides this notification through Oracle Directory Integration Platform Service.

Throughout the integration process, Oracle Directory Integration Platform ensures that the applications and other directories receive and provide the necessary information in a reliable way.

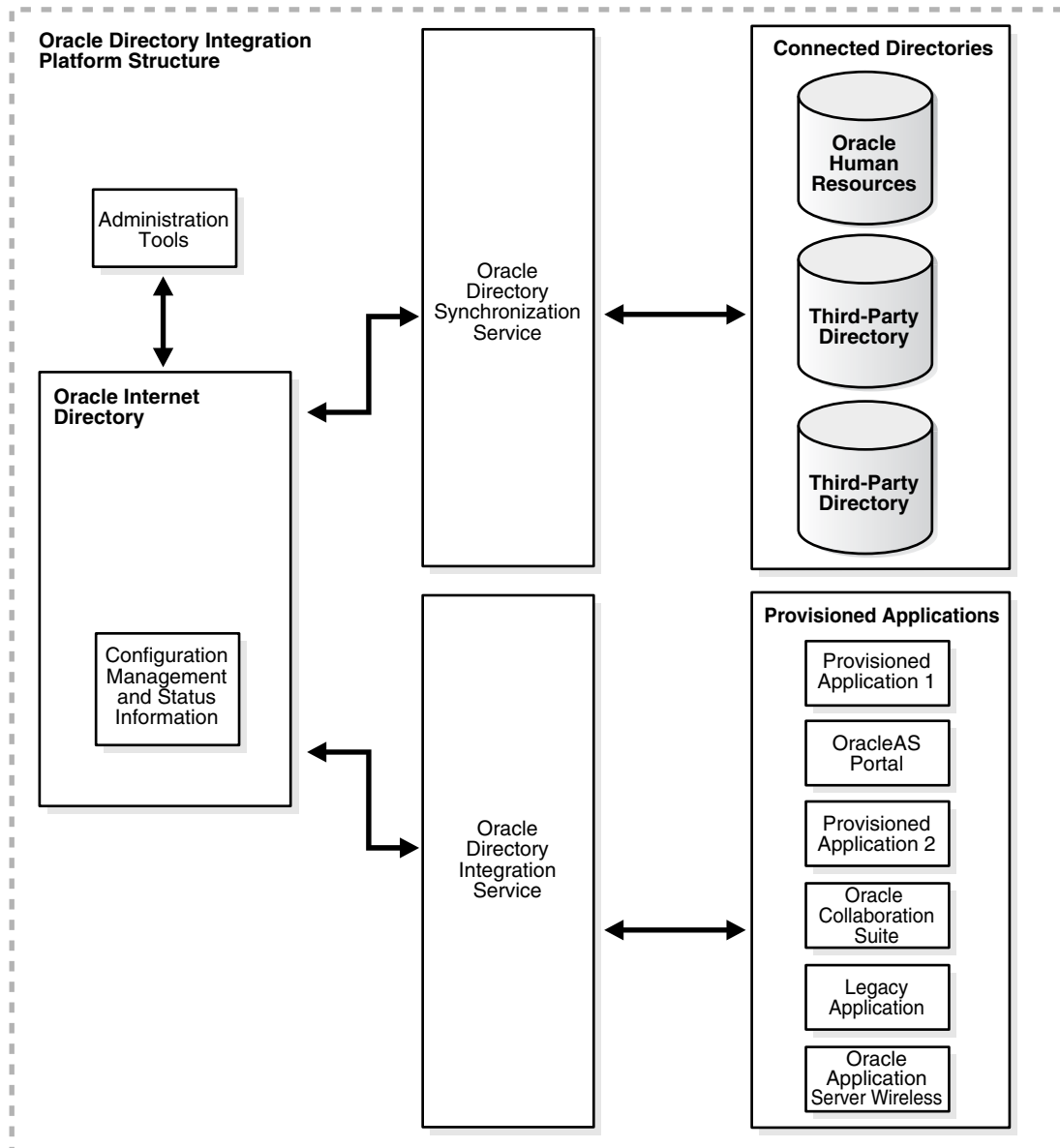
You can integrate with various directories, including Microsoft Active Directory, Sun Java System Directory, Novell eDirectory, and OpenLDAP. For example, in an Oracle Application Server environment, where access to Oracle components relies on data stored in Oracle Internet Directory, you can still use Microsoft Active Directory as the central enterprise directory. Users of that directory can still access Oracle components because Oracle Directory Integration Platform can synchronize the data in Microsoft Active Directory with that in Oracle Internet Directory.

See Also:

- [Chapter 10, "Synchronization with Oracle Human Resources"](#)
- [Chapter 19, "Integrating with Microsoft Active Directory"](#)
- [Chapter 21, "Integrating with Sun Java System Directory"](#)

Figure 1–1 shows a sample deployment of Oracle Directory Integration Platform.

Figure 1–1 Example of an Oracle Directory Integration Platform Environment



In the example in Figure 1–1, Oracle Internet Directory is synchronized with connected directories by way of the Oracle Directory Synchronization Service. In this example, the connected directories are Oracle Human Resources, Sun Java System Directory, and Microsoft Active Directory. Similarly, changes in Oracle Internet Directory are sent to various applications by using the Oracle Directory Integration Platform Service. In this example, the provisioned applications include OracleAS Portal, Oracle Files,

Oracle Application Server Wireless, two unspecified provisioned application, and a legacy application.

Oracle Identity Management Installation Options

By default, Oracle Directory Integration Platform is installed as a component of Oracle Internet Directory. However, you can also install Oracle Directory Integration Platform in a standalone installation. You should install a standalone instance of Oracle Directory Integration Platform under the following circumstances:

- You need Oracle Internet Directory to run on a separate host for performance reasons.
- The applications that you need to provision and synchronize require intensive processing.
- You need to run multiple instances of Oracle Directory Integration Platform for high availability.

Synchronization, Provisioning, and the Differences Between Them

Synchronization has to do with directories rather than applications. It ensures the consistency of entries and attributes that are in both Oracle Internet Directory and other connected directories.

Provisioning has to do with applications. It notifies them of changes to user or group entries or attributes that the application needs to track.

This section contains these topics:

- [Synchronization](#)
- [Provisioning](#)
- [How Synchronization and Provisioning Differ](#)

Synchronization

Synchronization enables you to coordinate changes among Oracle Internet Directory and connected directories. For all directories to both use and provide only the latest data, each directory must be informed of changes made in the other connected directories. Synchronization ensures that changes to directory information—including, but not limited to data updated through provisioning—is kept consistent.

Whenever you decide to connect a third-party directory to Oracle Internet Directory, you create a synchronization profile for that specific directory. This profile specifies the format and content of the data to be synchronized between Oracle Internet Directory and the connected directory. To create a synchronization profile, you use the Directory Integration Assistant.

See Also:

- [Part III, "Synchronization with the Oracle Directory Integration Platform"](#)
- The chapter on Oracle Directory Integration Platform tools in the *Oracle Identity Management User Reference* for information about the Directory Integration Assistant

Provisioning

Provisioning enables you to ensure that an application is notified of directory changes to, for example, user or group information. Such changes can affect whether the application allows a user access to its processes and determines which resources can be used.

Use provisioning when you are designing or installing an application has the following requirements:

- Does not maintain a directory
- Is LDAP-enabled
- Can and should allow only authorized users to access its resources

When you install an application that you want to provision, you must create a provisioning integration profile for it by using the Provisioning Subscription Tool.

See Also:

- [Part IV, "Provisioning with the Oracle Directory Integration Platform"](#)
- The chapter on Oracle Directory Integration Platform tools in the *Oracle Identity Management User Reference* for information about the Provisioning Subscription Tool

How Synchronization and Provisioning Differ

Synchronization and provisioning have important operational differences, as described in [Table 1-1](#).

Table 1-1 *Directory Synchronization and Provisioning Integration Distinctions*

Consideration	Directory Synchronization	Provisioning Integration
The time for action	Application deployment time. Directory synchronization is for connected directories requiring synchronization with Oracle Internet Directory.	Application design time. Provisioning integration is for application designers developing LDAP-enabled applications.
Communication direction	Either one-way or two-way—that is, either from Oracle Internet Directory to connected directories, the reverse, or both	Two way—that is, from Oracle Internet Directory to provisioned applications, and from provisioned applications to Oracle Internet Directory
Type of data	Any data in a directory	Restricted to provisioned users and groups
Examples	Oracle Human Resources Sun Java System Directory Microsoft Active Directory Novell eDirectory OpenLDAP	OracleAS Portal

Components Involved in Oracle Identity Management Integration

This section describes the components involved in Oracle Identity Management integration. It contains these topics:

- [Oracle Internet Directory](#)
- [Oracle Directory Integration Server](#)
- [Oracle Application Server Single Sign-On](#)

Oracle Internet Directory

Oracle Internet Directory is the repository in which Oracle components and third-party applications store and access user identities and credentials. It uses the Oracle directory server to authenticate users by comparing the credentials entered by users with the credentials stored in Oracle Internet Directory. When credentials are stored in a third-party directory and not in Oracle Internet Directory, users can still be authenticated. In this case, Oracle Internet Directory uses an external authentication plug-in that authenticates users against the third-party directory server.

Oracle Directory Integration Server

The Oracle directory integration server is the shared server process that provides functionality for the Oracle Directory Synchronization Service and the Oracle Directory Integration Platform Service.

What the Oracle Directory Integration Server Does

The Oracle directory integration server performs these services:

- Oracle Directory Synchronization Service
 - Scheduling—Processing a synchronization profile based on a predefined schedule
 - Mapping—Executing rules for converting data between connected directories and Oracle Internet Directory
 - Data propagation—Exchanging data with connected directories by using a connector
 - Error handling
- Oracle Directory Integration Platform Service
 - Scheduling—Processing a provisioning profile based on a predefined schedule
 - Event Notification—Notifying an application of a relevant change to the user or group data stored in Oracle Internet Directory
 - Error handling

See Also: [Chapter 4, "Managing the Oracle Directory Integration Platform"](#)

About the Oracle Directory Synchronization Service

In the Oracle Directory Integration Platform environment, the contents of connected directories are synchronized with Oracle Internet Directory through the Oracle Directory Synchronization Service.

For Oracle Application Server components, Oracle Internet Directory is the central directory for all information, and all other directories are synchronized with it. This synchronization can be:

- One-way: Some connected directories only supply changes to Oracle Internet Directory and do not receive changes from it. This is the case, for example, with

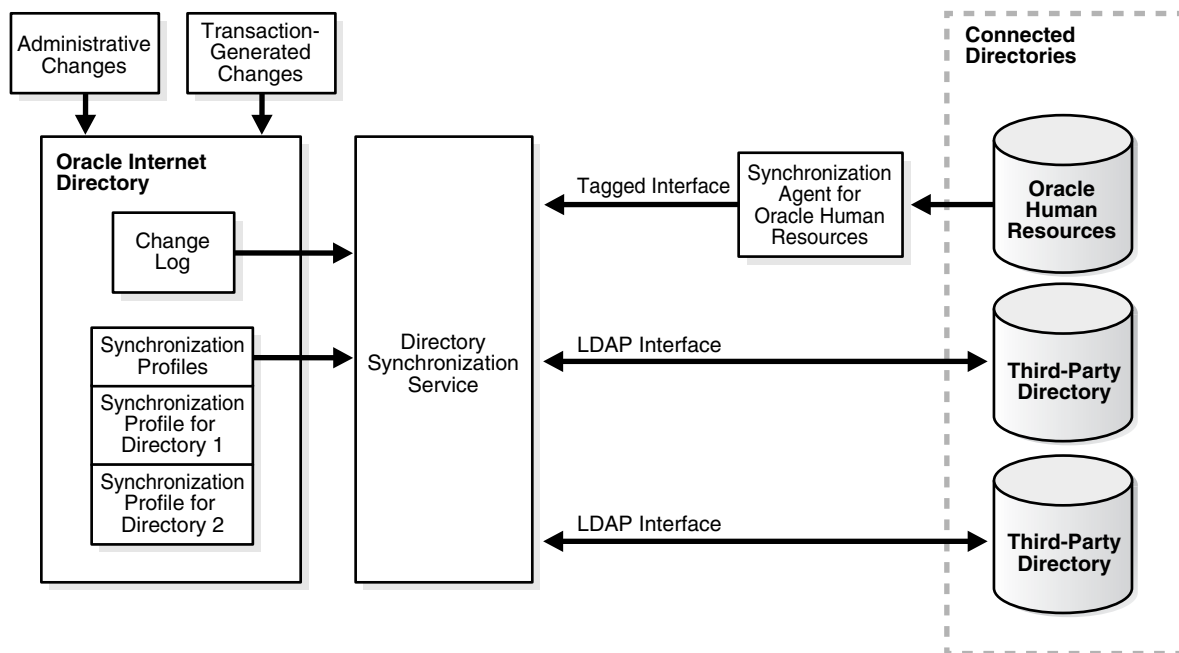
Oracle Human Resources, the primary repository and basis for comparison for employee information.

- Two-way: Changes in Oracle Internet Directory can be exported to connected directories, and changes in connected directories can be imported into Oracle Internet Directory.

Certain attributes can be targeted or ignored by the synchronization service. For example, the attribute for the employee badge number in Oracle Human Resources may not be of interest to Oracle Internet Directory, its connected directories or client applications. You might not want to synchronize them. On the other hand, the employee identification number may be of interest to those components, so you might want to synchronize them.

Figure 1–2 shows the interactions among components in the Oracle Directory Synchronization Service in a sample deployment.

Figure 1–2 Directory Synchronization Interactions of the Oracle Directory Integration Platform Service



The central mechanism triggering all such synchronization activities is the Oracle Internet Directory change log. It adds one or more entries for every change to any connected directory, including Oracle Internet Directory. The Oracle Directory Synchronization Service:

- Monitors the change log.
- Takes action whenever a change corresponds to one or more synchronization profiles.
- Supplies the appropriate change to all other connected directories whose individual profiles correspond to the logged change. Such directories could include, for example, relational databases, Oracle Human Resources, Microsoft Active Directory, Sun Java System Directory, Novell eDirectory, or OpenLDAP. The Oracle Directory Synchronization Service supplies these changes using the interface and format required by the connected directory. Synchronization through the Oracle Directory Integration Platform connectors ensures that Oracle Internet

Directory remains up-to-date with all the information that Oracle Internet Directory clients need.

About the Oracle Directory Integration Platform Service

The Oracle Directory Integration Platform Service ensures that each provisioned application is notified of changes in, for example, user or group information. To do this, it relies on the information contained in a provisioning integration profile. Each provisioning profile:

- Uniquely identifies the application and organization to which it applies
- Specifies, for example, the users, groups, and operations requiring the application to be notified

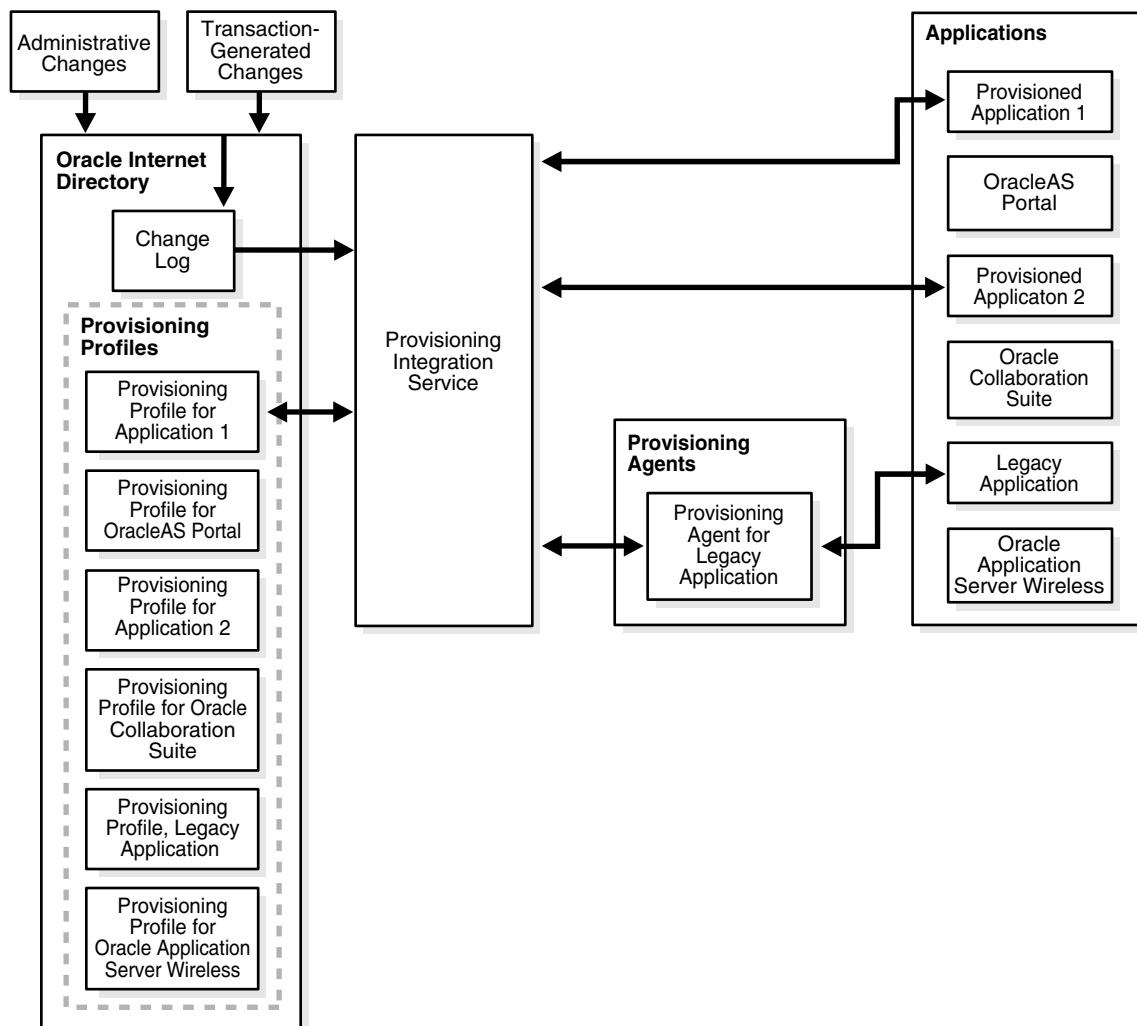
The profile must be created when the application is installed, by using the Provisioning Subscription Tool.

See Also: The chapter on Oracle Directory Integration Platform tools in the *Oracle Identity Management User Reference* for information about the Provisioning Subscription Tool

When changes in Oracle Internet Directory match what is specified in the provisioning profile of an application, the Oracle Directory Integration Platform Service sends the relevant data to that application.

Note: A legacy application—that is, one that was operational before the Oracle Directory Integration Platform Service was installed—would not have subscribed in the usual way during installation. To enable such an application to receive provisioning information, a **provisioning agent**, in addition to the provisioning profile, must be developed. The agent must be able to translate the relevant data from Oracle Internet Directory into the exact format required by the legacy application.

Figure 1–3 shows the interactions among components in an Oracle Directory Integration Platform Service environment, including the special case of a provisioning agent for a legacy application.

Figure 1–3 Interactions of the Oracle Directory Integration Platform Service

Oracle Application Server Single Sign-On

Oracle Application Server Single Sign-On (OracleAS Single Sign-On) enables users to access Oracle Web-based components by logging in only once.

Oracle components delegate the login function to the OracleAS Single Sign-On server. When a user first logs in to an Oracle component, the component redirects the login to the OracleAS Single Sign-On server. The OracleAS Single Sign-On server authenticates the user by verifying the credentials entered by the user against those stored in Oracle Internet Directory. After authenticating the user, and throughout the rest of the session, the OracleAS Single Sign-On server grants the user access to all the components the user both seeks and is authorized to use.

See Also: *Oracle Application Server Single Sign-On Administrator's Guide* for information about OracleAS Single Sign-On

Security Features in Oracle Directory Integration Platform

This chapter discusses the most important aspects of security in Oracle Directory Integration Platform. It contains these topics:

- [Authentication in Oracle Directory Integration Platform](#)
- [Access Control and Authorization and Oracle Directory Integration Platform](#)
- [Data Integrity and Oracle Directory Integration Platform](#)
- [Data Privacy and Oracle Directory Integration Platform](#)
- [Tools Security and Oracle Directory Integration Platform](#)

Authentication in Oracle Directory Integration Platform

Authentication is the process by which the Oracle directory server establishes the true identity of the user connecting to the directory. It occurs when an LDAP session is established by means of the `ldapbind` operation.

It is important that each component in Oracle Directory Integration Platform be properly authenticated before it is allowed access to the directory.

This section contains these topics:

- [Secure Sockets Layer and Oracle Directory Integration Platform](#)
- [Oracle Directory Integration Server Authentication](#)
- [Profile Authentication](#)

Secure Sockets Layer and Oracle Directory Integration Platform

You can deploy Oracle Directory Integration Platform with or without [Secure Socket Layer \(SSL\)](#). SSL implementation supports these modes:

- No authentication—Provides SSL data encryption, but does not use SSL for authentication.
- SSL server authentication—Includes both SSL data encryption and SSL authentication of the server to the client. In Oracle Directory Integration Platform, the server is the directory server, and the client is the Oracle directory integration platform.

The server verifies its identity to the client by sending a [certificate](#) issued by a trusted [certificate authority \(CA\)](#). This mode requires a public key infrastructure (PKI) and SSL wallets to hold the certificates.

To use SSL with Oracle Directory Integration Platform, you must start both the Oracle directory server and Oracle directory integration platform in SSL mode.

See Also: The chapter on preliminary tasks and information in *Oracle Internet Directory Administrator's Guide* for instructions about starting the Oracle directory server in SSL mode

Oracle Directory Integration Server Authentication

You can install and run multiple instances of the directory integration server on various hosts. However, when you do this, beware of a malicious user either posing as the directory integration server or using an unauthorized copy of it.

To avoid such security issues:

- Ensure that each directory integration server is identified properly.
- Ensure that, when you start a directory integration server, it is properly authenticated before it obtains access to Oracle Internet Directory.

Non-SSL Authentication

To use non-SSL authentication, register each directory integration server by using the registration tool called `odisrvreg`.

The registration tool creates:

- An identity entry in the directory. The directory integration server uses this entry when it binds to the directory.
- An encrypted password. It stores this password in the directory integration server entry.
- A private wallet on the local host. This wallet contains the security credentials, including an encrypted password. The name of the wallet is specified in the `odi.properties` file, and it is stored in the `$ORACLE_HOME/ldap/odi/conf` directory.

When it binds to the directory, the directory integration server uses the encrypted password in the private wallet.

Note: Ensure that the wallet is protected against unauthorized access.

See Also: ["Manually Registering the Oracle Directory Integration Platform"](#) on page 4-14

Authentication in SSL Mode

The identity of the directory server can be established by starting both Oracle Internet Directory and the directory integration server in SSL server authentication mode. In this case, the directory server provides its certificate to the directory integration server, which acts as the client of Oracle Internet Directory.

The directory integration server is authenticated by using the same mechanism used in the non-SSL mode.

You can also configure the Oracle directory integration platform to use SSL when connecting to a third-party directory. In this case, you store the connected directory

certificates in the wallet as described in ["Managing the SSL Certificates of Oracle Internet Directory and Connected Directories"](#) on page 4-7.

Profile Authentication

Within Oracle Internet Directory, an integration profile represents a user with its own distinguished name (DN) and password. The users who can access the profiles are:

- The administrator of Oracle Directory Integration Platform (DIPAdmin), represented by the DN `Cn=dipadmin, cn=dipadmins, cn=directory integration platform, cn=products, cn=oraclecontext`
- Members of the Oracle Directory Integration Platform administrator group (DIPAdminGroup), represented by the DN `cn=dipadmingrp, cn=dipadmin, cn=directory integration platform, cn=products, cn=oraclecontext`

When the directory integration server imports data to Oracle Internet Directory based on an integration profile, it proxy-binds to the directory as that integration profile. The Oracle directory integration platform can bind in either SSL or non-SSL mode.

Access Control and Authorization and Oracle Directory Integration Platform

Authorization is the process of ensuring that a user reads or updates only the information for which he or she has privileges. When directory operations are attempted within a directory session, the directory server ensures that the user—identified by the authorization identifier associated with the session—has the requisite permissions to perform those operations. If the user does not have the necessary permissions, then the directory server disallows the operation. Through this mechanism, called access control, the directory server protects directory data from unauthorized operations by directory users.

To restrict access to only the desired subset of Oracle Internet Directory data, for both the directory integration server and a connector, place appropriate access policies in the directory.

This section discusses these policies in detail. It contains these topics:

- [Access Controls for the Oracle Directory Integration Platform](#)
- [Access Controls for Profiles](#)

Access Controls for the Oracle Directory Integration Platform

The Oracle directory integration server binds to the directory both as itself and on behalf of the profile, as follows:

- When it binds as itself, it can cache the information in various integration profiles. This enables the directory integration server to schedule synchronization actions to be carried out by various connectors.
- When the directory integration server operates on behalf of a profile, it acts as proxy for the profile—that is, it uses the profile credentials to bind to the directory and perform various operations. The directory integration server can perform only those operations in the directory that are permitted in the profile.

To establish and manage access rights granted to directory integration servers, Oracle Directory Integration Platform creates a group entry, called `odisgroup`, during installation. The DN of `odisgroup` is `cn=odisgroup, cn=odi, cn=oracle`

internet directory. When a directory integration server is registered, it becomes a member of this group.

You control the access rights granted to directory integration servers by placing access control policies in the `odisgroup` entry. The default policy grants various rights to directory integration servers for accessing the profiles. For example, the default policy enables the directory integration server to compare user passwords between Oracle Internet Directory and a connected directory it binds as a proxy on behalf of a profile. It also enables directory integration servers to modify status information in the profile—such as the last successful execution time and the synchronization status.

Access Controls for Profiles

To control access to Oracle Internet Directory data by using integration profiles, place appropriate access control policies in Oracle Internet Directory. This enables you to protect data synchronized or processed by one profile from interference by another profile. It also enables you to allow only the integration profile that owns synchronization of an attribute to modify that attribute.

See Also: The chapter on access control, specifically, the section about security groups, in *Oracle Internet Directory Administrator's Guide* for instructions about setting access control policies for group entries

For example, creating a group entry called `odipgroup` when installing the Oracle Internet Directory enables you to control the access rights granted to various profiles. Rights are controlled by placing appropriate access policies in the `odipgroup` entry. Each profile is a member of this group. The membership is established when the profile is registered in the system. The default access policy, automatically installed with the product, grants to profiles certain standard access rights for the integration profiles they own. One such right is the ability to modify status information in the integration profile, such as the parameter named `orclodipConDirLastAppliedChgTime`. The default access policy also permits profiles to access Oracle Internet Directory change logs, to which access is otherwise restricted.

The `odisgroup` group entries and their default policies are created during the server installation of Oracle Internet Directory. Oracle Directory Integration Platform-only installations do not create these groups and policies.

Data Integrity and Oracle Directory Integration Platform

Oracle Directory Integration Platform ensures that data is not modified, deleted, or replayed during transmission by using SSL. This SSL feature generates a cryptographically secure message digest—through cryptographic checksums using either the Message-Digest algorithm 5 (MD5) or the Secure Hash Algorithm (SHA)—and includes the message digest with each packet sent across the network.

Data Privacy and Oracle Directory Integration Platform

Oracle Directory Integration Platform ensures that data is not disclosed during transmission by using public-key encryption available with SSL. In public-key encryption, the sender of a message encrypts the message with the public key of the recipient. Upon delivery, the recipient decrypts the message using the recipient's private key.

To exchange data securely between the directory integration server and Oracle Internet Directory, you run both components in SSL mode.

Tools Security and Oracle Directory Integration Platform

You can run all the commonly used tools in SSL mode to transmit data to Oracle Internet Directory securely. These tools include:

- Oracle Directory Manager
- The Oracle directory integration server registration tool
- The Oracle Directory Integration Server Administration tool
- The Directory Integration Assistant (dipassistant)
- The Provisioning Subscription Tool

Part II

General Administration of Oracle Directory Integration Platform

Part II describes some of the general administrative tasks involved in running Oracle Directory Integration Platform. You can find more specific administrative information in the respective sections of this guide.

Part II contains the following chapters:

- [Chapter 3, "Oracle Directory Integration Platform Administration Tools"](#)
- [Chapter 4, "Managing the Oracle Directory Integration Platform"](#)

Oracle Directory Integration Platform Administration Tools

This chapter describes the Oracle Directory Integration Server Administration tool along with various other tools used for administering Oracle Directory Integration Platform. It contains these topics:

- [Using Oracle Directory Integration Server Administration Tool](#)
- [Graphical Tools for Oracle Directory Integration Platform Administration](#)
- [Command-Line Tools for Oracle Directory Integration Platform Administration](#)

Using Oracle Directory Integration Server Administration Tool

The Oracle Directory Integration Server Administration tool is a Java-based utility for graphically administering the Oracle directory integration platform. This section describes some of its basic features.

This section contains these topics:

- [Starting the Oracle Directory Integration Server Administration Tool](#)
- [Connecting to a Directory Server by Using the Oracle Directory Integration Server Administration Tool](#)
- [Understanding the Oracle Directory Integration Server Administration Tool Interface](#)
- [Disconnecting from a Directory Server by Using the Oracle Directory Integration Server Administration Tool](#)

Starting the Oracle Directory Integration Server Administration Tool

Before you can start the Oracle Directory Integration Server Administration tool, a directory server instance must be running.

See Also: [Chapter 7, "Administration of Directory Synchronization"](#) for information about how to administer the Oracle directory integration platform with the Oracle Directory Integration Server Administration tool

To start the Oracle Directory Integration Server Administration tool, follow the instructions for your operating system, as described in [Table 3-1](#).

Table 3–1 Operating System-Specific Instructions for Starting Oracle Directory Integration Server Administration Tool

Operating System	Instructions
Windows	From the Start menu, select Programs , then ORACLE_HOME , then Integrated Management , then Oracle Directory Integration Server Administration .
UNIX/Linux	If you did not set the path, then navigate to \$ORACLE_HOME/bin. At the system prompt, enter: dipassistant -gui

The first time you start the Oracle Directory Integration Server Administration tool, an alert tells you that you must connect to a server. Click **OK**. The [Directory Server Connection Window](#) dialog box appears.

Connecting to a Directory Server by Using the Oracle Directory Integration Server Administration Tool

Note: To use this tool, you must be a member of the following group: cn=dipadmingrp, cn=dipadmin, cn=directory integration platform, cn=products, cn=oraclecontext. If you do not have the correct privileges, then access to the tool is denied.

To connect to a directory server:

1. In the [Directory Server Connection Window](#) dialog box, enter the name and port number of an available server.

The default port is 389. You can change the port number. However, if you have an Oracle directory server running on a port that is not the default, then be sure that any clients that use that server are informed of the correct port.

Click **OK**. The Oracle Directory Integration Server Administration Connect dialog box appears.

If the directory server to which you want to connect does not appear in the initial login window—that is, it is not the default directory server—then you can select another directory server by clicking the button to the right of the **Server** field.

The dialog box then displays a list of all directory servers to which you have connected at any time in the past. You can select a directory server from the list, connect to it, delete it, edit it, or use it as a template for another management connection.

To connect to a server from the list, select it and click **Select** at the bottom of the dialog box. The server and port appear in the Oracle Internet Directory Connect dialog box, from which you can connect.

To delete an existing defined connection, select the server, then click **Delete**. The server entry is removed from your list of defined management connections.

To define a new management connection:

- To add a new management connection, click **Add**. This displays the Directory Server Connection dialog box. After you enter a server name and port in this dialog box and click **OK**, the new management connection appears in the list

in the Select Directory Server dialog box. From here, you can select it to appear in the Oracle Internet Directory Connect dialog box, and thus connect.

- To use an existing management connection as the template for a new connection, select the server you want to use as a template, then click **Add Like**. The Directory Server Connection dialog box appears, with the template server information filled in. You must edit these entries to create a new management connection. After you enter a server name and port in this dialog box and click **OK**, the new management connection appears in the list in the Select Directory Server dialog box. From here you can select it to appear in the Oracle Internet Directory Connect dialog box, and thus connect.
 - To edit an existing connection, select it, then click **Edit**. The Directory Server Connection dialog box appears, with the server and port information filled in. Edit the entries and save any changes. After you enter a server name and port in this dialog box and click **OK**, the new management connection appears in the list in the Select Directory Server dialog box. From here, you can select it to appear in the Oracle Internet Directory Connect dialog box, and thus connect.
2. In each field of the **Credentials Tab** page, enter the information specific to this server instance.

The fields in the Credentials tab page are described in [Table A-1](#) on page A-1.

See Also:

- The chapter on SSL and the directory in *Oracle Internet Directory Administrator's Guide* for instructions about enabling SSL and about the impact of changing ports on security
 - The section about entries in the concepts chapter of *Oracle Internet Directory Administrator's Guide* for instructions about formatting distinguished names
 - *Oracle Advanced Security Administrator's Guide* for instructions about creating a wallet by using Oracle Wallet Manager when using SSL
3. If you selected the **SSL Enabled** check box on the **Credentials** tab page, then select the **SSL** tab.
 4. In the **SSL Tab** page, enter the requested data in the fields.
The fields in the SSL tab page are described in [Table A-3](#) on page A-3.
 5. Select **Login**. The Oracle Directory Integration Server Administration tool appears.

Understanding the Oracle Directory Integration Server Administration Tool Interface

This section provides an overview of Oracle Directory Integration Server Administration, and explains the items in the menu bar and the buttons on the toolbar.

Overview of Oracle Directory Integration Server Administration

As with the directory itself, the navigator pane (left side of the double window interface) has a tree-like structure. When the tool first opens, the navigator pane shows only one tree item. By clicking the plus sign (+) next to the tree item, subcomponents of that tree item appear.

In the right pane, some windows contain buttons labeled **Apply** and **OK**. If you click **Apply**, then your changes are committed, and the window remains available for more changes. If you click **OK**, then your changes are committed, and the window closes.

Similarly, some windows have buttons that are labeled **Revert** and **Cancel**. If you click **Revert**, then your changes in that window do not take effect, the original values reappear in the fields, and the window stays open for further work. If you click **Cancel**, then your changes in that window do not take effect, and the window closes.

The Oracle Directory Integration Server Administration Menu Bar

Table 3–2 lists and describes the menus you can access by using the menu bar. Menu items become enabled or disabled depending on the pane or tab page you are displaying.

Table 3–2 Oracle Directory Integration Server Administration Menu Bar

Menu	Menu Items
File	Create —Adds an object.
	Create Like —Adds a new object by using the object selected in the navigator pane as a template.
	Connect —Connects to a directory server selected in the navigator pane.
	Disconnect —Disconnects from a directory server selected in the navigator pane.
	Exit —Exits the Oracle Directory Integration Server Administration tool.
Edit	Edit —Modifies an object.
	Remove —Removes an object.
	Find Objects —Searches for either an object class or an attribute, depending on the context.
View	Refresh —Updates data stored in memory to reflect changes in the database.
	Tear-Off —Generates a secondary dialog box containing the fields and values displayed in the Oracle Directory Integration Server Administration tool's right pane. This is useful when comparing two pieces of information.
Help	Contents —Displays the Contents tab page of the Help navigator.
	Search for Help On... —Displays the Help Search dialog box that you use to search for words in the online Help guide.
	About Oracle Internet Directory —Displays Oracle Internet Directory version information.

Disconnecting from a Directory Server by Using the Oracle Directory Integration Server Administration Tool

To disconnect from a directory server by using the Oracle Directory Integration Server Administration tool, from the **File** menu select **Disconnect**. Also, when you exit the Oracle Directory Integration Server Administration tool, connections between all directory servers and the directory are automatically disconnected.

All connection information is stored in the user's home directory in the file `osdadmin.ini`.

When you restart the Oracle Directory Integration Server Administration tool, all previous server connections appear in the Directory Server Login dialog box.

Graphical Tools for Oracle Directory Integration Platform Administration

In addition to the Oracle Directory Integration Server Administration tool, you can use the following graphical tools to administer Oracle Directory Integration Platform:

- [Oracle Directory Manager](#)
- [Oracle Internet Directory Self-Service Console](#)
- [Oracle Internet Directory Provisioning Console](#)

Oracle Directory Manager

Oracle Directory Manager is a Java-based tool to graphically administer Oracle Internet Directory. You can use Oracle Directory Manager to:

- Create, modify, and delete directory integration profiles for synchronization
- Monitor synchronization profiles and synchronization status
- Monitor the status of all Oracle directory integration server instances
- Troubleshoot synchronization problems

See Also:

- *Oracle Internet Directory Administrator's Guide* for more information about Oracle Directory Manager
- [Chapter 4, "Managing the Oracle Directory Integration Platform"](#)

Oracle Internet Directory Self-Service Console

The Oracle Internet Directory Self-Service Console enables you to delegate administrative privileges to various administrators and to users. It is a ready-to-use standalone application created by using Oracle Delegated Administration Services that provides a single graphical interface for delegated administrators and users to manage data in the directory. The Oracle Internet Directory Self-Service Console enables both administrators and users, depending on their privileges, to perform various directory operations. In an integrated deployment, the Oracle Internet Directory Self-Service Console is primarily used for customizing realm parameters.

See Also: *Oracle Identity Management Guide to Delegated Administration*

Oracle Internet Directory Provisioning Console

The Oracle Internet Directory Provisioning Console provides a single graphical interface for administrators to provision users in Oracle Internet Directory. The Provisioning Console was created with Oracle Delegated Administration Services, and works alongside the Oracle Internet Directory Self-Service Console.

See Also: [Part IV, "Provisioning with the Oracle Directory Integration Platform"](#)

Command-Line Tools for Oracle Directory Integration Platform Administration

The following command-line tools are available for administering Oracle Directory Integration Platform:

- [OID Control and OID Monitor](#)
- [Oracle Directory Integration Platform Registration Tool](#)
- [Directory Integration Assistant](#)
- [Provisioning Subscription Tool](#)
- [Entry and Attribute Management Command-Line Tools](#)
- [Schema Synchronization Tool](#)

See Also: *Oracle Identity Management User Reference* for the required syntax for each of the tools discussed in this section, along with information on other command-line tools that you can use to administer Oracle Internet Directory and Oracle Directory Integration Platform

OID Control and OID Monitor

OID Control and OID Monitor enable you to start, stop, and monitor the Oracle directory integration platform.

In Oracle Internet Directory, you can use OID Control and OID Monitor to control the directory integration server in the `ORACLE_HOME` where either the Oracle directory server or Oracle directory integration server is installed.

If the Oracle Internet Directory installation is client-only, then the OID Control Utility and OID Monitor are not installed. In this case, start the Oracle directory integration server manually. In this configuration you can still use the Oracle Directory Integration Server Administration tool to learn the status of the Oracle directory integration server.

See Also: [Chapter 4, "Managing the Oracle Directory Integration Platform"](#)

Oracle Directory Integration Platform Registration Tool

The Oracle Directory Integration Platform Registration tool (`odisrvreg`) registers an Oracle directory integration platform with the directory. It does this by creating an entry in the directory and setting the password for the Oracle directory integration platform. If the registration entry already exists, then you can use the `odisrvreg` tool to reset the existing password. The `odisrvreg` tool also creates a local file named `odisrvwallet_hostname`, at `$ORACLE_HOME/ldap/odi/conf`. This file acts as a private wallet for the Oracle directory integration platform, which uses it during startup to bind to the directory.

Directory Integration Assistant

The Directory Integration Assistant (`dipassistant`) is the command-line version of the Oracle Directory Integration Server Administration tool. Some of the tasks you can perform with the Directory Integration Assistant include:

- Creating, modifying, and deleting synchronization profiles

- Viewing all synchronization profile names in Oracle Internet Directory
- Viewing the details of a specific synchronization profile
- Migrating data (or "bootstrapping") between a connected directory and Oracle Internet Directory
- Setting the wallet password for Oracle directory integration platform
- Resetting the password of the Oracle Directory Integration Platform administrator
- Moving integration profiles to a different Oracle Internet Directory node

Note: Starting with Oracle Identity Management 10g (10.1.4.2), the Directory Integration Assistant (diassistant) also supports Secure Sockets Layer (SSL).

Provisioning Subscription Tool

You use the Provisioning Subscription tool (`oidprovtool`) to administer provisioning profile entries in the directory. More specifically, you can use the Provisioning Subscription tool to:

- Create new provisioning profiles
- Enable or disable existing provisioning profiles
- Modify existing provisioning profiles
- Delete existing provisioning profiles
- Get the current status of a provisioning profile
- Clear all errors in an existing provisioning profile

Entry and Attribute Management Command-Line Tools

[Table 3–3](#) lists the entry and attribute management command-line tools that you can use with Oracle Directory Integration Platform.

Table 3–3 Entry and Attribute Management Command-Line Tools

Tool	Description
Catalog Management tool (<code>catalog.sh</code>)	Indexes attributes
<code>ldapadd</code>	Adds entries and their object classes, attributes, and values to the directory
<code>ldapaddmt</code>	Supports multiple threads for concurrently adding entries and their object classes, attributes, and values to the directory
<code>ldapbind</code>	Determines whether you can authenticate a client to a server
<code>ldapcompare</code>	Matches specified attribute values with an entry's attribute values
<code>ldapdelete</code>	Removes entries from the directory
<code>ldapmoddn</code>	Modifies an entry's DN or RDN
<code>ldapmodify</code>	Modifies an entry's attributes
<code>ldapmodifymt</code>	Supports multiple threads to modify entries concurrently
<code>ldapsearch</code>	Searches for entries in the directory

Schema Synchronization Tool

The Schema Synchronization tool (`schemasync`) tool enables you to synchronize schema elements—namely attributes and object classes—between Oracle Internet Directory and third-party LDAP directories.

Managing the Oracle Directory Integration Platform

This chapter discusses the Oracle directory integration server and explains how to configure and manage it. It contains these topics:

- [Operational Information About the Oracle Directory Integration Platform](#)
- [Viewing Oracle Directory Integration Platform Information](#)
- [Managing Configuration Set Entries](#)
- [Managing Multiple Profiles](#)
- [Managing the SSL Certificates of Oracle Internet Directory and Connected Directories](#)
- [Starting, Stopping, and Restarting the Oracle Directory Integration Platform](#)
- [Starting and Stopping the Oracle Directory Integration Platform in a High Availability Scenario](#)
- [Setting the Debugging Level for the Oracle Directory Integration Platform](#)
- [Managing Oracle Directory Integration Platform in a Replicated Environment](#)
- [Finding Log Files](#)
- [Manually Registering the Oracle Directory Integration Platform](#)

See Also: "Oracle Directory Integration Server" on page 1-5 for a summary of the functions performed by the Oracle directory integration platform

Note: For security reasons, Oracle recommends that you run the Oracle directory integration server on the same host as the directory server. If you run them on different hosts, then run them by using SSL as described in the chapter about SSL and the directory in *Oracle Internet Directory Administrator's Guide*.

Operational Information About the Oracle Directory Integration Platform

This section introduces structural and operational information about the Oracle directory integration platform and contains these topics:

- [Directory Integration Profiles](#)
- [Oracle Directory Integration Platform and Configuration Set Entries](#)

- [Standard Sequences of Oracle Directory Integration Platform Events](#)
- [Oracle Directory Integration Platform Event Propagation in a Multimaster Oracle Internet Directory Replication Environment](#)

Directory Integration Profiles

In Oracle Directory Integration Platform, you can create two types of profiles: a directory synchronization profile and a directory provisioning profile. A [directory synchronization profile](#) describes how synchronization is carried out between Oracle Internet Directory and an external system. You can create two types of directory synchronization profiles: an import profile and an export profile. An import profile imports changes from a connected directory to Oracle Internet Directory while an export profile exports changes from Oracle Internet Directory to a connected directory. A [directory provisioning profile](#) describes the nature of provisioning-related notifications that Oracle Directory Integration Platform sends to the directory-enabled applications. Each type of profiles is special kind of [directory integration profile](#), which is an entry in Oracle Internet Directory that describes how Oracle Directory Integration Platform communicates with external systems and what is communicated.

Oracle Directory Integration Platform and Configuration Set Entries

Each Oracle directory integration server can execute a set of connectors either for:

- Synchronizing between Oracle Internet Directory and connected directories. The set of connectors for synchronization is provided in the configuration set number entered in the command line when starting the Oracle directory integration server.
- Provisioning users, groups, and realms for Oracle components. The set of profiles for provisioning is provided in the `grpID` argument in the command line when starting the Oracle directory integration server.

If the configuration set number is not specified, then the Oracle directory integration server starts in the mode for processing provisioning profiles. If the configuration set number is specified, but there are no integration profiles in the directory for the specified configuration set number, then the Oracle directory integration server waits until integration profiles are added to that configuration set. This wait also occurs if integration profiles are configured for the configuration set but are disabled.

If the configuration set specified in the command line does not exist in the directory, then the Oracle directory integration server logs this information in the log file and exits. For provisioning profiles, the same behavior is followed for the `grpID` attribute, which is passed as an argument in the command line.

Whenever a connector is scheduled to do synchronization or provisioning, the Oracle directory integration server starts a separate thread. This thread opens an LDAP connection to the directory server to read or write entries from Oracle Internet Directory, and then closes the connection before exiting.

The Oracle directory integration platform executes three types of threads in the process, and these are described in [Table 4-1](#).

Table 4–1 Oracle Directory Integration Platform Threads

Thread	Description
Main thread	Daemon thread of the Oracle directory integration server. To look for changed profiles and to refresh its cache, it starts the scheduler and periodically sends refresh signals to it. This thread also looks for the shutdown signal from the OID Monitor (oidmon). This signal causes the thread to shut itself down after it sends a signal to the scheduler to shut down.
Scheduler thread	Scheduler for the connectors for synchronization based on their specified scheduling interval. This thread refreshes the synchronization profiles to the latest values after it receives a signal from the main thread.
Connector thread	In a synchronization, the thread that invokes the connector executable file named in the profile, and maps and filters the attributes. It is spawned by the scheduler at specified individual scheduling intervals. Once all the changes from the source directory are propagated to the destination directory, this thread exits.

Standard Sequences of Oracle Directory Integration Platform Events

Each instance of the Oracle directory integration server supports either provisioning or synchronization. The Oracle directory integration server runs as a shared server process while handling the synchronization and provisioning event propagations.

The three threads described in [Table 4–1](#) work together to create these typical process flow sequences:

Main Thread Process Sequence

On startup, the main thread comes up. This daemon thread of the server starts the scheduler. It verifies the registration of the instance in the directory. If the instance is not registered, then it is not started by OID Monitor. Instead, it registers itself in Oracle Internet Directory with the configuration set number and the instance number.

The main thread periodically checks for the refresh time and signals the scheduler to refresh the main thread. It also periodically checks for the shutdown signal. When the shutdown signal is received, the scheduler thread shuts down.

After the scheduler thread shuts down, the main thread unregisters and shuts down.

Scheduler Thread Process Sequence

When it is started by the main thread, the scheduler thread reads the configuration set to determine which integration profiles to schedule. It creates a list of profiles to be scheduled, and schedules them based on their specified scheduling interval. While creating the list of profiles, the scheduler thread validates the attributes. If any of the profile attributes have invalid values, the profile is not considered for synchronization or provisioning.

When it receives the refresh signal, the scheduler thread refreshes the integration profiles. When it receives the shutdown signal, the scheduler thread waits until all the connectors complete the synchronization or provisioning event propagation. Then, it returns control to the main thread.

Connector Thread Process Sequence for Synchronization

A synchronization thread follows this process:

1. Establishes a connection with the connected directory and Oracle Internet Directory.

2. In an import operation, executes any agent execution command that is specified in the connector.
3. Opens the DB/LDAP/LDIF/Tagged file if required.
4. Reads the changes from the source one at a time.
5. Filters the changes, if applicable.
6. Maps the changes, as specified by the mapping rules.
7. Creates the destination change record.
8. Writes the changes to the destination.
9. After applying all the changes, closes the thread.

Connector Thread Process Sequence for Provisioning

A provisioning thread follows this process:

1. Establishes a connection with the connected directory.
2. Reads the changes from the source, one at a time.
3. Filters the changes, if applicable.
4. Identifies the change as a specific event—that is:
 - USER Add/Modify/Delete
 - GROUP Add/Modify/Delete
5. Creates the event notification record.
6. Invokes the given package to consume the event notification.

Oracle Directory Integration Platform Event Propagation in a Multimaster Oracle Internet Directory Replication Environment

In a multimaster Oracle Internet Directory replication environment, changes to directory integration profiles on one Oracle Internet Directory node are not automatically replicated on other Oracle Internet Directory nodes. For this reason, you must observe the considerations that are outlined in this section when you implement Oracle Directory Integration Platform in a multimaster Oracle Internet Directory replication environment.

Directory Synchronization in a Multimaster Oracle Internet Directory Replication Environment

Because directory synchronization profiles on a primary Oracle Internet Directory node are not automatically replicated to secondary Oracle Internet Directory nodes, you should manually copy the profiles on the primary node to any secondary nodes on a periodic basis. This allows a directory synchronization profile to execute on a secondary node in the event of a problem on the primary node. However, the value assigned to the `lastchangenumber` attribute in a directory synchronization profile is local to the Oracle Internet Directory node where the profile is located. This means that if you copy a directory synchronization profile from one Oracle Internet Directory node to another, the correct state of synchronization or event propagation will not be preserved.

Note: If the primary node running either the directory replication server (`oidrep1d`), or the Oracle directory integration server (`odisrv`), or both fails, then the OID Monitor on the secondary node starts these processes on the secondary node after five minutes. However, when the primary node is restarted, these servers are not automatically restarted on the primary node.

Normal shutdown is not treated as a failover—that is, after a normal shutdown, the OID Monitor on the secondary node does not start these processes on the secondary node after five minutes. However, as in the case of a failure, when the primary node is restarted, these servers are not automatically restarted on the primary node.

When copying import profiles from one node to another, the `lastchangenumber` attribute is irrelevant because the value is obtained from the connected directory. However, after copying an export profile to a target node, you must update the `lastchangenumber` attribute with the value from the target node, as follows:

1. Stop the Oracle directory integration server as explained in ["Stopping the Oracle Directory Integration Platform"](#) on page 4-9.
2. Get the value of the `lastchangenumber` attribute on the target node by following the instructions in the `dipassistant showprofile` section in the Oracle Directory Integration Platform tools chapter of *Oracle Identity Management User Reference*.
3. Copy the directory synchronization profiles from the primary node to the target nodes by following the instructions in the `dipassistant reassociate` section of the Oracle Directory Integration Platform tools chapter of *Oracle Identity Management User Reference*.
4. Use the Oracle Directory Integration Server Administration tool or the Directory Integration Assistant (`dipassistant`) to update the `lastchangenumber` attribute in the export profile you copied to the target node with the value you obtained in Step 2.

See Also:

- ["Using Oracle Directory Integration Server Administration Tool"](#) on page 3-1
 - *Oracle Identity Management User Reference*
5. Start the Oracle directory integration server as explained in ["Starting the Oracle Directory Integration Platform"](#) on page 4-9.

Directory Provisioning in a Multimaster Oracle Internet Directory Replication Environment

In a default multimaster Oracle Internet Directory replication environment, the Oracle directory integration platform is installed in the same location as the primary Oracle Internet Directory. If the primary node fails, event propagation stops for all profiles located on the node. Although the events are queued and not lost while the primary node is stopped, the events will not be propagated to any applications that expect them. To ensure that events continue to be propagated even when the primary node is down, you must copy the directory provisioning profiles to other secondary nodes in a multimaster Oracle Internet Directory environment. However, directory provisioning

profiles should only be copied from the primary node to any secondary nodes immediately after an application is installed and before any user changes are made in Oracle Internet Directory.

To copy the directory provisioning profiles from a primary node to any secondary nodes, follow the instructions in the `dipassistant reassociate` command section in the Oracle Directory Integration Platform tools chapter of *Oracle Identity Management User Reference*.

Viewing Oracle Directory Integration Platform Information

When the Oracle directory integration server starts, it generates specific run-time information and stores it in the directory. This information includes:

- The instance number of the Oracle directory integration server
- The host on which it is running
- The configuration set with which the Oracle directory integration server was started
- The group identifier of the provisioning profile group it is running

You can view this information by using either the Oracle Directory Integration Server Administration tool or the `ldapsearch` utility, as described in these topics:

- [Viewing Oracle Directory Integration Platform Runtime Information Using the Oracle Directory Integration Server Administration Tool](#)
- [Viewing Oracle Directory Integration Platform Runtime Information Using the ldapsearch Utility](#)

Viewing Oracle Directory Integration Platform Runtime Information Using the Oracle Directory Integration Server Administration Tool

To view runtime information for the Oracle directory integration server instance using the Oracle Directory Integration Server Administration tool:

1. In the navigator pane, expand the *directory server instance*.
2. Select **Integration Profile Configuration**. The Active Processes box appears in the right pane and displays the Oracle directory integration platform runtime information.

Viewing Oracle Directory Integration Platform Runtime Information Using the ldapsearch Utility

To view registration information for the Oracle directory integration server instance using the `ldapsearch` utility, perform a base search on its entry. For example:

```
ldapsearch -p 3060 -h my_host -D "mybinddn" -w password -b  
cn=instance1,cn=odisrv,cn=subregistrysubentry -s base -v "objectclass=*"
```

This example search returns the following:

```
dn: cn=instance1,cn=odisrv,cn= subregistrysubentry  
cn: instance1  
orclodipconfigdns: orclodipagentname=HRAgent,cn=subscriber profile,cn=changelog  
subscriber,cn=oracle internet directory  
orcldiaconfigrefreshflag: 0  
orclhostname: my_host
```



```
orclconfigsetnumber: 1
objectclass: top
objectclass: orclODISInstance
```

Managing Configuration Set Entries

You can create, modify, and view configuration set entries using either the Oracle Directory Integration Server Administration tool or the Directory Integration Assistant (dipassistant). Configuration set entries determine the behavior of the Oracle directory integration server by identifying the parameters with which the Oracle Directory Integration Platform instance is started. Typical Oracle Directory Integration Platform start up configuration set parameters include `refreshinterval`, `searchtimelimit`, `searchsizelimit`, `tracefilesize`, and `auditfilesize`. The configuration set parameters are available in Oracle Internet Directory, which is the metadata repository. Configuration information is stored in the following DIT: `cn=Server Config`, `cn=Directory Integration Platform`, `cn=Products`, `cn=Oraclecontext`. The following example demonstrates how to start Oracle Directory Integration Platform by specifying configuration set 0 with the `oidctl` command:

```
oidctl server=odisrv inst=1 configset=0 flags="host=oidhost port=oidport" start
```

You can control the run-time behavior of the Oracle directory integration server by using a different configuration set entry when you start it. For example, you can start instance 1 of the Oracle directory integration server on host H1 with `configset1`, and instance 2 on host H1 with `configset2`. The behavior of instance 1 depends on `configset1`, and that of instance 2 depends on `configset2`. Dividing the agents on host H1 between two configuration set entries distributes the load between the two Oracle directory integration server instances. Similarly, running different configuration sets and different instances on different hosts balances the load between the servers.

You can also use a connector group to manage multiple profiles. A connector group is represented by the `grpID` parameter of the `oidctl` command or the `group` parameter of the `dipassistant` command.

Managing Multiple Profiles

Prior to 10g (10.1.4.2), multiple profiles could be organized by associating the profiles with configuration set entries. In 10g (10.1.4.2) profiles are organized by associating them with connector groups. A connector group is represented by the `grpID` parameter of the `oidctl` command or the `dipassistant` command.

If you upgrade to Release 10g (10.1.4.2) from an earlier version of Oracle Directory Integration Platform, new groups are created to organize the profiles that were previously organized by configuration set. These new groups are assigned the same name as the configuration set entries. Oracle recommends that you avoid using the same name for configuration set entries and connector groups. For this reason, when the upgrade process is complete you should rename the new connector groups to names other than the original configuration set names. For example, a new connector group named `configset1` could be renamed to `group1`.

Managing the SSL Certificates of Oracle Internet Directory and Connected Directories

The Oracle directory integration server can use SSL to connect to Oracle Internet Directory and connected directories. When using SSL with no authentication to

connect to Oracle Internet Directory, no certificate is required. However, when connecting to Oracle Internet Directory using SSL with server authentication, you need a trust-point certificate to connect to the LDAP server. The Oracle directory integration server expects the certificate to be in a wallet, which is a data structure used to store and manage security credentials for an individual entity. Oracle Wallet Manager is an application that wallet owners and security administrators use to manage and edit the security credentials in their wallets.

See Also: The chapter about Oracle Wallet Manager in *Oracle Advanced Security Administrator's Guide*

The location of the wallet and the password to open it are stored in a properties file used by Oracle Directory Integration Platform. This file is `$ORACLE_HOME/ldap/odi/conf/odi.properties`.

A typical `odi.properties` file has the entries described in [Table 4–2](#). You must update the `odi.properties` file with values that are appropriate to your deployment.

Table 4–2 Entries in the `odi.properties` File

Entry	Description
<code>RegWalletFile: odi/conf/srvWallet</code>	Identifies the location of the registration information of Oracle Directory Integration Platform with Oracle Internet Directory. The location of the file is in relation to the <code>\$ORACLE_HOME/ldap</code> directory.
<code>CertWalletFile: location_of_certificate_wallet</code>	Identifies the location of the certificate wallet. The certificate wallet file is the location of the <code>ewallet.p12</code> file.
<code>CertWalletPwdFile: location_of_certificate_wallet_password_file</code>	Identifies the location of the file containing the encrypted wallet password. You must update this password by using the Directory Integration Assistant (<code>dipassistant</code>).
See Also: The chapter on SSL and the directory in <i>Oracle Internet Directory Administrator's Guide</i> <i>Oracle Identity Management User Reference</i>	

As an example, an `odi.properties` file can look like this:

```
RegWalletFile: /private/myhost/orahome/ldap/odi/conf
CertWalletFile: /private/myhost/orahome/ldap/dipwallet
CertWalletPwdFile: /private/myhost/orahome/ldap/
```

In the preceding example, the file locations are absolute path names. In this example, the wallet file `ewallet.p12` is located in the `/private/myhost/orahome/ldap/dipwallet` directory.

Starting, Stopping, and Restarting the Oracle Directory Integration Platform

This section tells you how to start, stop, and restart the Oracle Directory Integration Platform. It contains these topics:

- [Starting the Oracle Directory Integration Platform](#)
- [Stopping the Oracle Directory Integration Platform](#)

- [Restarting the Oracle Directory Integration Platform](#)

Note: When the Oracle directory integration server is invoked in the default mode, it supports only the Oracle Directory Integration Platform Service, not the Oracle Directory Synchronization Service.

Starting the Oracle Directory Integration Platform

Oracle Directory Integration Platform can be installed as a component of Oracle Internet Directory or as a standalone installation. How you start the Oracle directory integration server depends on whether you install Oracle Directory Integration Platform as a component of Oracle Internet Directory or as a standalone installation.

To start Oracle Directory Integration Platform as a component of Oracle Internet Directory, you use the Oracle Internet Directory Monitor (`oidmon`) and the Oracle Internet Directory Control Utility (`oidctl`). You can start both utilities at the same time by using the Oracle Process Manager and Notification Server Control Utility (`opmnctl`). When you install Oracle Directory Integration Platform as a component of Oracle Internet Directory, an instance of the Oracle directory integration server is started that only processes provisioning requests. To start an additional instance of Oracle directory integration server that performs synchronization, you must use the Oracle Internet Directory Control Utility (`oidctl`). The `oidmon`, `oidctl`, and `opmnctl` utilities are documented in the Oracle Identity Management server administration tools chapter of *Oracle Identity Management User Reference*.

To start a standalone installation of Oracle Directory Integration Platform, use the Oracle Directory Integration Server Control Tool (`odisrv`), which is also documented in the Oracle Identity Management server administration tools chapter of the *Oracle Identity Management User Reference*. In a standalone installation of Oracle Directory Integration Platform, the Oracle directory integration server instance starts by default if no other Oracle directory integration server instance is running within the same Oracle Application Server infrastructure.

CAUTION: If you manually stop and then start the server within 30 seconds, the old server instance may not shut down before the new instance starts. This is because the Oracle directory integration server determines whether to shut down by polling the registration entry stored under `cn=odisrv,cn=subregistrysubentry` every 30 seconds. For this reason, be sure to wait for 30 seconds before restarting the server.

Stopping the Oracle Directory Integration Platform

How you stop the Oracle directory integration server depends on the utility you used to start it. If you started the server with either the `oidctl` or the `opmnctl` utility, then you must use the `oidctl` utility to stop it. If you used the `odisrv` utility to start the server, you must use the `stopodiserver.sh` command to stop it. You can also use `opmnctl` command to stop all running Oracle Internet Directory instances on a particular node, including directory servers, directory replication server, and Oracle directory integration server. The `oidctl`, `opmnctl`, `odisrv`, and `stopodiserver.sh` utilities are documented in the Oracle Identity Management server administration tools chapter of *Oracle Identity Management User Reference*.

Restarting the Oracle Directory Integration Platform

To restart the Oracle directory integration server, first stop the server using the procedures described in ["Stopping the Oracle Directory Integration Platform"](#) on page 4-9, wait 30 seconds, then start the server again using the procedures described in ["Starting the Oracle Directory Integration Platform"](#) on page 4-9. You need to wait 30-seconds because the Oracle directory integration server determines whether to shut down by polling the registration entry stored under `cn=odisrv,cn=subregistrysubentry` at 30 second intervals. If you start the server before the next polling interval, the first instance of the server will not be stopped, resulting in two running instances.

Starting and Stopping the Oracle Directory Integration Platform in a High Availability Scenario

The Oracle directory integration platform can, with certain restrictions, execute in various high availability scenarios. This section discusses the Oracle directory integration server as it operates in an Oracle Real Application Clusters environment and in an Oracle Application Server Cold Failover Cluster (Infrastructure). It contains these topics:

- [Oracle Directory Integration Platform in an Oracle Real Application Clusters Environment](#)
- [Oracle Directory Integration Platform in an Oracle Application Server Cold Failover Cluster \(Infrastructure\)](#)

In either type of high availability environment, there are two common scenarios for configuring Oracle Directory Integration Platform. They are:

- Collocated—The Oracle directory integration server is located within the cluster on the same node as Oracle Internet Directory.
- Outside the cluster—The Oracle directory integration server is installed on a separate node, outside the cluster.

Oracle Directory Integration Platform in an Oracle Real Application Clusters Environment

The Oracle Internet Directory infrastructure is configured to work in an Oracle Real Application Clusters (Oracle RAC) mode. In Oracle RAC, the Oracle directory integration server can execute against any directory node.

A particular configuration set can be executed by only one instance of the Oracle directory integration server. For this reason, during the default installation only one server instance—namely, instance 1—is started on the Oracle RAC master node. This server instance executes configuration set 0. Although it is started only on the master node, the server is nevertheless registered on all the nodes.

If the master node fails, then the Oracle directory integration server instance is started by the OID Monitor on a secondary node. If there are multiple secondary nodes, then the server is started by the first OID Monitor to recognize the master node failure.

When it starts the server, the OID Monitor uses the same instance number and configuration set that was used on the master node. This is transparent to the end user, and, once it is done, the Oracle directory integration server on the secondary node behaves as if it is the primary server. The server continues executing on the secondary node as long as that node is available.

Two separate instances of the Oracle directory integration server running on two nodes cannot simultaneously execute the same configuration set. Although the OID Monitor does not check for this, the Oracle directory integration server itself fails to start.

You can stop the Oracle directory integration server at any time by using the OID Control utility. However, if you do this, then the server does not start automatically on any other node. To start it on another node, do so manually by using the OID Control utility.

If you execute the `opmnctl stopall` command, and subsequently execute the `opmnctl startall` command, then the Oracle directory integration server starts.

In summary, unless an OID Control command stops the Oracle directory integration server, the OID Monitor ensures that the server is running.

Collocated Configurations

In a collocated configuration, you can start Oracle Directory Integration Platform from any node in the cluster. Once the Oracle directory integration server is started on the first node, you do not need to start it on any other node. On failure of the Oracle directory integration server node, another node in OracleAS Cluster (Identity Management) will detect the failure and start the Oracle directory integration server. No additional OID Control command is required to register the Oracle directory integration platform.

In most cases, the Oracle Directory Integration Platform server communicates with only the single, default instance of the Oracle directory server. It is possible, however, to have manually configured the Oracle directory integration server to communicate with a second instance of the Oracle directory server. If the second instance of the Oracle directory server is not configured on the other nodes, then on failover, the surviving node will start both Oracle Directory Integration Platform and a second instance of the Oracle directory server.

In a collocated configuration, node failure is handled as follows: the OID Monitor on a surviving node keeps polling all other nodes every 10 seconds. When a node detects that one node is not responding, the OID Monitor on the surviving node starts the Oracle directory integration server and possibly the LDAP server (if it is not on the default node).

Outside-the-Cluster Configurations

In an outside-the-cluster configuration, the Oracle directory integration server node does not have failover capability. In this configuration, you can configure Oracle Directory Integration Platform to connect to the Oracle Internet Directory LDAP server using a load balancer or virtual server in front of the multiple Oracle Internet Directory nodes.

Oracle Directory Integration Platform in an Oracle Application Server Cold Failover Cluster (Infrastructure)

In this configuration, you start the Oracle directory integration server with a virtual hostname. This is the default configuration on installation.

If the active node fails, then the OID Monitor on a standby node starts the Oracle directory integration server instance on the standby node. When it does this, it uses the same instance number and configuration set as previously used on the active node. This is transparent to the end user. The server continues executing on the active node as long as the node is available. In an Oracle Application Server Cold Failover Cluster

(Infrastructure), the server is registered once for both the active and standby nodes because the virtual host names are the same for both.

You can stop the Oracle directory integration server at any time by using the OID Control utility. However, if you do this, then the server does not start again on this node. Moreover, if this node fails over, then the OID Monitor on the standby node does not start the Oracle directory integration server. To start the server, you must use the OID Control utility.

If you execute the `opmnctl stopall` command, and subsequently execute `opmnctl startall`, then the Oracle directory integration server starts.

In summary, unless an OID Control command stops the Oracle directory integration server, OID Monitor ensures that the server is running.

See Also: The chapters on Oracle Application Server Cold Failover Cluster (Infrastructure) in *Oracle Application Server High Availability Guide*

Collocated Configurations

In a collocated configuration, start the Oracle Directory Integration Platform server using this command:

```
oidctl connect=connStr host=virtualHost server=odisrv instance=1 \  
flags="host=virtualHost port=OIDPORT" start
```

Outside-the-Cluster Configurations

In an outside-the-cluster configuration, to start the Oracle Directory Integration Platform server using this command:

```
oidctl connect=connStr server=odisrv instance=1 \  
flags="host=OIDvirtualHost port=OIDPORT" start
```

Note: There are two `host` parameters in the command-line examples for the collocated and outside-the-cluster configurations:

- The `host` parameter outside the flags specifies the node where the OID Control utility runs and originates requests to the OID Monitor.
 - The `host` parameter inside the flags specifies the LDAP server to which the Oracle Directory Integration Platform and replication servers should connect. This parameter is valid only for those servers.
-

Setting the Debugging Level for the Oracle Directory Integration Platform

You set the debugging level by specifying a value for the `orclodipdebuglevel` attribute in the profile. The value you assign to the `orclodipdebuglevel` attribute enables you to separately control the trace logging levels for the Oracle directory integration server and that of each connector.

For server execution, tracing is stored in the `$ORACLE_HOME/ldap/log/odisrv_nn.log` file, where `nn` is the number of the started instance. For connectors, tracing is stored in the `$ORACLE_HOME/ldap/odi/log/profile_name.trc`.

See Also: [Appendix C, "Troubleshooting the Oracle Directory Integration Platform"](#) for more information about how trace and log files

[Table 4–3](#) lists the server debugging levels you can assign to the `orclodipdebuglevel` attribute. If you specify a nonzero debugging level, then each trace statement in the server log file includes these trace statement types:

- Main—Messages from the controller thread
- Scheduler—Messages from the scheduler thread

Table 4–3 Server Debugging Levels

Debugging Event Type	Numeric Value
Starting and stopping threads	1
Refreshing profiles	2
Initialization, execution, and end details of connectors	4
Details during connector execution	8
Change record of the connector	16
Mapping details of the connector	32
Execution time details of the connector	64

See Also: [Chapter 7, "Administration of Directory Synchronization"](#) for instructions about selectively debugging the threads

If you do not set a value for the debugging flag, then the default level is 0 (zero), and none of the debugging events in [Table 4–3](#) on page 4-13 are logged. However, errors and exceptions are always logged.

You can set the debugging levels for each connector in the profile itself. [Table 4–4](#) lists the connector debugging levels you can assign to the `orclodipdebuglevel` attribute.

Table 4–4 Connector Debugging Levels

Debugging Event Type	Numeric Value
Initializing and terminating	1
Searching within the connection	2
Processing entries after searching	4
Creating change records	8
Processing details of change records	16
Mapping details	32

See Also: The `oidprovtool` section in the Oracle Directory Integration Platform tools chapter of the *Oracle Identity Management User Reference* for information about the debug attribute for a synchronization profile

Managing Oracle Directory Integration Platform in a Replicated Environment

For provisioning and synchronization, the replicated directory is different from the master directory. Any profiles created in the original directory need to be re-created in the new directory, and all configurations must be performed as in the original directory.

Finding Log Files

Execution details and debugging information are in the log file located in the `$ORACLE_HOME/ldap/log/odisrvInstance_number.log` directory.

For example, if the server was started as server instance number 3, then the log file would have this path name: `$ORACLE_HOME/ldap/log/odisrv03.log`.

Any other exceptions in the server are in the file `odisrv_jvm_nnnn.log` where *nnnn* is the identifier of the process running the Oracle directory integration server in that table.

All the profile-specific debugging events are stored in the profile-specific trace file in `$ORACLE_HOME/ldap/odi/log/profile_name.trc`.

Manually Registering the Oracle Directory Integration Platform

The Oracle directory integration server is registered with Oracle Internet Directory during installation of Oracle Directory Integration Platform. This registration creates a footprint in the directory indicating the specified host as the one authorized to run Oracle Directory Integration Platform.

There may be times when you need to perform this registration manually on the client side, for example, if there is a failure during installation. You can do this by using either the Oracle directory integration server registration tool (`odisrvreg`) or Oracle Enterprise Manager 10g Application Server Control Console.

You must separately register each Oracle directory integration server on each host by running `odisrvreg` on that host. To run this tool, you need privileges to administer a directory server.

See Also:

- The `odisrvreg` section in the Oracle Directory Integration Platform tools chapter of the *Oracle Identity Management User Reference* for instructions about using `odisrvreg`
- ["Troubleshooting Synchronization"](#) on page C-23

Manually Registering the Oracle Directory Integration Server Using Oracle Enterprise Manager 10g Application Server Control Console

You can use Oracle Enterprise Manager 10g Application Server Control Console to configure Oracle Directory Integration Platform in an Oracle Identity Management infrastructure. When you do this, Application Server Control Console registers the Oracle directory integration server on that infrastructure.

1. On the main Application Server Control Console page, select the name of the Oracle Application Server instance you want to manage in the **Standalone**

Instances section. The Oracle Application Server home page opens for the selected instance.

2. Click **Configure Components**, located just above the System Components table. The Select Component page appears.

Note: The **Configure Component** button is available only if you have installed but did not configure any Oracle Application Server components.

3. Select **Oracle Directory Integration Platform**, then select **Continue**. The Login screen appears.
4. Enter the user name and password of the directory super user. The default user name is `cn=orcladmin`.
5. Click **Finish** to complete the registration.

Part III

Synchronization with the Oracle Directory Integration Platform

Part III discusses the concepts and components involved in synchronization between the Oracle Directory Integration Platform and other identity management systems. It also discusses things you should consider when deciding how to deploy synchronization.

- [Chapter 5, "Oracle Directory Synchronization Service"](#)
- [Chapter 6, "Configuration of Directory Synchronization Profiles"](#)
- [Chapter 7, "Administration of Directory Synchronization"](#)
- [Chapter 8, "Bootstrapping a Directory in Oracle Directory Integration Platform"](#)
- [Chapter 9, "Synchronization with Relational Database Tables"](#)
- [Chapter 10, "Synchronization with Oracle Human Resources"](#)
- [Chapter 11, "Synchronization with Third-Party Metadirectory Solutions"](#)

Oracle Directory Synchronization Service

This chapter discusses the synchronization profiles and connectors that link Oracle Internet Directory and connected directories. It contains these topics:

- [Components Involved in Oracle Directory Synchronization](#)
- [How Synchronization Works](#)

See Also: [Chapter 1, "Introduction to Oracle Identity Management Integration"](#) for a conceptual discussion of Oracle Directory Integration Platform

Components Involved in Oracle Directory Synchronization

This section discusses the components involved in Oracle Directory synchronization. It contains these topics:

- [Connectors for Directory Synchronization](#)
- [Directory Synchronization Profiles](#)

Connectors for Directory Synchronization

To synchronize between Oracle Internet Directory and a connected directory, Oracle Directory Integration Platform relies on a prepackaged connectivity solution called a connector. Minimally, this connector consists of a **directory integration profile** containing all the configuration information required for synchronization.

Using Connectors with Supported Interfaces

When synchronizing between Oracle Internet Directory and a connected directory, Oracle Directory Integration Platform uses one of these interfaces: DB, LDAP, tagged, or LDIF. If the connected directory uses one of these interfaces, then the connector requires only a directory integration profile for synchronization to occur. For example, the Sun Java System Directory connector provided with Oracle Internet Directory uses the LDAP interface to read the changes from the Sun Java System Directory. The changes are in the format specific to Sun Java System Directory and can be determined by running `ldapsearch` in the Sun Java System Directory.

Using Connectors Without Supported Interfaces

If a connected directory cannot use one of the interfaces supported by Oracle Directory Integration Platform, then, in addition to the directory integration profile, it requires an agent. The agent transforms the data from one of the formats supported by Oracle Directory Integration Platform into one supported by the connected directory. An example is the Oracle Human Resources connector. It has both a prepackaged

integration profile and an Oracle Human Resources agent. To communicate with Oracle Internet Directory, the agent uses the tagged file format supported by Oracle Directory Integration Platform. To communicate with the Oracle Human Resources system, it uses SQL (through an OCI interface).

Directory Synchronization Profiles

A directory integration profile for synchronization, called a **directory synchronization profile**, contains all the configuration information required for synchronization including:

- Direction of synchronization

Some connected directories only receive data from Oracle Internet Directory—that is, they participate in export operations only. Others only supply data to Oracle Internet Directory—that is, they participate in import operations only. Still others participate in both import and export operations.

A separate profile is used for each direction—that is, one profile for information coming into Oracle Internet Directory, and another for information going from Oracle Internet Directory to connected directories.

- Type of interface

Some connected directories can receive data in any of the interfaces built into Oracle Directory Integration Platform. These interfaces include LDAP, tagged, DB (for read-only), and LDIF. For these connected directories, the Oracle Directory Synchronization Service performs the synchronization itself directly, using the information stored in the profile.

- Mapping rules and formats

In a directory synchronization environment, a typical set of entries from one domain can be moved to another domain. Similarly, a set of attributes can be mapped to another set of attributes.

Mapping rules govern the conversion of attributes between a connected directory and Oracle Internet Directory. Each connector stores a set of these rules in the `orclodipAttributeMappingRules` attribute of its synchronization profile. The Oracle directory integration server uses these rules to map attributes as needed when exporting from the directory and interpreting data imported from a connected directory or file. When the Oracle directory integration server imports changes into Oracle Internet Directory, it converts the connected directory's change record into an LDAP change record following the mapping rules. Similarly, during export, the connector translates Oracle Internet Directory changes to the format understood by the connected directory.

- Connection details of the connected directory

These details include such information about the connected directory as host, port, mode of connection—that is, either SSL or non-SSL—and the connected directory credentials.

- Other information

Although the synchronization profile stores most of the information needed by a connector to synchronize Oracle Internet Directory with connected directories, some connectors may need more. This is because some operations require additional configuration information at runtime.

You can store additional connector configuration information wherever and however you want. However, Oracle Directory Integration Platform enables you

to store it in the synchronization profile as an attribute called `orclODIPAgentConfigInfo`. Its use is optional—that is, if a connector does not require such information, then leave this attribute empty.

The configuration information can pertain to the connector, the connected directory, or both. Oracle Internet Directory and Oracle directory integration server do not modify this information. When the connector is invoked, the Oracle directory integration server provides it with the information in this attribute as a temporary file.

See Also: The attribute reference chapter of the *Oracle Identity Management User Reference* for a list and descriptions of the attributes in a directory integration profile

How Synchronization Works

Depending on where the changes are made, synchronization can occur:

- From a connected directory to Oracle Internet Directory
- From Oracle Internet Directory to a connected directory
- In both directions

Regardless of the direction in which the data flows, it is assumed that:

- During synchronization, incremental changes made on one directory are propagated to the other
- Once synchronization is complete, the information is maintained in both directories is the same

This section contains these topics:

- [Synchronizing from Oracle Internet Directory to a Connected Directory](#)
- [Synchronizing from a Connected Directory to Oracle Internet Directory](#)
- [Synchronizing Directories with Interfaces Not Supported by Oracle Internet Directory](#)

Synchronizing from Oracle Internet Directory to a Connected Directory

Oracle Internet Directory maintains a change log in which it stores incremental changes made to directory objects. It stores these changes sequentially based on the change log number.

Synchronization from Oracle Internet Directory to a connected directory makes use of this change log. Consequently, when running the Oracle directory integration server, you must start Oracle Internet Directory with the default setting in which change logging is enabled. If change logging is disabled, you can enable it by using the `-l` flag in the OID Control Utility (`oidctl`), as described in *Oracle Identity Management User Reference*.

Each time the Oracle Directory Synchronization Service processes a synchronization profile, it:

1. Retrieves the latest change log number up to which all changes have been applied.
2. Checks each change log entry more recent than that number.
3. Selects changes to be synchronized with the connected directory by using the filtering rules in the profile.

4. Applies the mapping rules to the entry and makes the corresponding changes in the connected directory.

The appropriate entries or attributes are then updated in that connected directory. If the connected directory does not use DB, LDAP, tagged, or LDIF formats directly, then the agent identified in its profile is invoked. The number of the last change successfully used is then stored in the profile.

Periodically, Oracle Internet Directory purges the change log after all profiles have used what they need, and identifies where subsequent synchronization should begin.

Synchronizing from a Connected Directory to Oracle Internet Directory

When a connected directory uses DB, LDAP, tagged, or LDIF formats directly, changes to its entries or attributes can be automatically synchronized by the Oracle Directory Synchronization Service. Otherwise, the connector has an agent in its synchronization profile, which writes the changes to a file in the LDIF or tagged format. The Oracle Directory Synchronization Service then uses this file of connected directory data to update Oracle Internet Directory.

Synchronizing Directories with Interfaces Not Supported by Oracle Internet Directory

Some connected directories cannot receive data by using any of the interfaces supported by Oracle Internet Directory. Profiles for this type of directory contain an attribute identifying a separate program for synchronization, called an agent. The agent translates between the connected directory's unique format and a DB, LDAP, tagged, or LDIF file containing the synchronization data. The agent, as identified in the profile, is invoked by the Oracle Directory Synchronization Service.

When exporting data from Oracle Internet Directory to this type of connected directory, the Oracle Directory Synchronization Service creates the necessary file in the tagged or LDIF format. The agent then reads that file, translates it into the correct format for the receiving connected directory, and stores the data in that directory.

When importing data from this type of connected directory to Oracle Internet Directory, the agent creates the necessary tagged or LDIF format file. The Oracle Directory Synchronization Service then uses this file data to update Oracle Internet Directory.

Configuration of Directory Synchronization Profiles

This chapter explains how to register connectors with Oracle Directory Integration Platform and how to format the mapping rule attribute. It contains these topics:

- [Registering Connectors in Oracle Directory Integration Platform](#)
- [Sample Synchronization Profiles](#)
- [Configuring Connection Details](#)
- [Additional Configuration Information](#)
- [Configuring Mapping Rules](#)
- [Configuring Matching Filters](#)
- [Location and Naming of Files](#)

See Also: The attribute reference chapter of the *Oracle Identity Management User Reference* for a list and descriptions of the attributes in synchronization profiles

Registering Connectors in Oracle Directory Integration Platform

Before deploying a connector, you register it in Oracle Internet Directory. This registration involves creating a directory synchronization profile, which is stored as an entry in the directory.

To create a directory synchronization profile, use one of the following tools:

- Oracle Directory Integration Server Administration tool
- Directory Integration Assistant (dipassistant)

See Also:

- [Chapter 3, "Oracle Directory Integration Platform Administration Tools"](#)
- ["Directory Synchronization Profiles"](#) on page 5-2

Attributes in a synchronization profile entry belong to the object class `orclodiProfile`. The only exception is the `orclodiplastappliedchangenumber` attribute, which belongs to the `orclchangesubscriber` object class.

The 2.16.840.1.113894.7 object identifier prefix is assigned to platform-related classes and attributes.

The various synchronization profile entries in the directory are created under the container `cn=subscriber profile,cn=changelog subscriber,cn=oracle internet directory`. For example, a connector called `OracleHRAgent` is stored in the directory as

`orclodipagentname=OracleHRAgent,cn=subscriber profile,cn=changelog subscriber,cn=oracle internet directory`.

Sample Synchronization Profiles

When you install Oracle Directory Integration Platform, sample import and export synchronization profiles are automatically created for:

- Microsoft Active Directory 2000/2003
- Microsoft Exchange 2000/2003
- Sun Java System Directory 5.2. Sun Java System Directory has formerly been known as Sun ONE Directory Server, iPlanet Directory Server, and Netscape Directory Server, respectively. Oracle Internet Directory 10g (10.1.4.2) is certified for integration with all versions starting with Netscape Directory Server 4.13.
- Novell eDirectory 8.6.2 and 8.7
- OpenLDAP-2.2
- LDIF files
- Tagged files

The property and mapping files used to create the sample profiles are available in the `$ORACLE_HOME/ldap/odi/samples` and `$ORACLE_HOME/ldap/odi/conf` directory.

Configuring Connection Details

You can configure the third-party directory by using the express configuration option with the Directory Integration Assistant (`dipassistant`). Using this approach, you can specify the connection details as input. This is the recommended approach.

You can also create the profiles based on the template properties file provided during installation. If you are doing this, then you must specify the connection details in the `odip.profile.condirurl`, `odip.profile.condiraccount`, and `odip.profile.condirpassword` properties of the profile. In addition to specifying the connection details, you must also ensure that the user account in the third-party directory has the necessary privileges to read user and group information.

With Microsoft Active Directory, you must also ensure that the user account has the privileges to replicate directory changes for every domain of the forest monitored for changes. You can do this by one of the following methods:

- Grant to this account Domain Administrative permissions
- Make this account a member of the Domain Administrator's group
- Grant to this account Replicating Directory Changes permissions for every domain of the forest that is monitored for changes

To grant this permission to a non-administrative user, follow the instructions in the "More Information" section of the Microsoft Help and Support article "How to Grant

the 'Replicating Directory Changes' Permission for the Microsoft Metadirectory Services ADMA Service Account" available at <http://support.microsoft.com/>.

Some of the most important pieces of a directory synchronization profile include the connection details you assign to the properties listed in [Table 6–1](#):

Table 6–1 Connection Detail Properties

Property	Description
<code>odip.profile.condirurl</code>	The URL of the connected directory: <ul style="list-style-type: none"> ■ To connect to an LDAP directory, use the form <i>host:port</i> ■ To connect in SSL mode, use the form <i>host:port:1</i>. ■ To connect to a database, use the form <i>host:port:sid</i>
<code>odip.profile.condiraccount</code>	The DN or account name used to connect to the third-party directory
<code>odip.profile.condirpassword</code>	The password used to connect to the third-party directory

Notes:

- The account information you specify must have sufficient privileges in the directory to which you are connecting.
 - The account name and password properties are not required if you are using the LDIF or tagged data formats.
-

Additional Configuration Information

The Additional Config Info (`orclodipAgentConfigInfo`) attribute in a synchronization profile stores any additional configuration information needed by a connector to synchronize Oracle Internet Directory with a connected directory. Although not required, you can use the following parameters with the Additional Config Info attribute to significantly improve synchronization efficiency:

- [SearchDeltaSize Parameter](#)
- [SkipErrorToSyncNextChange Parameter](#)
- [UpdateSearchCount](#)

You cannot use the Oracle Directory Integration Server Administration tool or Oracle Directory Manager to modify the Additional Config Info attribute. Instead, you must use the Directory Integration Assistant (`dipassistant`).

See Also:

- *Oracle Identity Management User Reference*
- ["Step 7: Specifying Synchronization Parameters for the Additional Config Information Attribute"](#) on page 22-6 for additional configuration information parameters that can be used with Novell eDirectory and OpenLDAP

SearchDeltaSize Parameter

The `SearchDeltaSize` parameter determines how many incremental changes are processed during each iteration in a synchronization cycle. By default, the `SearchDeltaSize` parameter is assigned a value of 500. The number of iterations performed during each synchronization cycle depend on the number of pending changes. For example, if the `SearchDeltaSize` parameter is assigned a value of 500 and there are 498 pending changes, synchronization will require a single iteration. However, if there are 501 pending changes, synchronization will require two iterations. In some cases, you will experience better synchronization efficiency if you assign a higher value to this parameter. However, be sure that the value you specify does not exceed the LDAP search limit of the connected directory server. Otherwise, you may receive an error during synchronization and some changes may not be processed.

CAUTION: Be sure to thoroughly analyze and test your deployment when modifying the `SearchDeltaSize` parameter, especially if you assign a value higher than 2,000.

SkipErrorToSyncNextChange Parameter

The `SkipErrorToSyncNextChange` parameter determines how the Oracle directory integration server handles an error when processing a change during synchronization. By default, the `SkipErrorToSyncNextChange` parameter is assigned a value of `false`, which means that the Oracle directory integration server will continue processing a change until the error is resolved. If you assign a value of `true` to the `SkipErrorToSyncNextChange` parameter, the Oracle directory integration server will skip any changes that cause an error. Any failures are recorded in the `$ORACLE_HOME/ldap/odi/log/profile_name.aud` audit log. If you do assign a value of `true` to the `SkipErrorToSyncNextChange` parameter, be sure to periodically review the audit log for failures.

See Also: ["Troubleshooting Synchronization"](#) on page C-23

UpdateSearchCount

The `UpdateSearchCount` parameter specifies the maximum number of iterations to perform on the connected directory during the synchronization process. The synchronization process stops after the specified number of search has been performed and resumes at the next scheduled interval.

Configuring Mapping Rules

This section discusses how to configure mapping rules. It contains these topics:

- [Distinguished Name Mapping](#)
- [Attribute-Level Mapping](#)
- [How to Create a New Mapping File](#)
- [Supported Attribute Mapping Rules and Examples](#)
- [Example: Mapping File for a Tagged-File Interface](#)
- [Example: Mapping Files for an LDIF Interface](#)
- [Updating Mapping Rules](#)

You use the mapping rules attribute to specify how to convert entries from the source to the destination. Oracle Internet Directory must either be the source or the destination. When converting the entries, there are three types of mapping rules: domain rules, attribute rules, and reconciliation rules. These mapping rules allow you to specify distinguished name mapping, attribute-level mapping, and reconciliation rules. Note that reconciliation rules are only used with Novell eDirectory and OpenLDAP. For more information on using reconciliation rules, see [Chapter 22, "Integrating with Novell eDirectory or OpenLDAP"](#).

Mapping rules are organized in a fixed, tabular format, and you must follow that format carefully. Each set of mapping rules appears between a line containing only the word `DomainRules` and a line containing only three number signs (`###`). The fields within each rule are delimited by a colon (`:`).

```
DomainRules
srcDomainName1: [dstDomainName1]: [DomainMappingRule1]
srcDomainName2: [dstDomainName2]: [DomainMappingRule2]
AttributeRules
srcAttrName1: [ReqAttrSeq]: [SrcAttrType]: [SrcObjectClass]: [dstAttrName1]:
[DstAttrType]: [DstObjectClass]: [AttrMappingRule1]
srcAttrName1, srcAttrName2: [ReqAttrSeq]: [SrcAttrType]: [SrcObjectClass]:
[dstAttrName2]: [DstAttrType]: [DstObjectClass]: [AttrMappingRule2]
###
```

The expansion of `srcAttrName1` and `srcAttrName2` in the preceding example should be on a single, unwrapped long line.

Distinguished Name Mapping

This section specifies how entries are mapped between Oracle Internet Directory and a connected directory. If the mapping is between Oracle Internet Directory and another LDAP directory, then you can create multiple mapping rules, as explained in ["Configuring Mapping Rules"](#) on page 6-4. The domain rule specifications appear after a line containing only the keyword `DomainRules`. Each domain rule is represented with the components, separated by colons, and are described in [Table 6-2](#).

Table 6-2 Domain Rule Components

Component Name	Description
<code>SrcDomainName</code>	Name of the domain or container of interest. Specify NONLDAP for sources other than LDAP and LDIF.
<code>DstDomainName</code>	<p>Name of the domain of interest in the destination. Specify this component if the container for the entries in the destination directory is different from that in the source directory.</p> <p>If the value assigned to <code>SrcDomainName</code> is an LDAP or LDIF domain, then this field assumes the same value. However, if the value assigned to <code>SrcDomainName</code> is not an LDAP or LDIF domain, you must specify the container where entries should be created.</p> <p>If not specified, this field assumes the value of <code>SrcDomainName</code> under valid conditions. For destinations other than LDAP and LDIF, specify NONLDAP. Because "import" and "export" always refer to Oracle Internet Directory, a combination of NONLDAP:NONLDAP is not allowed.</p>

Table 6–2 (Cont.) Domain Rule Components

Component Name	Description
DomainMappingRule	<p>This rule is used to construct the destination DN from the source domain name, from the attribute given in <code>AttributeRules</code>, or both. This field is typically in the form of <code>cn=% , l=% , o=oracle , dc=com</code>. These specifications are used to put entries under different domains or containers in the directory. In the case of non-LDAP sources, this rule specifies how to form the target DN so it can add entries to the directory.</p> <p>This field is meaningful only when importing to Oracle Internet Directory, or when exporting to an LDIF file or another external LDAP-compliant directory. Specify this component if any part of an entry's DN in the destination directory is different from that in the source directory entry.</p> <p>This component is optional for LDAP-to-LDIF, LDAP-to-LDAP, or LDIF-to-LDAP synchronizations. If it is not specified, then the source domain and destination domain names are considered to be the same.</p>

Example 6–1 Example of Distinguished Name Mapping

Distinguished Name Rules

```
%USERBASE INSOURCE%:%USERBASE ATDEST%:
```

`USERBASE` refers to the container from which the third-party directory users and groups must be mapped. Usually, this is the `users` container under the root of the third-party directory domain.

Example 6–2 Example of One-to-One Distinguished Name Mapping

For one-to-one mapping to occur, the DN in the third-party directory must match that in Oracle Internet Directory. In this example, the DN in the third-party directory matches the DN in Oracle Internet Directory. More specifically:

- The third-party directory host is in the domain `us.mycompany.com`, and, accordingly, the root of the third-party directory domain is `us.mycompany.com`. A user container under the domain would have a DN value `cn=users,dc=us,dc=mycompany,dc=com`.
- Oracle Internet Directory has a default realm value of `dc=us,dc=mycompany,dc=com`. This default realm automatically contains a `users` container with a DN value `cn=users,dc=us,dc=mycompany,dc=com`.

Because the DN in the third-party directory matches the DN in Oracle Internet Directory, one-to-one distinguished name mapping between the directories can occur.

If you plan to synchronize only the `cn=users` container under `dc=us,dc=mycompany,dc=com`, then the domain mapping rule is:

Distinguished Name Rules

```
cn=users,dc=us,dc=mycompany,dc=com:cn=users,dc=us,dc=mycompany,dc=com
```

This rule synchronizes every entry under `cn=users,dc=us,dc=mycompany,dc=com`. However, the type of object synchronized under this container is determined by the attribute-level mapping rules that follow the DN Mapping rules.

If you plan to synchronize the entry `cn=groups,dc=us,dc=mycompany,dc=com` under `cn=users,dc=us,dc=mycompany,dc=com` then the domain mapping rule is as follows:

cn=groups,dc=us,dc=mycompany,dc=com: cn=users,dc=us,dc=mycompany,dc=com

See Also: The mapping file examples at the end of this chapter

Attribute-Level Mapping

The attribute rule specifications appear after a line containing only the keyword `AttributeRules`. Attribute rules specify how property values for an entry are related between two LDAP directories. For example, the `cn` attribute of a user object in one directory can be mapped to the `givenname` object in another directory. Similarly, the `cn` attribute of a group object in one directory can be mapped to the `displayname` attribute in another directory. Each attribute rule is represented with the components, separated by colons, and are described in [Table 6–3](#). The attribute rule specifications end with a line three number signs (###).

Table 6–3 Components in Attribute Rules

Component Name	Description
<code>SrcAttrName</code>	<p>For LDAP-compliant directory repositories, this parameter refers to the name of the attribute to be translated.</p> <p>For Oracle Database repositories, it refers to the <code>ColumnName</code> in the table specified by the <code>SrcClassName</code>.</p> <p>For other repositories this parameter can be appropriately interpreted.</p>
<code>ReqAttrSeq</code>	<p>Indicator of whether the source attribute must be passed to the destination. When entries are synchronized between Oracle Internet Directory and the connected directory, some attributes need to be used as synchronization keys. This field indicates whether the specified attribute is being used as a key. If so, regardless of whether the attribute has changed or not, the value of the attribute is extracted from the source.</p> <p>A nonzero integer value should be placed in this field if the attribute needs to be always passed on to the other end.</p>
<code>SrcAttrType</code>	This parameter refers to the attribute type—for example, integer, string, binary—that validates the mapping rules.
<code>SrcObjectClass</code>	<p>If the source of the shared attribute is an LDAP-compliant directory, then this parameter names the object class to which the attribute belongs.</p> <p>If the source of the shared attribute is an Oracle Database repository, then this parameter refers to the table name and is mandatory. For other repositories, this parameter may be ignored.</p>
<code>DstAttrName</code>	<p>Optional attribute. If it is not specified, then the <code>SrcAttrName</code> is assumed.</p> <p>For LDAP-compliant directories, this parameter refers to the name of the attribute at the destination.</p> <p>For Oracle Database repositories, it refers to the <code>ColumnName</code> in the table specified by the <code>SrcClassName</code>.</p> <p>For other repositories, this parameter can be appropriately interpreted.</p>
<code>DstAttrType</code>	This parameter refers to the attribute type—for example, integer, string, binary. Note that it is up to you, the administrator, to ensure the compatibility of the source and destination attribute types. Oracle Directory Integration Platform does not ensure this compatibility.

Table 6–3 (Cont.) Components in Attribute Rules

Component Name	Description
DstObjectClass	For LDAP-compliant directories, this parameter refers to the object class to which the attribute belongs, and is optional. For Oracle Database repositories, it refers to the table name, and is mandatory. For other repositories this parameter may be ignored.
AttrMapping Rule	Optional arithmetic expression with these operators: +, , and these functions: toUpper (string), toLower (String), trunc (string, char). If nothing is specified, then the source attribute value is copied as the value of the destination attribute. Literals can be specified with single quotation marks (') or with double quotation marks (").

In a newly created synchronization profile, mapping rules are empty. To enter mapping rules, edit a file that strictly follows the correct format.

Note: When attributes and object classes are defined in the mapping file, it is assumed that source directories contain the respective attributes and object classes defined in the schema.

If a parent container is selected for synchronization, then all its children that match the mapping rules are likewise synchronized. Child containers cannot be selectively ignored for synchronization.

How to Create a New Mapping File

To create a new mapping file:

1. Identify the containers of interest for synchronization in the source directory.
2. Identify the destination containers to which the objects in the source containers should be mapped. Be sure that the specified container already exists in the directory.
3. Determine the rule to create a DN of the entry to be created in the destination directory. In LDAP-to-LDAP, mapping is normally one-to-one. In non-LDAP-to-LDAP, a domain DN construct rule is required. For instance in the case of synchronizing from a tagged file or Human Resources agent, the mapping rule may be in the form `uid=%,dc=mycompany,dc=com`. In this case, the `uid` attribute must be present in all the changes to be applied from Oracle Human Resources. The `uid` attribute must be specified as a required attribute, as specified in step 6.
4. Identify the objects that you want to synchronize among directories—that is, the relevant object classes in the source and destination directories. In general, objects that get synchronized among directories include users, groups, organizational units, organizations, and other resources. Identify the actual object classes used in the directories to identify these objects.
5. Identify the properties of the various objects that you want to synchronize among directories—that is, the attributes in the LDAP context. All the attributes of an object need not be synchronized. The properties of users that you might want to synchronize are `cn`, `sn`, `uid`, and `mail`.
6. Define the mapping rules. Each mapping rule has this format:


```
<srcAttrName>:<ReqdFlag>:<srcAttrType>:<SrcObjectClass>:
<dstAttrName>:<dstAttrType>:<dstObjectClass>: <Mapping Rule>
```

While defining the mapping rule, ensure the following:

- Every required attribute has a sequence number. For example, if in step 3 the `uid` attribute is identified as required, then assign a value of 1 in place of `<ReqdFlag>`.
- Every relevant object class has a schema definition on the destination directory.
- Every mandatory attribute in a destination object class has a value assigned from the source. This is true for standard object classes also, as the different LDAP implementations may not be completely standards-compliant.

It is not necessary to assign all attributes belonging to a source object class to a single-destination object class. Different attributes of a source object class can be assigned to different attributes belonging to different destination object classes.

If an attribute has binary values, then specify it as `binary` in the `<attrtype>` field.

Mapping rules are flexible. They can include both one-to-many and many-to-one mappings.

- One-to-many

One attribute in a connected directory can map to many attributes in Oracle Internet Directory. For example, suppose an attribute in the connected directory is `Address:123 Main Street/MyTown, MyState 12345`. You can map this attribute in Oracle Internet Directory to both the LDAP attribute `homeAddress` and the LDAP attribute `postalAddress`.

- Many-to-one

Multiple attributes in a connected directory can map to one attribute in Oracle Internet Directory. For example, suppose that the Oracle Human Resources directory represents Anne Smith by using two attributes: `firstname=Anne` and `lastname=Smith`. You can map these two attributes to one attribute in Oracle Internet Directory: `cn=Anne Smith`. However, in bidirectional synchronization, you cannot then map in reverse. For example, you cannot map `cn=Anne Smith` to many attributes.

See Also: The mapping file examples at the end of this chapter

Supported Attribute Mapping Rules and Examples

The attribute mapping rules supported are:

- Concatenation operator (+): Concatenates two string attributes.

The mapping rule looks like:

```
Firstname,lastname: : : givenname: : inetorgperson: firstname+lastname
```

For example, if the `Firstname` is John and `LastName` is Doe in the source, then this rule results in the `givenname` attribute in the destination with the value `JohnDoe`.

- OR operator (|): Assigns one of the values of the two string attributes to the destination.

The mapping rule looks like this:

```
Fistname,lastname : : :givenname: :inetorgperson: firstname | lastname
```

In this example, givenname is assigned the value of firstname if it exists. If the firstname attribute does not exist, then givenname is assigned the value of lastname. If both the values are empty, then no value is assigned.

- `bin2b64 ()`: Stores a binary value of the source directory as a base64 encoded value in the destination directory. Typical usage is as follows:

```
objectguid: : : :binary: :orclobjectguid: orcladuser:bin2b64(objectguid)
```

This is required when you need search on the value of (objectguid).

- `tolower ()`: Converts the String attribute value to lowercase.

```
firstname: : : :givenname: :inetorgperson: tolower(firstname)
```
- `toupper ()`: Converts the String attribute value to uppercase.

```
firstname: : : :givenname: :inetorgperson: toupper(firstname)
```

- `trunc (str, char)`: Truncates the string beginning from the first occurrence of the specified char.

```
mail : : : : uid : : inetorgperson : trunc(mail, '@')
```

For example, if mail is John.Doe@acme.com in the source, then this rule results in the uid attribute in the destination with the value John.Doe.

- `trunc (str, char)`: Truncates the string up to and including the first occurrence of the specified char.

```
mail : : : : uid : : inetorgperson : trunc1(mail, '@')
```

For example, if mail is John.Doe@acme.com in the source, then this rule results in the uid attribute in the destination with the value acme.com.

- `trunc (str1, str2)`: Truncates the string beginning with the first occurrence of the specified string.

```
mail : : : : uid : : inetorgperson : trunc1(mail, "@domain")
```

- `dnconvert (str)`: Converts DN type attributes if domain mapping is used.

This example assumes the following domain mapping rule:

```
DomainRules  
cn=srcdomain:cn=dstdomain:
```

For example:

```
uniquemember : : : groupofuniquenames : uniquemember : :groupofuniquenames :  
dnconvert(uniquemember)
```

In this example, if uniquemember in the source is cn=testuser1, cn=srcdomain, then uniquemember in the destination becomes cn=test user1, cn=dstdomain.

- **Literals:**

```
Userpassword: : :person: userpassword: :person: 'welcome1'
```

Example: Mapping File for a Tagged-File Interface

Based on the preceding discussions, here is a sample mapping file for importing user entries from the Oracle Human Resources database tables by using the tagged-file interface. Note that the source is a non-LDAP directory. This sample file is supplied during installation, at `$ORACLE_HOME/ldap/odi/conf/oraclehragent.map.master`.

```
DomainRules
NONLDAP:dc=myCompany,dc=com:uid=%dc=myCompany,dc=com
AttributeRules
firstname: : : :cn: :person
email : : : :cn: :person: trunc(email,'@')
email : 1 : :uid: :person:trunc(email,'@')
firstname,lastname: : : :cn: :person: firstname+", "+lastname
lastname,firstname: : : :cn: :person: lastname+", "+firstname
firstname,lastname: : : :sn: :person: lastname | firstname
EmployeeNumber: : : :employeenumber: :inetOrgperson
EMail: : : :mail: :inetOrgperson
TelephoneNumber1: : : :telephonenumber: :person
TelephoneNumber2: : : :telephonenumber: :person
TelephoneNumber3: : : :telephonenumber: :person
Address1: : : :postaladdress: :person
state: : : :st: :locality
street1: : : :street: :locality
zip: : : :postalcode: :locality
town_or_city: : : :l: :locality
Title: : : :title: :organizationalperson
#Sex: : : :sex: :person
###
```

As described earlier, the mapping file consists of keywords and a set of domain and attribute mapping rule entries. The mapping file in this example contains the domain rule `NONLDAP:dc=myCompany,dc=com:cn=%,dc=myCompany,dc=com`.

- This rule implies that the source domain is NONLDAP—that is, there is no source domain.
- The destination domain (`:dc=myCompany,dc=com`) implies that all the directory entries this profile deals with are in the domain `dc=myCompany,dc=com`. Be sure that the domain exists before you start synchronization.
- The domain mapping rule (`:uid=%,dc=myCompany,dc=com`) implies that the data from the source refers to the entry in the directory with the DN that is constructed using this domain mapping rule. In this case, `uid` must be one of the destination attributes that should always have a non null value. If any data corresponding to an entry to be synchronized has a null value, then the mapping engine assumes that the entry is not valid and proceeds to the next entry. To identify the entry correctly in the directory, it is also necessary that `uid` is a single value.
- In the case of the tagged file, the source entry does not have an object class to indicate the type of object to which it is synchronizing. Note that the `SrcObjectClass` field is empty.
- Every object whose destination is Oracle Internet Directory must have an object class.
- Note that `email` is specified as a required attribute in the sample mapping file. This is because the `uid` attribute is derived from the `email` attribute. Successful synchronization requires the `email` attribute to be specified in all changes specified in the tagged file as follows:

```
Email : 1 : : :uid : : person : trunc(email,'@')
```

- In some cases, the **RDN** of the DN needs to be constructed by using the name of a multivalued attribute. For example, to construct an entry with the DN of `cn=%,l=%,dc=myCompany,dc=com`, where `cn` is a multivalued attribute, the `DomainMappingRule` can be in this form: `rdn,l=%,dc=myCompany,dc=com` where `rdn` is one of the destination attributes having a non null value. A typical mapping file supporting this could have the following form:

```
DomainRules
NONLDAP:dc=us,dc=myCompany,dc=com:rdn,l=%,dc=us,dc=myCompany,dc=com
AttributeRules
firstname: : :cn: :person
email : : : :cn: :person: trunc(email,'@')
email : 1: : :rdn: :person: 'cn='+trunc(email,'@')
firstname,lastname: : : :cn: :person: firstname+", "+lastname
lastname,firstname: : : :cn: :person: lastname+", "+firstname
firstname,lastname: : : :sn: :person: lastname | firstname
EmployeeNumber: : : :employeenumber: :inetOrgperson
EMail: : : :mail: :inetOrgperson
TelephoneNumber1: : : :telephonenumber: :person
TelephoneNumber2: : : :telephonenumber: :person
TelephoneNumber3: : : :telephonenumber: :person
Address1: : : :postaladdress: :person
Address1: : : :postaladdress: :person
Address1: : : :postaladdress: :person
state: : : :st: :locality
street1: : : :street: :locality
zip: : : :postalcode: :locality
town_or_city: 2 : : :1: :locality
Title: : : :title: :organizationalperson
#Sex: : : :sex: :person
###
```

Example: Mapping Files for an LDIF Interface

A set of sample integration profiles are created as part of the installation by using the Directory Integration Assistant (`dipassistant`). The properties file used to create the profiles is located in the `$ORACLE_HOME/ldap/odi/samples` directory.

Sample Import Mapping File

```
DomainRules
dc=mycompany.oid,dc=com:dc=mycompany.iplanet,dc=com
AttributeRules
# Mapping rules to map the domains and containers
o: : :organization: o: :organization
ou: : :organizationalUnit: ou: :organizationalUnit
dc: : :domain:dc: :domain
# Mapping Rules to map users
uid : : :person: uid: :inetOrgperson
sn: : :person:sn: :person
cn: : :person:cn: :person
mail: :inetorgperson: mail: :inetorgperson
employeenumber: :organizationalPerson: employeenumber: :organizationalperson
c: : :country:c: :country
l: : :locality:l: :locality
telephonenumber: :organizationalPerson: telephonenumber: :organizationalperson
userpassword: : :person: userpassword: :person
uid: : :person: orcldefaultProfileGroup: :orclUserV2
```

```
# Mapping Rules to map groups
cn: : :groupofuniquenames:cn: :groupofuniquenames
member: : :groupofuniquenames:member: :orclgroup
uniquemember: : :groupofuniquenames:uniquemember: :orclgroup
owner: : :groupofuniquenames:owner: :orclgroup
# userpassword: :base64:userpassword: :binary:
```

Notice, in the preceding example that both the source domain and destination domain are specified in the Domain Mapping rule section. In this example, the source and the destination domains are the same. However, you can specify a different destination domain, provided the container exists in the destination directory.

Also notice, in the preceding example, that the attribute rules are divided into two sections: user attribute mapping rules and group attribute mapping rules. Specifying the object class in a mapping rule helps to uniquely map a specific attribute of an object.

Updating Mapping Rules

You can customize mapping rules by adding new ones, modifying existing ones, or deleting some from the mapping rule set specified in the `orclodipAttributeMappingRules` attribute. In general, to perform any of these operations, you identify the file containing the mapping rules, or store the value of the attribute for a file by using an `ldapsearch` command as described in *Oracle Internet Directory Administrator's Guide*.

You cannot edit the mapping rules in the Oracle Directory Integration Server Administration tool. Instead, mapping rules are stored in a file that you upload to the directory as a value of the attribute. To upload the mapping file, use the Directory Integration Assistant (`dipassistant`). Once you have created and uploaded the mapping file, you can maintain a copy of it in the `$ORACLE_HOME/ldap/odi/conf` directory, and upload it again after any future updates.

See Also: *Oracle Identity Management User Reference* for information on how to use the Directory Integration Assistant (`dipassistant`)

Adding an Entry to the Mapping Rules File

To add a new entry to the mapping rules file, edit this file and add a record to it. To do this:

1. Identify the connected directory attribute name and the object class that needs to be mapped to Oracle Internet Directory.
2. Identify the corresponding attribute name in Oracle Internet Directory and the object class to which it needs to be mapped.
3. Generate the mapping rule elements indicating the conversion that needs to be done on the attribute values.
4. Load the attribute mapping rule file to the synchronization profile.

For instance, if the e-mail attribute of an entry in the source directory needs to be mapped to the unique identifier of the destination, then it can be:

```
Email: : : inetorgperson: uid: : person:
```

Modifying an Entry in the Mapping Rules File

After you identify an entry to be modified in the mapping rules file, generate the mapping rule element for the desired conversion of attribute values.

Deleting an Entry from the Mapping Rules File

After you identify an entry to be deleted in the mapping rules file, you can either delete the entry from the file or comment it out by putting a number sign (#) in front of it.

See Also:

- The Oracle Directory Integration Platform tools chapter of *Oracle Identity Management User Reference* for instructions about using the Directory Integration Assistant (dipassistant)
- ["Location and Naming of Files"](#) on page 6-15 for the names of the mapping rule files
- OracleMetaLink Note: 261342.1—Understanding DIP Mapping Files available on OracleMetaLink at <http://metalink.oracle.com/>

Configuring Matching Filters

By default, a connector retrieves changes to all objects in the container configured for synchronization. However, you may want to synchronize only certain types of changes, such as changes to just users and groups. While mapping rules allow you to specify how entries are converted from one directory to another, you can also filter objects that are synchronized among directories. Before changes from a connected directory are imported into Oracle Internet Directory, they can be filtered with the Connected Directory Matching Filter (orclODIPConDirMatchingFilter) attribute in the synchronization profile. Similarly, before changes are exported from Oracle Internet Directory to a connected directory, they can be filtered with the OID Matching Filter (orclODIPOIDMatchingFilter) attribute. For both attributes, you can specify a filter for connected directories that either obtain incremental changes through an LDAP search or that store changes in a change log, as described in the following sections:

- [Filtering Changes with an LDAP Search](#)
- [Filtering Changes from a Change Log](#)

You can use either the Oracle Directory Integration Server Administration tool or Directory Integration Assistant (dipassistant) to update the matching filters.

See Also: [Chapter 3, "Oracle Directory Integration Platform Administration Tools"](#)

Filtering Changes with an LDAP Search

For connected directories that do not support change logs, the latest footprint of the entries are obtained by performing an LDAP search. Because an LDAP search that is performed with `objectclass=*` will return all entries in a given tree or subtree, to retrieve only the objects of interest for synchronization, you must provide a filter using LDAP filter syntax. For example, you can assign a search filter to the `orclODIPConDirMatchingFilter` attribute. You specify the filter as `searchfilter=LDAP_SEARCH_FILTER`.

The following example creates an LDAP search filter that retrieves organizational units, groups, and users, but not computers:

```
searchfilter=(| (objectclass=group) (objectclass=organizationalUnit)
(&(objectclass=user) (!(objectclass=computer))))
```

Filtering Changes from a Change Log

For connected directories that store changes in a change log, you can use the following simple operators, which are provided by Oracle Directory Integration Platform, to specify a matching filter for either the Connected Directory Matching Filter (orclODIPConDirMatchingFilter) or the OID Matching Filter (orclODIPOIDMatchingFilter):

- = (equal operator)
- != (not equal operator)

Note: Connected directories that obtain incremental changes through an LDAP search can also use the preceding operators without the `searchfilter` attribute. However, you can only specify a single expression or the search will fail.

You can use the preceding operators with either LDAP or non-LDAP directories, provided they obtain incremental changes from a change log. Wildcards and pattern matching are not supported with the preceding operators if you do not use the `searchfilter` attribute. However, when multiple operator pairs are including in the filter, the expression is evaluated as a logical AND operation. For example, the following expression includes four operator pairs:

```
(objectclass=group) (objectclass=organizationalUnit)
(objectclass=user) (objectclass!=computer)
```

The preceding expression evaluates as follows:

```
objectclass is equal to group
AND objectclass is equal to organizationalUnit
AND objectclass is equal to user
AND objectclass is NOT equal to computer
```

For connected directories that store changes in a change log, a matching filter can synchronize changes for only the attributes that appear in the change log. If you include attributes in a matching filter that do not appear in the change log, the search operation will fail. For this reason, matching filters are of limited use for connected directories that store incremental changes in a change log.

Location and Naming of Files

[Table 6–4](#) tells you where to find the various files used in the directory integration profile and during synchronization.

Table 6–4 Location and Names of Files

File	File Name
Import data file	<code>\$ORACLE_HOME/ldap/odi/data/import/Profile_Name.dat</code>
Export data file	<code>\$ORACLE_HOME/ldap/odi/data/export/Profile_Name.dat</code>

Table 6–4 (Cont.) Location and Names of Files

File	File Name
Additional configuration information file	<code>\$ORACLE_HOME/ldap/odi/conf/Profile_Name.cfg</code>
Mapping rules file	<code>\$ORACLE_HOME/ldap/odi/conf/Profile_Name.map</code>

For example, the name of the data file of the Oracle Human Resources connector is `oraclehrprofile.dat`.

Administration of Directory Synchronization

This chapter explains how to manage synchronization profiles. It contains these topics:

- [Managing Synchronization Profiles](#)
- [Managing Synchronization Profiles Using Command-Line Tools](#)

See Also: ["Troubleshooting Synchronization"](#) on page C-23

Managing Synchronization Profiles

This section tells you how to register and deregister a profile by using the Oracle Directory Integration Server Administration tool. It contains these topics:

- [Creating a Profile](#)
- [Modifying a Profile](#)
- [Deleting a Profile](#)
- [Modifying the Synchronization Status Attributes](#)

Creating a Profile

You to create a profile in one of two ways:

- By creating a new connector group entry, then adding a profile to it
- By selecting an existing connector group entry, then adding a profile to it

To create a profile:

1. Perform the following steps to start the Oracle Directory Integration Server Administration tool:
 - a. Run the following command to start the Oracle Directory Integration Server Administration tool:

```
dipassistant -gui
```
 - b. In the navigator pane, select [Connector Profile Management Window](#).
2. In the Connector Profile Management window, you have two options for creating a new connector profile:
 - Create an integration profile by copying an existing one

To do this, select the Oracle Directory Integration Platform profile you want to copy, then select **Create Like**. The Integration Profile dialog box displays the General tab page.

- Create an integration profile without copying an existing one

To do this, select **Create New**. The Integration Profile dialog box displays the General tab page.

See Also: "[Connector Profile Management Window](#)" on page A-6 for more information about the Connector Profiles Management window

3. In the [General Tab](#) tab page, fill in the fields.
The fields in the General tab page are described in [Table A-10](#) on page A-11.
4. Click the [Mapping Tab](#) tab and fill in the fields.
The fields in the Mapping tab page are described in [Table A-11](#) on page A-12.
5. Click the [Filtering Tab](#) tab and fill in the fields.
The fields in the Mapping tab page are described in [Table A-9](#) on page A-11.
6. Click the [Status Tab](#) tab and fill in the fields. Because this page shows the execution status of the connectors, most of the fields cannot be edited.
The fields in the Status tab page are described in [Table A-13](#) on page A-13.
7. Click the [Others Tab](#) tab and fill in the fields.
The fields in the Execution tab page are described in [Table A-12](#) on page A-12.
8. After you enter the information, click **OK**. This returns you to the Connector Profile Management window, which now lists the integration profile you just created. The profile you created is now registered with Oracle Internet Directory.

Modifying a Profile

To modify a profile:

1. Perform the following steps to start the Oracle Directory Integration Server Administration tool:
 - a. Run the following command to start the Oracle Directory Integration Server Administration tool:

```
dipassistant -gui
```
 - b. In the navigator pane, select **Connector Profile Management**.
2. In the Connector Profile Management window, select the profile you want to modify.
3. Click **Edit**. The [General Tab](#) tab page appears.
4. In the [General Tab](#) tab page, modify the necessary fields.
The fields in the General tab page are described in [Table A-10](#) on page A-11.
5. Click the [Mapping Tab](#) tab and modify the necessary fields.
The fields in the Mapping tab page are described in [Table A-11](#) on page A-12.
6. Click the [Filtering Tab](#) tab and modify the necessary fields.
The fields in the Mapping tab page are described in [Table A-9](#) on page A-11.
7. Click the [Status Tab](#) tab and modify the necessary fields. Because this page shows the execution status of the connectors, most of the fields cannot be edited.

The fields in the Status tab page are described in [Table A-13](#) on page A-13.

8. Click the [Others Tab](#) and modify the necessary fields.

The fields in the Execution tab page are described in [Table A-12](#) on page A-12.

9. When you have finishing modifying the information, click **OK**.

Deleting a Profile

To delete a profile:

1. Perform the following steps to start the Oracle Directory Integration Server Administration tool:
 - a. Run the following command to start the Oracle Directory Integration Server Administration tool:


```
dipassistant -gui
```
 - b. In the navigator pane, select **Connector Profile Management**.
2. In the Connector Profile Management, select the profile you want to delete.
3. Click **Delete**. A window that prompts you to confirm deletion of the connector profile.
4. Click **Yes** to confirm that you want to delete the profile.

Modifying the Synchronization Status Attributes

During the synchronization process, the server constantly updates the `orcllastappliedchangenumber` synchronization status attribute. In the Oracle Directory Integration Server Administration tool, this field is called **OID last applied change number**. Oracle does not recommend changing the synchronization status attributes. However, there may be cases when you need to update the `lastappliedchangenumber` attribute. For example, you may need to reapply some changes or skip synchronization of certain entries.

To change the synchronization status attributes by using the Oracle Directory Integration Server Administration tool:

1. Verify that the Oracle directory integration platform recognizes the disable flag for the profile.

In the default mode, it can take up to two minutes for the Oracle directory integration server to recognize this flag. To enable it to recognize this flag sooner, set the refresh interval to a lower value, as described in the `odisrv` section in the Oracle Internet Directory server administration tools chapter of *Oracle Identity Management User Reference*.
2. Disable the agent by using the Oracle Directory Integration Server Administration tool.
3. Modify the synchronization status attributes by following the procedures in ["Modifying a Profile"](#) on page 7-2.
4. Reenable the agent after the change.

Managing Synchronization Profiles Using Command-Line Tools

You can create, modify, and delete a synchronization profile using the Directory Integration Assistant (`dipassistant`), as described in the `dipassistant` section of

the Oracle Directory Integration Platform tools chapter in *Oracle Identity Management User Reference*.

Bootstrapping a Directory in Oracle Directory Integration Platform

This chapter discusses directory bootstrapping, which refers to the initial migration of data between a connected directory and Oracle Internet Directory. Because the synchronization process can handle the migration of data between a connected directory and Oracle Internet Directory, you are not required to perform directory bootstrapping. However, relying on the synchronization process to perform the initial migration can be a time-consuming process, especially for large amounts of data. For this reason, you should perform directory bootstrapping when you first deploy Oracle Directory Integration Platform.

This chapter contains these topics:

- [About Directory Bootstrapping in Oracle Directory Integration Platform](#)
- [Bootstrapping Using a Parameter File](#)
- [Bootstrapping Directly Using the Default Integration Profile](#)
- [Bootstrapping in SSL Mode](#)
- [Recommended Bootstrapping Methodology](#)

See Also: The chapter on data migration from other directories and data repositories in *Oracle Internet Directory Administrator's Guide*

About Directory Bootstrapping in Oracle Directory Integration Platform

In Oracle Directory Integration Platform, bootstrapping is handled by using the Directory Integration Assistant (dipassistant) with the `bootstrap` option. The command is:

```
dipassistant bootstrap
```

For information about using the Directory Integration Assistant, enter:

```
dipassistant bootstrap -help
```

The Directory Integration Assistant enables you to bootstrap using either a parameter file or a completely configured integration profile. This chapter discusses both approaches.

See Also: The `dipassistant` section of the Oracle Directory Integration Platform tools chapter in *Oracle Identity Management User Reference*

Bootstrapping Using a Parameter File

The parameters in this file specify:

- Source and destination interface types (LDIF and LDAP)
- Connection details and credentials (valid only for LDAP)
- Mapping rules

The various parameters and the default values that the Directory Integration Assistant assumes for them while reading the file are given in the `dipassistant` section of the Oracle Directory Integration Platform tools chapter in *Oracle Identity Management User Reference*.

You can bootstrap using an LDIF file in one of these ways:

- By using the Directory Integration Assistant to read from the source directory
- By using directory-dependent tools to read from the source directory
- By using the Directory Integration Assistant to load data into Oracle Internet Directory

During installation, the following sample parameter files are copied to the `$ORACLE_HOME/ldap/odi/samples/` directory:

- `Ldp2ldp.properties`
- `Ldp2ldf.properties`
- `Ldf2ldp.properties`
- `Ldf2ldf.properties`

The preceding files describe the significance of each of the parameters in bootstrapping.

When you run the tools for bootstrapping, be sure that the `ORACLE_HOME` and `NLS_LANG` settings are correct.

Bootstrapping can be performed between services with or without one or more intermediate files. However, for large directories, an intermediate LDIF file is required.

This section contains these topics:

- [Bootstrapping Without Using an LDIF File](#)
- [Bootstrapping Using an LDIF File](#)

Bootstrapping Without Using an LDIF File

Oracle recommends this method for smaller directories where the entries are:

- Relatively few in number
- In a flat structure
- Not interdependent—that is, the creation of one entry does not depend on the existence of another as, for example, when the creation of a group entry depends on the existence of user member entries

To use this method:

1. Create the mapping file with appropriate mapping rules. The mapping file is one of the properties in the bootstrap file. Be sure that it is compatible with the mapping rules defined for synchronization.

2. Create the parameter file with the required details specifying the source as LDAP and the destination type as LDIF. A sample parameter file, `ldp2ldf.properties`, is available in `$ORACLE_HOME/ldap/odi/samples`. Make sure that binary attributes are specified as binary in the `SrcAttrType` field.
3. Use the Directory Integration Assistant `bootstrap` command using a configuration file in which:
 - The source is specified as an LDAP directory.
 - The destination type is specified as an LDIF.

Start the Directory Integration Assistant as follows:

```
dipassistant bootstrap -cfg parameter_file
```

4. Check the `$ORACLE_HOME/ldap/odi/log/bootstrap.log` and `$ORACLE_HOME/ldap/odi/log/bootstrap.trc` files for any errors.
5. Use the `bulkload` utility to upload the data to Oracle Internet Directory.
6. For continued synchronization, update the last change number:

```
dipassistant mp -profile profile_name -updlcn
```

Bootstrapping Using an LDIF File

This section describes two ways to bootstrap a directory by using an LDIF file.

Bootstrapping from an LDIF File Using Directory-Dependent Tools to Read the Source Directory

Oracle recommends that you use this method for large directories. To use this method:

1. Download the data from the directory to an LDIF file. The tool you use depends on the directory from which you are loading the data. If you are bootstrapping from a Microsoft Active Directory, then use the `ldifde` command to load the data. Be sure to load all the required attributes for each entry.
2. Create the mapping file with appropriate mapping rules. When you want to do further synchronization, be sure that the mapping file is the same as the one used for synchronization.
3. Create the parameter file with source and destination as LDIF and other details. A sample parameter file is available in `$ORACLE_HOME/ldap/odi/samples/ldf2ldf.properties`.
4. Use the Directory Integration Assistant `bootstrap` command with a parameter file in which the source is specified as LDIF and the destination type is specified as LDIF. This converts the source data and creates a new LDIF as required by Oracle Internet Directory. Execute the Directory Integration Assistant as follows:

```
dipassistant bootstrap -cfg parameter_file
```

5. Check the `bootstrap.log` and `bootstrap.trc` files for any errors.
6. Use the Oracle Internet Directory bulkload tool (`bulkload.sh`) to upload the data to Oracle Internet Directory.
7. If a corresponding synchronization profile is created for further synchronization, then update the last change number:

```
dipassistant mp -profile profile_name -updlcn
```

Bootstrapping from an LDIF File Using the Directory Integration Assistant to Load Data into Oracle Internet Directory

To use this method:

1. Download the data from the directory to an LDIF file. The tool you use depends on the directory from which you are loading the data. If you are bootstrapping from a Microsoft Active Directory, then use the `ldifde` command to load the data. Be sure to load all the required attributes for each entry.
2. Prepare the mapping file with appropriate mapping rules. When you want to do further synchronization, be sure that the mapping file is the same as the one used for synchronization.
3. Create the properties file with the source specified as LDIF and the destination specified as LDAP.
4. Use the Directory Integration Assistant `bootstrap` command with a parameter file in which the source is specified as the LDIF file, the destination type is specified as LDAP, and the destination specified as Oracle Internet Directory. This converts the source data and creates entries in Oracle Internet Directory as required. A sample properties file, `ldf2ldp.properties`, is available in `$ORACLE_HOME/ldap/odi/samples`.
5. Check the `bootstrap.log` and `bootstrap.trc` files for any errors.
6. If a corresponding synchronization profile is created for further synchronization, then update the last change number:

```
dipassistant mp -profile profile_name -updlcn
```

Bootstrapping Directly Using the Default Integration Profile

Bootstrapping relies on an existing integration profile configured for synchronization. The configuration information used to connect to the third-party directory.

While using this method, put the source directory in read-only mode.

If the profile is an import profile, then footprints of the required objects in the connected directory are created in Oracle Internet Directory. If the profile is an export profile, then footprints of the required objects from Oracle Internet Directory are created in the connected directory.

While creating these entries, the distinguished name and object-level mappings as specified in the integration profile are used. If there is a failure uploading the entries, then the information is logged in `$ORACLE_HOME/ldap/odi/log/bootstrap.log`. The trace information is written to the file `$ORACLE_HOME/ldap/odi/log/bootstrap.trc`.

For example, for bootstrapping from Sun Java System Directory to Oracle Internet Directory, you would do the following:

1. Customize the default integration profile `iPlanetImport`, which is created as part of the installation by following the instructions in ["Configuring Advanced Integration with Sun Java System Directory"](#) on page 21-2.
2. Enter the following command:

```
dipassistant bootstrap -profile iPlanetImport -D 'cn=orcladmin'
```
3. Check the `bootstrap.log` and `bootstrap.trc` files to be sure that the bootstrapping is successfully completed.

If you are bootstrapping using the Directory Integration Assistant (`dipassistant`), then, at the end of the bootstrapping process, the assistant initializes the `lastchangenumber` attribute for further synchronization.

Bootstrapping in SSL Mode

You can use either a parameter file or an integration profile to bootstrap in SSL mode. When you bootstrap in SSL mode, either Oracle Internet Directory, the connected directory, or both Oracle Internet Directory and the connected directory can be running SSL mode.

To bootstrap in SSL mode from a parameter file, you must assign values of either `true` or `false` to the `odip.bootstrap.srcsslmode` and `odip.bootstrap.destsslmode` arguments in the parameter file.

To bootstrap in SSL mode from an integration profile, you use the `-U` argument with the Directory Integration Assistant's `-bootstrap` command. The `-U` argument accepts one of the following values:

- 1—SSL mode with no authentication
- 2—SSL mode with server authentication
- 3—SSL mode with server and client authentication

When you bootstrap from a default integration profile, the value assigned to the default integration profile's `odip.profile.condirurl` is used to establish an SSL connection to the connected directory.

See Also: *Oracle Identity Management User Reference* for information on how to run the `dipassistant` command in SSL mode

Recommended Bootstrapping Methodology

If the source directory from which you are loading data contains a large number of entries, the quickest and easiest method to bootstrap the target directory is by using an LDIF file. Bootstrapping with an integration profile is not recommended in this case because connection errors may occur when reading and writing between the source and target directories. Using an LDIF file is also recommended if the DNs contain special characters, which may not be escaped properly when bootstrapping with an integration profile.

Synchronization with Relational Database Tables

This chapter explains how to synchronize data from tables in a relational database with Oracle Internet Directory. The synchronization can be either incremental—for example, one database table row at a time—or all the database tables at once. The process of synchronization with a database involves executing a directory integration profile. This process has two steps:

1. Retrieving the data from the database. This involves executing a SQL `SELECT` statement that retrieves the specified data records from the database.
2. Writing the data into the directory. This involves converting the retrieved data records to LDAP attribute values and performing the LDAP operation on the directory.

Note: Before reading this chapter, be sure to familiarize yourself with the introductory chapters about Oracle Directory Integration Platform—specifically:

- [Chapter 1, "Introduction to Oracle Identity Management Integration"](#)
- [Chapter 5, "Oracle Directory Synchronization Service"](#)

Oracle Internet Directory 10g (10.1.4.2) does not support exporting data from Oracle Internet Directory to a relational database.

This chapter contains these topics:

- [Preparing the Additional Configuration Information File](#)
- [Preparing the Mapping File](#)
- [Preparing the Directory Integration Profile](#)
- [Example: Synchronizing a Relational Database Table to Oracle Internet Directory](#)

Preparing the Additional Configuration Information File

During synchronization from a relational database to Oracle Internet Directory, the additional configuration information file governs the retrieval of data from the database. It provides the Oracle directory integration server with the following information:

- The `SELECT` statement to execute

- Either the attributes or the database columns to be used in incremental synchronization. Generally, this is either an attribute that contains a timestamp or a change sequence number that the next SQL statement should use to retrieve incremental data.

To configure this file, use the sample file `DBReader.cfg.master` in the `$ORACLE_HOME/ldap/odi/conf` directory, and edit it to your specifications.

Formatting the Additional Configuration Information File

It is very important to follow the correct format of this file. The various sections are divided using TAG names. Every TAG section has a list of parameters and their respective values. The general layout is as follows:

```
[TAG]
PARAMETER1: value
PARAMETER2: value

[TAG]
PARAMETER1: value
PARAMETER2: value\
VALUE continuation\
value continuation\
end of value continuation

[TAG]
PARAMETER1: value
PARAMETER2: value\
end of value continuation
```

For example, following this format, the `DBReader.cfg.master` file looks like this:

```
[DBQUERY]
SELECT: SELECT\
EMPNO EmpNum,\
ENAME,\
REPLACE(EMAIL,'@ACME.COM','') UID,\
EMAIL,\
TELEPHONE,\
TO_CHAR(LAST_UPDATE_DATE,'YYYYMMDDHH24MISS') Modified_Date\
FROM\
EMPLOYEE\
WHERE\
LAST_UPDATE_DATE>TO_DATE (:Modified_Date,'YYYYMMDDHH24MISS')\
ORDER BY\
LAST_UPDATE_DATE

[SYNC-PARAMS]
CHANGEKEYATTRS: Modified_Date
```

Note that the entire `SELECT` statement is put as a value in the `SELECT` parameter in the section represented by the tag `DBQUERY`. Because it is a lengthy value, the value continuation character is put as the last character in every line until the `SELECT` statement ends.

The `CHANGEKEYATTRS` parameter value is the name of the columns to be used while performing incremental synchronization. The values of these columns are always stored in the `orclOdipLastAppliedChgNum` attribute of the profile. Every time the `SELECT` statement is executed, the current values of this attribute are put into the SQL statement accordingly. This ensures that the data is always retrieved incrementally.

If there are multiple column names in the `CHANGEKEYATTRS`—for example, `column1:column2`—then the value in the `orclodipLastAppliedChgNum` attribute of the profile is stored as `value1~value2` and so on, with `value1` corresponding to `column1` and `value2` to `column2`.

Column names are retrieved into Oracle Directory Integration Platform as attribute value pairs and subsequently mapped into LDAP attribute values according to set mapping rules. For this reason, all columns names retrieved in the `SELECT` statement must be simple names rather than expressions. For example, you can have the expression `REPLACE(EMAIL), '@ACME.COM', ''`, but it retrieves the expression value as `UID`.

In this example, the `Modified_Date` is the key for incremental synchronization. Because it is a date, it must be presented in string format.

When the profile is created, the `orclodipLastAppliedChgNum` attribute must be set to some value. All changes after this date—that is, rows in the table with `LAST_UPDATE_DATE` greater than this value—are retrieved. For example, if the `orclodipLastAppliedChgNum` attribute is set to `20000101000000`, then all employee changes since January 1, 2000 are retrieved.

Because of the `ORDER BY` clause, all the database rows returned are in the order of `LAST_UPDATE_DATE`—that is, the changes retrieved and applied to the directory are in chronological order. Once the last change is retrieved and applied:

1. The `orclodipLastAppliedChgNum` attribute value is set to the `Modified_Date` from the last row retrieved.
2. The profile is updated.

Whenever the Oracle Directory Integration Platform executes the profile again, it uses the previously stored value.

Preparing the Mapping File

To configure the mapping rules, follow the instructions in ["Mapping rules and formats"](#) on page 5-2.

Preparing the Directory Integration Profile

You can create the directory integration profile by using the Oracle Directory Integration Server Administration tool or the Directory Integration Assistant (`dipassistant`). If you use the Oracle Directory Integration Server Administration tool, then you must upload the additional configuration information file and the mapping file by using the Directory Integration Assistant.

To configure the directory integration profile, follow the general instructions in ["Registering Connectors in Oracle Directory Integration Platform"](#) on page 6-1, but with these specific instructions in mind:

- Do not set a value for the agent execution command (`orclodipAgentExeCommand`) attribute.
- Set the interface type (`orclodipDataInterfaceType`) attribute to `DB`.

Example: Synchronizing a Relational Database Table to Oracle Internet Directory

This section demonstrates how to synchronize a relational database table with Oracle Internet Directory. It contains these topics:

- [Configuring the Additional Configuration Information File](#)
- [Configuring the Mapping File](#)
- [Configuring the Directory Integration Profile](#)
- [Uploading the Additional Configuration Information File](#)
- [Uploading the Mapping File](#)
- [Synchronization Process](#)
- [Observations About the Example](#)

In this example, the following relational database table containing employee data is synchronized with Oracle Internet Directory:

EMPNO	ENAME	LAST_UPDATE_DATE	EMAIL	TELEPHONE
98357	JOHN DOE	2-JAN-2000	JOHN.DOE@ACME.COM	435-324-3455
98360	ROGER BECK	3-JUL-2001	ROGER.BECK@ACME.COM	435-324-3600
98365	JIMMY WONG	4-MAR-2001	JIMMY.WONG@ACME.COM	435-324-2390
98370	GEORGE MICHAEL	6-FEB-2002	GEORGE.MICHAEL@ACME.COM	435-324-9232

You can find a sample profile for this example in the `$ORACLE_HOME/ldap/odi/samples` directory along with sample configuration and mapping files. In this example:

- The name of the table is `Employee`
- The Profile Name is `TESTDBIMPORT`.
- The employee number (`EMPNO`) is used to join a database record with a directory entry. It is specified in the OID Matching Filter (`orclodipOIDMatchingFilter`) attribute described in the attributes reference chapter of the *Oracle Identity Management User Reference*.
- This table is present in the `testsync/testsyncpwd` schema in a database. The database is located on the host `machine.acme.com`, the database listener port is `1526`, and the SID is `iasdb`. The database URL is `machine.acme.com:1526:iasdb`.
- Appropriate read/write permissions were given explicitly to this profile, namely, `orclodipagentname=testdbimport`, `cn=subscriber profile`, `cn=changelog subscriber`, `cn=oracle internet directory`
- The profile is created in configuration set 1.

Configuring the Additional Configuration Information File

This example uses the same Additional Configuration Information file described earlier in ["Preparing the Additional Configuration Information File"](#) on page 9-1.

Configuring the Mapping File

The mapping file for this example contains the following:

```
DomainRules
NONLDAP:dc=testdbsync,dc=com:uid=%,dc=testdbsync,dc=com
AttributeRules
ename: : : :cn: :person
ename : : : :sn: :person
uid : : : :uid: :inetOrgperson:
EMail: : : :mail: :inetOrgperson
Telephone: : : :telephonenumber: :inetOrgperson
empnum: : : :employeenumber: :inetOrgperson
```

This mapping file specifies the following:

- Directory entries are created as `uid=%,dc=testdbsync,dc=com`. The percent sign (%) is a placeholder for the actual value of `uid`. The `uid` must be present in the mapping rules so that it has a value after the mapping. Otherwise, the DN construction fails.
- Both the `cn` and `sn` attributes need to have the same value as `ename`.
- The `uid` element must have the value of the `EMail` prefix, which is the element of the e-mail address prior to the at sign (@) character.
- The `empnum` attribute becomes `employeenumber` in the directory entry.
- The `telephone` attributes becomes `telephone number` in the directory entry.

Configuring the Directory Integration Profile

The directory integration profile for this example contains the attribute values as described in [Table 9–1](#) on page 9-5. A sample integration profile with these values populated and the corresponding mapping and configuration files are available in `$ORACLE_HOME/ldap/odi/samples` directory. You can create the profile by running the Directory Integration Assistant (`dipassistant`) in the `createprofile` mode and specifying the file as the argument. Alternatively, you can create the profile by using the Oracle Directory Integration Server Administration tool.

See Also:

- The `dipassistant` section in the Oracle Directory Integration Platform tools chapter of the *Oracle Identity Management User Reference* for information about the Directory Integration Assistant (`dipassistant`)
- ["Creating a Profile"](#) on page 7-1 for instructions about creating a profile by using the Oracle Directory Integration Server Administration tool

Table 9–1 Directory Integration Profile for TESTDBIMPORT

Attribute	Value
Profile Name (<code>orclOdipAgentName</code>)	TESTDBIMPORT
Synchronization Mode (<code>orclOdipSynchronizationMode</code>)	IMPORT
Professoriats (<code>orclOdipAgentControl</code>)	ENABLE

Table 9–1 (Cont.) Directory Integration Profile for TESTDBIMPORT

Attribute	Value
Agent Execution Command (orclodipAgentExeCommand)	null
Additional Config Info (orclodipAgentConfigInfo)	As shown in the preceding file. Needs to be uploaded.
Connected Directory Account (orclodipConDirAccessAccount)	testdbsync
Connected Directory Account Password (orclodipConDirAccessPassword)	testdbsyncpwd
Connected Directory URL (orclodipConDirURL)	machine.acme.com:1526:iasdb
Interface Type (orclodipDataInterfaceType)	DB
Mapping File:	To be uploaded from a file.
OID Matching Filter (orclodipOIDMatchingFilter)	<p>employeenumber</p> <p>This means that employeenumber is used to search the directory while looking for a match. If a match is found, then the directory entry is modified. Otherwise, a new entry is created. This is necessary to ensure that the orclodipOIDMatchingFilter attribute is unique in the database also.</p> <p>Once a database row is retrieved, the Oracle directory integration platform searches the directory for that employeenumber in the domain dc=testdbsync, dc=com according to the domain rules. If it gets a match, it updates that entry with the latest values of the columns in the row retrieved. If it does not get a match, it creates a new entry in the directory with all the attributes from the column values.</p>
Last Applied Change Number (orclodipConDirLastAppliedChangeNum)	<p>20000101000000</p> <p>This means that the first time the profile executes, it retrieves and synchronizes all four rows. Subsequently, it retrieves rows only when the LAST_UPDATE_DATE column in the table is updated to the time last modified.</p>

Uploading the Additional Configuration Information File

Use the Directory Integration Assistant to upload the additional configuration information file, as follows:

```
$ORACLE_HOME/bin/dipassistant modifyprofile [-h hostName] [-p port]
[-D bindDn] -profile profName
odip.profile.mapfile=absolute path name of configuration file
```

Uploading the Mapping File

Use the Directory Integration Assistant to upload the mapping file, as follows:

```
$ORACLE_HOME/bin/dipassistant modifyprofile [-h hostName] [-p port]
[-D bindDn] -profile profName
odip.profile.mapfile=absolute path name of mapping file
```


Synchronization Process

In this example, the sequence of steps in the synchronization process is:

1. The Oracle directory integration server starts a new profile thread for the TESTDBIMPORT profile every time the value specified in the scheduling interval (orclodipSchedulingInterval) attribute expires.
2. The profile thread reads the additional configuration information to get the SQL to execute, and then runs the SQL.
3. For every row retrieved from the database, the mapping rules are applied to the record, and LDAP attributes are created.
4. Depending on the OID Matching Filter (orclodipOIDMatchingFilter) attribute, the Oracle directory integration server determines whether a matching entry exists in Oracle Internet Directory. If it exists, then it is updated. If not, then a new entry is created. After the directory operation, the last applied change number (orclodipConDirLastAppliedChgNum) attribute is updated.

Observations About the Example

When a row is retrieved from the database, it is in the following form:

```
EmpNum: 98357
ENAME: JOHN DOE
UID: JOHN.DOE
EMAIL: JOHN.DOE@ACME.COM
TELEPHONE: 435-324-3455
Modified_Date: 20000102000000
```

After the mapping is performed on this record, the output is in the following form:

```
dn: uid=john.doe,dc=testdbsync,dc=com
uid: JOHN.DOE
cn: JOHN DOE
sn: JOHN DOE
mail: JOHN.DOE@ACME.COM
employeenumber: 98357
telephonenumber: 435-324-3455
objectclass: person
objectclass: inetorgperson
```

A subtree search is made in the directory with the filter employeenumber=98357 under the domain dc=testdbsync,dc=com. If the search yields an existing entry, then that entry is updated. Otherwise, a new entry is created. Because the OID Matching Filter (orclodipOIDMatchingFilter) attribute is set to employeenumber, every database record retrieved must have that column. In this case, it is EmpNum as it maps to employeenumber.

Any other attributes in the mapping file that are not in the data retrieved by SQL are ignored—for example, the birthday attribute.

After the profile thread processes all the change records from SQL, it updates the directory with correct values for these attributes:

- Last Applied Change Number (orclodipConDirLastAppliedChgNum)
- Last Execution Time (orclodipLastExecutionTime)
- Last Successful Execution Time (orclodipLastSuccessfulExecutionTime)

Synchronization with Oracle Human Resources

If you use Oracle Human Resources as the primary repository for employee data in your enterprise, then you must synchronize between it and Oracle Internet Directory. The Oracle Human Resources connector enables you to do this.

This chapter introduces the Oracle Human Resources connector, and explains how to deploy it. It contains these topics:

- [Introduction to Synchronization with Oracle Human Resources](#)
- [Data You Can Import from Oracle Human Resources](#)
- [Managing Synchronization Between Oracle Human Resources and Oracle Internet Directory](#)
- [The Synchronization Process](#)
- [Bootstrapping Oracle Internet Directory from Oracle Human Resources](#)

See Also: Oracle Internet Directory Release Notes to find out which release of Oracle Human Resources can be synchronized with this release of Oracle Internet Directory

Introduction to Synchronization with Oracle Human Resources

The Oracle Human Resources connector enables you to import a subset of employee data from Oracle Human Resources into Oracle Internet Directory. It includes both a prepackaged integration profile and an Oracle Human Resources agent that handles communication with Oracle Internet Directory. You can customize the prepackaged integration profile to meet your deployment needs with either the Oracle Directory Integration Server Administration tool or the Directory Integration Assistant (dipassistant).

You can schedule the Oracle Human Resources connector to run at any time, configuring it to extract incremental changes from the Oracle Human Resources system. You can also set and modify mapping between column names in Oracle Human Resources and attributes in Oracle Internet Directory.

Data You Can Import from Oracle Human Resources

[Table 10–1](#) lists the tables in the Oracle Human Resources schema. If you choose, you can import most of these attributes into Oracle Internet Directory.

Table 10–1 Tables in Oracle Human Resources Schema

Table Name	Alias Used in the Connector Config Info Field
PER_PEOPLE_F	PER
PER_ADDRESSES	PA
PER_PERIODS_OF_SERVICE	PPS
PER_PERSON_TYPES	PPT

All of these tables are visible if the login to the Oracle Human Resources database is done with the apps account.

Because attributes can be added or deleted at run time from the configuration file, the Oracle Human Resources connector dynamically creates a SQL statement that selects and retrieves only the required attributes.

[Table 10–2](#) shows some of the fields in the Oracle Human Resources user interface. These fields appear when you add or modify employee data.

Table 10–2 Fields in the Oracle Human Resources User Interface

ATTRIBUTE NAME	DESCRIPTION	FORM/CANVAS/FIELD_NAME
LAST_NAME	Last name of the person	People/Name/Last
FIRST_NAME	First name of the person	People/Name/First
TITLE	Title of the person	People/Name/Title
SUFFIX	Suffix—for example, Jr, Sr, Ph.D.	People/Name/Suffix
MIDDLE_NAME	Middle name	People/Name/Middle
SEX	Sex	Gender List box
START_DATE	Hiring date	People/Hire Date
DATE_OF_BIRTH	Date of birth	People/Personal Information/Birth Date
MARITAL_STATUS	Marital status	People/Personal Information/Status
NATIONAL_INDENTIFIER	Social security number for US residents	People/Identification/Social Security
EMPLOYEE_NUMBER	Employee number	People/Identification/Employee
REGISTERED_DISABLED_FLAG	Indicator that the employee has a disability	People/Personal Information/Has Disability
EMAIL_ADDRESS	Electronic mail address	People/Personal Information/EMail
OFFICE_NUMBER	Office location	People/Office Location Info/Office
MAILSTOP	Mail delivery stop	People/Office Location Info/Mail Stop
INTERNAL_LOCATION	Location	People/Office Location Info/Location
ADDRESS_LINE1	Address line 1	Personal Address Information/Address line 1
ADDRESS_LINE2	Address line 2	Personal Address Information/Address line 2
ADDRESS_LINE3	Address line 3	Personal Address Information/Address line 3
TOWN_OR_CITY	Town or city	Personal Address Information/City

Table 10–2 (Cont.) Fields in the Oracle Human Resources User Interface

ATTRIBUTE NAME	DESCRIPTION	FORM/CANVAS/FIELD_NAME
REGION_1	First region	Personal Address Information/County
REGION_2	Second region	Personal Address Information/State
POSTAL_CODE	Postal code	Personal Address Information/Zip Code
COUNTRY	Country	Personal Address Information/Country
TELEPHONE_NUMBER_1	First telephone number	Personal Address Information/Telephone
TELEPHONE_NUMBER_2	Second telephone number	Personal Address Information/Telephone2

Managing Synchronization Between Oracle Human Resources and Oracle Internet Directory

This section contains these topics:

- [Task 1: Configure a Directory Integration Profile for the Oracle Human Resources Connector](#)
- [Task 2: Configure the List of Attributes to Be Synchronized with Oracle Internet Directory](#)
- [Task 3: Configure Mapping Rules for the Oracle Human Resources Connector](#)
- [Task 4: Prepare to Synchronize from Oracle Human Resources to Oracle Internet Directory](#)

Task 1: Configure a Directory Integration Profile for the Oracle Human Resources Connector

To configure the prepackaged integration profile that is installed with the Oracle Human Resources connector, you can use either the Oracle Directory Integration Server Administration tool or the Directory Integration Assistant. For information on the Oracle Directory Integration Server Administration tool, see [Chapter 7, "Administration of Directory Synchronization"](#). For information about the Directory Integration Assistant, see the `dipassistant` section in the Oracle Directory Integration Platform tools chapter of the *Oracle Identity Management User Reference*.

For some of the parameters in the prepackaged integration profile, you must specify values specific to integration with the Human Resources Connector. The parameters specific to the Human Resources Connector are listed in [Table 10–3](#) on page 10-4.

Table 10–3 Attributes Specific to Oracle Human Resources Connector Integration Profile

Attribute	Description
Profile Name (orclODIPAgentName)	Unique name by which the connector is identified in the system, used as an RDN component of the DN that identifies the integration profile. The name can contain only alpha-numeric characters. This attribute is mandatory and not modifiable. The default name is OracleHRAgent.
Synchronization Mode (ModeorclODIPSynchronizationMode)	<p>The direction of synchronization between Oracle Internet Directory and a connected directory.</p> <ul style="list-style-type: none"> ■ IMPORT indicates importing changes from a connected directory to Oracle Internet Directory. ■ EXPORT indicates exporting changes from Oracle Internet Directory to a connected directory. <p>The default is IMPORT.</p> <p>This attribute is mandatory and modifiable.</p> <p>Note: In Oracle Internet Directory 10g (10.1.4.2), only import operations for Oracle Human Resources are supported.</p>
Execution Information	
Agent Execution Command (orclODIPAgentExeCommand)	<p>Connector executable name and argument list used by the directory integration server to execute the connector.</p> <p>This attribute is mandatory and modifiable.</p> <p>The default is:</p> <pre>odihragent OracleHRAgent connect=hrdb \ login=%orclodipConDirAccessAccount \ pass=%orclodipConDirAccessPassword \ date=%orclODIPLastSuccessfulExecutionTime \</pre> <p>You must set the value in the argument <code>connect=hrdb</code> to the connect string of the Oracle Human Resources system database.</p>
Connected Directory Account (orclodipConDirAccessAccount)	<p>Valid user account in the connected directory to be used by the connector for synchronization. For the Human Resources Agent, it is a valid user identifier in the Oracle Human Resources database.</p> <p>See Also: Chapter 10, "Synchronization with Oracle Human Resources" for typical usage of passing it in the command-line</p>
Additional Config Info (orclODIPAgentConfigInfo)	<p>Any configuration information that you want the connector to store in Oracle Internet Directory. It is passed by the directory integration server to the connector at time of connector invocation. The information is stored as an attribute and the directory integration server does not have any knowledge of its content.</p> <p>The value stored in this attribute represents (for Oracle Human Resources connector) all attributes that need to be synchronized from Oracle Human Resources.</p> <p>See Also: "Task 2: Configure the List of Attributes to Be Synchronized with Oracle Internet Directory" on page 10-5</p> <p>This attribute is mandatory for the Oracle Human Resources connector, and modifiable by editing the configuration file and uploading it again into the profile. You cannot modify this attribute by using the Oracle Directory Integration Server Administration tool.</p>
Connected Directory URL (orclodipConDirURL)	<p>The host and port details of the connected directory. They must be entered in this format: <i>host:port:sid</i>.</p>

Table 10–3 (Cont.) Attributes Specific to Oracle Human Resources Connector Integration Profile

Attribute	Description
Interface Type (orclODIPInterfaceType)	The interface used for data transfer. Because it is in the form of a tagged file, it is set to TAGGED. Note: You should not modify this attribute for Oracle Human Resources profile.
Mapping Information	
Mapping Rules (orclODIPAttributeMappingRules)	Attribute for storing the mapping rules. Store the mapping rules in a file by using the Directory Integration Assistant (dipassistant). This attribute is mandatory for Oracle Human Resources and is modifiable. See Also: <ul style="list-style-type: none"> "Mapping rules and formats" on page 5-2 "Configuring Mapping Rules" on page 6-4
Connected Directory Matching Filter (orclODIPConDirMatchingFilter)	This is not used in Oracle Human Resources connectivity.
OID Matching Filter (orclODIPOIDMatchingFilter)	This attribute names an LDAP filter that is used to search for a target entry in Oracle Internet Directory. The Oracle directory integration server uses this filter to find out what kind of LDAP operation it needs to do to synchronize. It is of the form <code>employeenumber=%</code> . It is optional and modifiable.
Status Information	
OID Last Applied Change Number (orcllastappliedChangenumber)	This attribute, standard for all export profiles, does not apply to Oracle Human Resources synchronization.
Last Applied Change Number (orclODIPConDirLastAppliedChgNum)	This attribute, standard for all profiles, does not apply to the Oracle Human Resources synchronization.

Task 2: Configure the List of Attributes to Be Synchronized with Oracle Internet Directory

The default Oracle Human Resources profile provides a default list of attributes to be synchronized from Oracle Human Resources to Oracle Internet Directory. You can customize this list, adding attributes to it or removing attributes from it.

The default attribute list is stored in the `orclodipAgentConfigInfo` attribute as part of the integration profile. The configuration information is also available in the file `oraclehragent.cfg.master` that is located under the `$ORACLE_HOME/ldap/odi/conf` directory.

Note: Do not modify the `oraclehragent.cfg.master` file; it serves as a backup.

Table 10–4 describes columns in the default list of Oracle Human Resources attributes.

Table 10–4 Oracle Human Resources Attributes Synchronized with Oracle Internet Directory by Default

Column	Description
ATTRNAME	The output tag generated in the output data file.

Table 10–4 (Cont.) Oracle Human Resources Attributes Synchronized with Oracle Internet Directory by Default

Column	Description
COLUMN_NAME	Database column name from where to obtain this value.
TABLE_NAME	Database table name from where to obtain this value.
FORMAT	The column data type of this attribute (ASCII, NUMBER, DATE).
MAP	Indicator of whether to extract this attribute from Oracle Human Resources. A value of Y indicates that it will be extracted, and a value of N indicates that it will not be.

The oraclehrgent.cfg.master file contains the following:

```

ATTRNAME: COLUMN_NAME: TABLE_NAME: FORMAT: MAP
PersonId: person_id: PER: NUMBER: Y
PersonType: person_type_id: PER: NUMBER: Y
PersonTypeName: system_person_type: PPT: ASCII: Y
LastName: last_name: PER: ASCII: Y
StartDate: start_date: PER: DATE: Y
BirthDate: date_of_birth: PER: DATE: Y
EMail: email_address: PER: ASCII: Y
EmployeeNumber: employee_number: PER: NUMBER: Y
FirstName: first_name: PER: ASCII: Y
FullName: full_name: PER: ASCII: Y
knownas: known_as: PER: ASCII: Y
MaritalStatus: marital_status: PER: ASCII: Y
middleName: middle_names: PER: ASCII: Y
country: country: PA: ASCII: Y
socialsecurity: national_identifier: PER: ASCII: Y
Sex: sex: PER: ASCII: Y
Title: title: PER: ASCII: Y
suffix: suffix: PER: ASCII: Y
street1: address_line1: PA: ASCII: Y
zip: postal_code: PA: ASCII: Y
Address1: address_line1: PA: ASCII: Y
Address2: address_line2: PA: ASCII: Y
Address3: address_line3: PA: ASCII: Y
TelephoneNumber1: telephone_number_1: PA: ASCII: Y
TelephoneNumber2: telephone_number_2: PA: ASCII: Y
TelephoneNumber3: telephone_number_3: PA: ASCII: Y
town_or_city: town_or_city: PA: ASCII: Y
state: region_2: PA: ASCII: Y
Start_date: effective_start_date: PER: DATE: Y
End_date: effective_end_date: PER: DATE: Y
per_updateTime: last_update_date: PER: DATE: Y
pa_updateTime: last_update_date: PA: DATE: Y

```

Modifying Additional Oracle Human Resources Attributes for Synchronization

To include additional Oracle Human Resources attributes for synchronization, follow these steps:

1. Copy the oraclehrgent.cfg.master file and name it anything other than *Agent_Name.cfg*. This is because the Oracle directory integration server generates a configuration file with that name, using it to pass the configuration information to the Oracle Human Resources agent at run time.

2. Include an additional Oracle Human Resources attribute for synchronization by adding a record to this file. To do this, you need this information:

- Table name in the database from which the attribute value is to be extracted. These tables are listed in [Table 10–1](#) on page 10-2. The file uses abbreviated names for the four tables used in the synchronization.
- Column name in the table.
- Column data type. Valid values are ASCII, NUMBER, and DATE.

You also need to assign an attribute name to the column name. This acts as the output tag that is used to identify this attribute in the output file. This tag is used in the mapping rules to establish a rule between the Oracle Human Resources attribute and the Oracle Internet Directory attribute.

You must also ensure that the map column—that is, the last column in the record—is set to the value Y.

Note: If you add a new attribute in the attribute list, then you must define a corresponding rule in the `orclodipAttributeMappingRules` attribute. Otherwise the Oracle Human Resources attribute is not synchronized with the Oracle Internet Directory even if it is being extracted by the Oracle Human Resources connector.

Excluding Oracle Human Resources Attributes from Synchronization

To exclude an Oracle Human Resources attribute that is currently being synchronized with Oracle Internet Directory:

1. Copy the `oraclehragent.cfg.master` file and name it anything other than `Agent_Name.cfg`. This is because the directory integration server generates a configuration file with that name, using it to pass the configuration information to the Oracle Human Resources connector at run time.
2. Do one of the following:
 - Comment out the corresponding record in the attribute list by putting a number sign (#) in front of it.
 - Set the value of the column map to N.

Configuring a SQL SELECT Statement in the Configuration File to Support Complex Selection Criteria

If the previous supporting attribute configuration is not sufficient to extract data from the Oracle Human Resources database, then the Oracle Human Resources agent can also execute a preconfigured SQL SELECT statement in the configuration file. There is a tag to indicate this in the configuration file, namely, a `[SELECT]` in the configuration file.

The following example shows a sample select statement to retrieve some information from the Oracle Human Resources database. Note that only the SQL statement should follow the `[SELECT]` tag. The `BINDVAR` bind variable needs to be there to retrieve incremental changes. The substitutes passes this value (the time stamp) to the Oracle Human Resources connector.

All the column expressions retrieved in the SELECT statement must have column names—for example, `REPLACE(ppx.email_address), '@ORACLE.COM', '')` is

retrieved as EMAILADDRESS. The Oracle Human Resources connector writes out EMAILADDRESS as the attribute name in the output file with its value as the result of the expression `REPLACE(ppx.email_address), '@ORACLE.COM' ''`.

The following is an example of a `SELECT` statement in a configuration file.

```
[SELECT]

SELECT
    REPLACE(ppx.email_address, '@ORACLE.COM', '') EMAILADDRESS ,
    UPPER(ppx.attribute26) GUID,
    UPPER(ppx.last_name) LASTNAME,
    UPPER(ppx.first_name) FIRSTNAME,
    UPPER(ppx.middle_names) MIDDLENAME,
    UPPER(ppx.known_as) NICKNAME,
    UPPER(SUBSTR(ppx.date_of_birth,1,6)) BIRTHDAY,
    UPPER(ppx.employee_number) EMPLOYEEID,
    UPPER(ppos.date_start) HIREDATE
FROM
    hr_organization_units hou,
    per_people_x ppx,
    per_people_x mppx,
    per_periods_of_service ppos
WHERE
    pax.supervisor_id = mppx.person_id(+)
    AND pax.organization_id = hou.organization_id(+)
    AND ppx.person_id = ppos.person_id
    AND ppx.person_id = pax.person_id
    AND ppos.actual_termination_date IS NULL
    AND UPPER(ppx.current_employee_flag) = 'Y'
    AND ppx.last_update_date >= (:BINDVAR, 'YYYYMMDDHH24MISS')
```

Task 3: Configure Mapping Rules for the Oracle Human Resources Connector

Attribute mapping rules govern how the Oracle directory integration server converts attributes between Oracle Human Resources and Oracle Internet Directory. You can customize the mapping rules you want the Oracle directory integration server to use.

The Oracle Human Resources agent profile has a default mapping file with a set of mapping rules in the attribute `orclodipAttributeMappingRules`. This information is also stored in the file named `oraclehragent.map.master` located under the `$ORACLE_HOME/ldap/odi/conf` directory.

Note: Do not modify the `oraclehragent.map.master` file. It serves as a backup.

See Also: ["Mapping rules and formats"](#) on page 5-2 for the contents of the `oraclehragent.map.master` file and a description of the format of the mapping rules records

Task 4: Prepare to Synchronize from Oracle Human Resources to Oracle Internet Directory

This section explains how to set up synchronization from Oracle Human Resources to Oracle Internet Directory.

Preparing for Synchronization

To prepare for synchronization between Oracle Human Resources and Oracle Internet Directory, follow these steps:

1. Ensure that the Oracle Human Resources connector and the directory integration server are installed on the host from which you want to run the Oracle Human Resources connector.
2. Ensure that you have the information for accessing the Oracle Human Resources system, including:
 - Connect string to the Oracle Human Resources system database
 - Access account
 - Password
3. Configure an integration profile for the Oracle Human Resources connector, as described in ["Task 1: Configure a Directory Integration Profile for the Oracle Human Resources Connector"](#) on page 10-3. Ensure that all values in the integration profile are properly set, including:
 - Oracle Human Resources attribute list
 - Oracle Human Resources attribute mapping rules
 - Scheduling interval
4. Once everything is properly set, set the Profile Status (`orclodipagentcontrol`) attribute to `ENABLE`. This indicates that the Oracle Human Resources connector is ready to run.
5. Start the Oracle directory server and the Oracle Human Resources system if they are not already running on the respective hosts.
6. When everything is ready, start the directory integration server if it is not already running on this host.

See Also: ["Starting, Stopping, and Restarting the Oracle Directory Integration Platform"](#) on page 4-8 for instructions about starting and stopping the directory integration server

The Synchronization Process

Once the Oracle Human Resources system, Oracle Internet Directory, and the Oracle directory integration server are running, and the Oracle Human Resources connector is enabled, the Oracle directory integration server automatically starts synchronizing changes from the Oracle Human Resources system into Oracle Internet Directory. It follows this process:

1. Depending on the value specified in the Last Execution Time (`orclodipLastExecutionTime`) and the Scheduling Interval (`orclodipschedulinginterval`), the Oracle directory integration server invokes the Oracle Human Resources connector.
2. The Human Resources agent extracts:
 - All the changes from the Oracle Human Resources System based on the time specified in the `orclodipLastSuccessfulExecutionTime` attribute in the integration profile
 - Only the attributes specified in the `orclodipAgentConfigInfo` attribute in the profile

It then writes the changes into the Oracle Human Resources import file, namely `$ORACLE_HOME/ldap/odi/import/HR_Agent_Name.dat`.

3. After the agent completes execution, it creates a data file that looks similar to the following:

```

FirstName: John
LastName: Liu
EmployeeNumber: 12345
Title: Mr.
Sex: M
MaritalStatus: Married
TelephoneNumber: 123-456-7891
Mail: Jliu@my_company.com
Address: 100 Jones Parkway
City: MyTown

```

4. The Oracle directory integration server imports the changes to Oracle Internet Directory by doing the following:
 - Reading each change record from the import file.
 - Converting each change record into an LDAP change entry based on the rules specified in the Mapping Rules (`orclodipAttributeMappingRules`) in the integration profile.
5. After importing all the changes to Oracle Internet Directory, Oracle Human Resources connector moves the import file to the archive directory, `$ORACLE_HOME/ldap/odi/import/archive`. The status attributes Last Execution Time (`orclodipLastExecutionTime`) and Last Successful Execution Time (`orclodipLastSuccessfulExecutionTime`) are updated to the current time.

If the import operation fails, only the Last Execution Time (`orclodipLastExecutionTime`) attribute is updated, and the connector attempts to extract the changes from Human Resources system based on the Last Successful Execution Time (`orclodipLastSuccessfulExecutionTime`) attribute. The reason for failure is logged in the trace file in `$ORACLE_HOME/ldap/odi/HR_Agent_Name.trc` file.

Bootstrapping Oracle Internet Directory from Oracle Human Resources

There are two ways to bootstrap Oracle Internet Directory from Oracle Human Resources:

- Use the Oracle Human Resources connector. In the integration profile, set the `orclodipLastSuccessfulExecutionTime` attribute to a time before Oracle Human Resources was installed.
- Use external tools to migrate data from Oracle Human Resources into Oracle Internet Directory.

Synchronization with Third-Party Metadirectory Solutions

To enable synchronization with supported third-party metadirectory solutions, Oracle Internet Directory uses change logs. The Oracle directory integration server does not provide mapping or scheduling services for third-party metadirectory solutions.

This chapter describes how change log information is generated and how supporting solutions use that information. It tells you how to enable third-party metadirectory solutions to synchronize with Oracle Internet Directory.

This chapter contains these topics:

- [About Change Logs](#)
- [Enabling Third-Party Metadirectory Solutions to Synchronize with Oracle Internet Directory](#)
- [Synchronization Process](#)
- [Disabling and Deleting Change Subscription Objects](#)

About Change Logs

Oracle Internet Directory records each change as an entry in the change log container. A third-party metadirectory solution retrieves changes from the change log container and applies them to the third-party directory. To retrieve these changes, the third-party metadirectory solution must subscribe to the Oracle Internet Directory change logs.

Each entry in the change log has a change number. The third-party metadirectory solution keeps track of the number of the last change it applied, and it retrieves from Oracle Internet Directory only those changes with numbers greater than the last change it applied. For example, if the last change a third-party metadirectory solution retrieved was a number of 250, then subsequent changes it retrieves would be greater than 250.

Note: If a third-party metadirectory solution is not subscribed to the Oracle Internet Directory change logs, and the first change it retrieves is more than one number higher than the last change it last applied, then some of the changes in the Oracle Internet Directory change log have been purged. In this case, the third-party metadirectory solution must read the entire Oracle Internet Directory to synchronize its copy with that in Oracle Internet Directory.

See Also: ["Components Involved in Oracle Directory Synchronization"](#) on page 5-1 for a conceptual discussion of directory integration profiles

Enabling Third-Party Metadirectory Solutions to Synchronize with Oracle Internet Directory

To enable third-party metadirectory solutions to retrieve changes from Oracle Internet Directory, perform the tasks described in this section.

- [Task 1: Perform Initial Bootstrapping](#)
- [Task 2: Create a Change Subscription Object in Oracle Internet Directory for the Third-Party Metadirectory Solution](#)

Task 1: Perform Initial Bootstrapping

To bootstrap a directory to synchronize data between a local directory and Oracle Internet Directory, do the following:

1. Find the number of the last change recorded in Oracle Internet Directory. This number is in the DSE root attribute, `lastChangeNumber`.

To find the number of the last change recorded in Oracle Internet Directory, use the `ldapsearch` command. Enter the following command:

```
ldapsearch -h host_name -p port_number -s base -b "" 'objectclass=*'  
lastchangenumber
```

If the change log does not contain change entries because they have been purged, then the last change number retrieved is 0 (zero).

2. Use the `ldifwrite` command to export data from Oracle Internet Directory into an LDIF file.
3. Convert the LDIF file to a format suitable to the client directory, then load it into the client directory.

Note: Initial bootstrapping is not required with a new installation of Oracle Internet Directory. In this case, the current change number of the newly installed Oracle Internet Directory is 0 (zero).

See Also: See the `ldifwrite` section in the Oracle Internet Directory data management tools chapter of the *Oracle Identity Management User Reference*

Task 2: Create a Change Subscription Object in Oracle Internet Directory for the Third-Party Metadirectory Solution

To enable a third-party metadirectory solution to synchronize with Oracle Internet Directory, you must create a change subscription object for it in Oracle Internet Directory. This gives the third-party metadirectory solution access to change log objects stored in Oracle Internet Directory.

About the Change Subscription Object

The change subscription object is an entry located under the following container in Oracle Internet Directory:

```
cn=Subscriber Profile,cn=ChangeLog Subscriber,cn=Oracle Internet Directory
```

This change subscription object provides a unique credential for a third-party metadirectory solution to bind with Oracle Internet Directory and to retrieve changes from it. You associate the change subscription object with the auxiliary object class `orclChangeSubscriber`. This object class has several attributes, of which the following are mandatory:

- `userPassword`
Password to be used by the directory when accessing the change log object in Oracle Internet Directory.
- `orclLastAppliedChangeNumber`
Number of the change applied during the last synchronization. This attribute allows the directory to retrieve only the changes in Oracle Internet Directory it has not already applied.

Creating a Change Subscription Object

To create a change subscription object, use the `ldapadd` command. The following example uses an input file, named `add.ldif`, to create and enable a change subscription object, named `my_change_subscription_object`, under the container `cn=Subscriber Profile,cn=ChangeLog Subscriber,cn=Oracle Internet Directory`. The `orclLastAppliedChangeNumber` attribute is the current change number in the directory before initial bootstrapping—in this example, 250.

- Edit the `add.ldif` file:

```
dn: cn=my_change_subscription_object,cn=Subscriber Profile,
   cn=ChangeLog Subscriber,cn=Oracle Internet Directory
userpassword: my_password
orclLastAppliedChangeNumber: 250
orclSubscriberDisable: 0
objectclass: orclChangeSubscriber
objectclass: top
```

- Add the entry:

```
ldapadd -h my_host -p 389 -f add.ldif
```

See Also: ["Disabling and Deleting Change Subscription Objects"](#) on page 11-4 for instructions about temporarily disabling or deleting change subscription objects

Synchronization Process

This section contains these topics:

- [How a Connected Directory Retrieves Changes the First Time from Oracle Internet Directory](#)
- [How a Connected Directory Updates the `orclLastAppliedChangeNumber` Attribute in Oracle Internet Directory](#)

How a Connected Directory Retrieves Changes the First Time from Oracle Internet Directory

In this example, a connected directory with a change subscription object named `my_change_subscription_object` acquires changes from Oracle Internet Directory.

```
ldapsearch -h my_host -p 389 -b "cn=changeLog" -s one
(&(objectclass=changeLogEntry)
(changeNumber >= orclLastAppliedChangeNumber )
( ! (modifiersname =cn=my_change_subscription_object,cn=Subscriber Profile,
      cn=ChangeLog Subscriber,cn=Oracle Internet Directory ) ) )
```

When the directory is retrieving changes for the first time, the value for `orclLastAppliedChangeNumber` is the number you set in ["Task 2: Create a Change Subscription Object in Oracle Internet Directory for the Third-Party Metadirectory Solution"](#) on page 11-2.

The `(! (modifiersname=client_bind_dn))` argument in the filter ensures that Oracle Internet Directory does not return changes made by the connected directory itself.

How a Connected Directory Updates the `orclLastAppliedChangeNumber` Attribute in Oracle Internet Directory

After retrieving changes from Oracle Internet Directory, the connected directory updates the `orclLastAppliedChangeNumber` attribute in its change subscription object in Oracle Internet Directory. This allows Oracle Internet Directory to purge changes that connected directories have already applied. It also enables the connected directory to retrieve only the most recent changes, ignoring those it has already applied.

This example uses an input file, `mod.ldif`, in which the connected directory has a change subscription object named `my_change_subscription_object`, and the last applied change number is 121. The connected directory updates `orclLastAppliedChangeNumber` in its change subscription object in Oracle Internet Directory as follows:

1. Edit the `mod.ldif` file:

```
dn: cn=my_change_subscription_object,cn=Subscriber Profile,
    cn=ChangeLog Subscriber,cn=Oracle Internet Directory
changetype:modify
replace: orclLastAppliedChangeNumber
orclLastAppliedChangeNumber: 121
```

2. Use the `ldapmodify` command to load the edited `mod.ldif` file:

```
ldapmodify -h host -p port -f mod.ldif
```

See Also: The chapter about garbage collection in *Oracle Internet Directory Administrator's Guide* for information about purging changes according to change numbers

Disabling and Deleting Change Subscription Objects

You can temporarily disable or delete an existing change subscription object. This section contains these topics:

- [Disabling a Change Subscription Object](#)
- [Deleting a Change Subscription Object](#)

Disabling a Change Subscription Object

If a change subscription object already exists for a third-party metadirectory solution, but you want to disable it temporarily, then set the `orclSubscriberDisable` attribute to 1. The following example uses an input file, `mod.ldif`, to disable a change subscription object.

- Edit the `mod.ldif` file:

```
dn: cn=my_change_subscription_object,cn=Subscriber Profile,
    cn=ChangeLog Subscriber,cn=Oracle Internet Directory
changetype: modify
replace: orclSubscriberDisable
orclSubscriberDisable: 1
```

- Modify the entry:

```
ldapmodify -h my_ldap_host -p 389 -v -f mod.ldif
```

Deleting a Change Subscription Object

To delete a change subscription object, use the `ldapdelete` command. Enter the following command:

```
ldapdelete -h ldap_host -p ldap_port
"cn=my_change_subscription_object,cn=Subscriber Profile,
cn=ChangeLog Subscriber,cn=Oracle Internet Directory"
```


Part IV

Provisioning with the Oracle Directory Integration Platform

Part IV discusses the concepts and components involved in provisioning and the process through which an application receives changes to user or group entries or attributes that it needs to track. It contains these chapters:

- [Chapter 12, "Oracle Directory Integration Platform Service Concepts"](#)
- [Chapter 13, "Deploying Provisioning-Integrated Applications"](#)
- [Chapter 14, "Managing with the Oracle Internet Directory Provisioning Console"](#)
- [Chapter 15, "Understanding the Oracle Provisioning Event Engine"](#)
- [Chapter 16, "Integration of Provisioning Data with Oracle E-Business Suite"](#)

Oracle Directory Integration Platform Service Concepts

As of 10g (10.1.4.2), Oracle offers two complementary provisioning products, optimized for different use cases:

- Oracle Identity Manager, formerly known as Oracle Xellerate Identity Provisioning, is an enterprise provisioning platform designed to manage complex environments with highly heterogeneous technologies that can include directories, databases, mainframes, proprietary technologies, and flat files. Oracle Identity Manager offers full-functioned workflow and policy capabilities along with a rich set of audit and compliance features.
- Oracle Directory Integration Platform, a component of the Identity Management infrastructure, is a meta-directory technology designed to perform directory synchronization as well as provisioning tasks in a directory-centric environment. Oracle Directory Integration Platform is designed to manage a more homogeneous environment consisting of directories and compatible Oracle products. Oracle Directory Integration Platform performs provisioning tasks by using data synchronization and offers a small deployment footprint when workflow and a full feature policy engine are not required.

This chapter discusses Oracle Directory Integration Platform Provisioning. It contains these sections:

- [What Is Provisioning?](#)
- [Components of the Oracle Directory Integration Platform Service](#)
- [Understanding Provisioning Concepts](#)
- [Overview of Provisioning Methodologies](#)
- [Organization of User Profiles in Oracle Internet Directory](#)
- [Understanding Provisioning Flow](#)
- [How Are Administrative Privileges Delegated?](#)

See Also:

- The chapter on developing provisioning-integrated applications in *Oracle Identity Management Application Developer's Guide*
- ["Troubleshooting Provisioning"](#) on page C-19

What Is Provisioning?

Provisioning refers to the process of providing users, groups, and other objects with access to applications and other resources that may be available in an enterprise environment. A provisioning-integrated application refers to an application that has registered for provisioning events and registered a provisioning-integration profile in Oracle Internet Directory. At times, you may want to synchronize all user entries in an application-specific directory with those in Oracle Internet Directory, but provision a particular application to receive notification about only some of them. For example, the directory for Oracle Human Resources typically contains data for all employees in an enterprise, and you would probably want to synchronize all of that data with Oracle Internet Directory. However, you might want to provision another application, such as Oracle Email, to be notified only when members join or leave a particular group.

Before a user account can be provisioned for applications in an Oracle Identity Management deployment, it must first be created in Oracle Internet Directory. User accounts can be created in Oracle Internet Directory with any of the following tools or methods:

- Oracle Internet Directory Provisioning Console
- Directory Integration Assistant's `bulkprov` operation
- Synchronization with third-party directories
- Command-line LDAP tools

The Oracle Directory Integration Platform Service can be invoked for any user entries, regardless of how they were created in Oracle Internet Directory. However, creating a user entry in Oracle Internet Directory does not necessarily mean that the user entry will have access to all applications in the Oracle Identity Management environment. The user account must be manually provisioned by an administrator or automatically provisioned according to an application's provisioning policies. The default provisioning policy of an application can be one of the following:

- Provision all users
- Do not provision users
- Provision users after evaluating a provisioning policy

Provisioning policies are entirely dependent on the needs and requirements within each enterprise environment. For example, an organization may choose to provision all users with access to an e-mail application, but may restrict the users that are provisioned to access a human resources application.

Components of the Oracle Directory Integration Platform Service

The Oracle Directory Integration Platform Service consists of the following components:

- The Oracle directory integration server.

See Also: [Chapter 4, "Managing the Oracle Directory Integration Platform"](#)

- The Oracle Internet Directory Provisioning Console, a ready-to-use, standalone application created by using Oracle Delegated Administration Services. The Provisioning Console works closely with the Oracle Directory Integration Platform Administration tools.

See Also:

- [Chapter 14, "Managing with the Oracle Internet Directory Provisioning Console"](#)
- *Oracle Identity Management Guide to Delegated Administration*
- A provisioning integration profile for each provisioning-integrated application in which you want to provision users. You create a provisioning-integration profile by using the Provisioning Subscription Tool.

See Also: The `oidprovtool` section in the Oracle Directory Integration Platform tools chapter of the *Oracle Identity Management User Reference* for information about the Provisioning Subscription Tool

Understanding Provisioning Concepts

This section explains how applications are provisioned with Oracle Directory Integration Platform Provisioning. It contains these topics:

- [Synchronous Provisioning](#)
- [Asynchronous Provisioning](#)
- [Provisioning Data Flow](#)

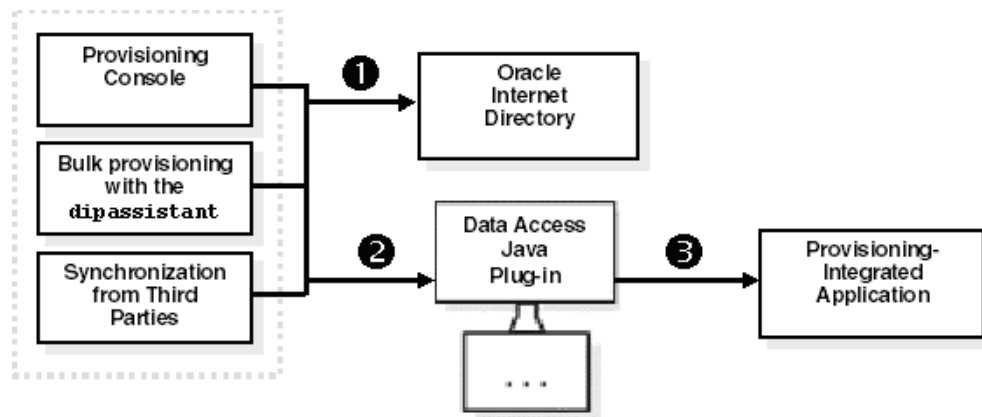
Synchronous Provisioning

A provisioning-integrated application can maintain user information in Oracle Internet Directory or a third-party repository. Applications that maintain user information in Oracle Internet Directory can use the Data Access Java plug-in to create, modify, and delete user entries whenever the change occurs in Oracle Internet Directory.

See Also: *Oracle Identity Management Application Developer's Guide* for more information about the Data Access Java plug-in

The Data Access Java plug-in can be invoked directly from Oracle Identity Management, including the Provisioning Console, bulk provisioning with the Directory Integration Assistant (`dipassistant`), and command-line LDAP tools. For this reason, applications that can be provisioned with the Data Access Java plug-in are provisioned synchronously; no separate provisioning event needs to be sent to the application from the Oracle directory integration server. The Data Access Java plug-in returns either `SUCCESS` or `FAILURE` to the Oracle directory integration server. If an execution status of `SUCCESS` is returned for the Data Access Java plug-in, then a provisioning status is also returned, which is recorded in the user's provisioning status attribute in Oracle Internet Directory for the specific provisioning-integrated application. If the status of `FAILURE` is returned for new user provisioning requests, then the user's provisioning status is assigned a value of `PROVISIONING_FAILURE`. See "[Provisioning Status in Oracle Internet Directory](#)" on page 12-10 for a list of provisioning statuses.

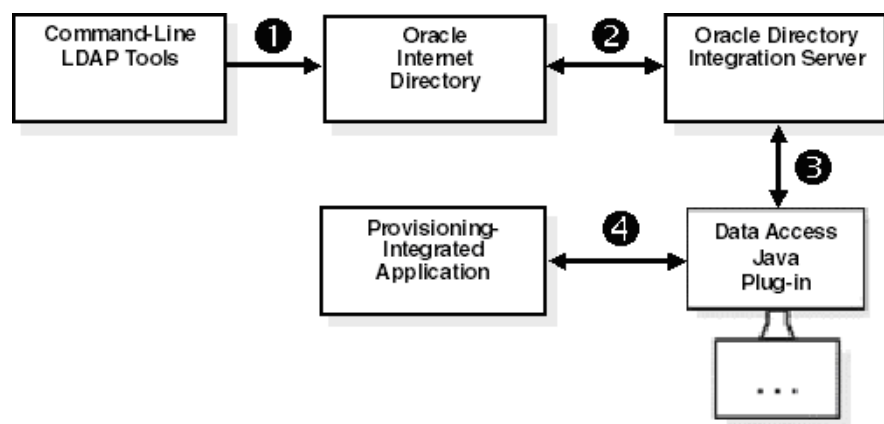
[Figure 12-1](#) illustrates the process of how an application is synchronously provisioned from the Provisioning Console, bulk provisioning with the Directory Integration Assistant (`dipassistant`), and from third-party directories.

Figure 12–1 Synchronous Provisioning Process

As illustrated in [Figure 12–1](#), synchronous provisioning with the Oracle Directory Integration Platform Service from the Provisioning Console, bulk provisioning with the Directory Integration Assistant (*dipassistant*), and from third-party directories follows this process:

1. A new user entry is created in Oracle Internet Directory from one of the following sources:
 - Oracle Internet Directory Provisioning Console
 - Bulk provisioning with the Directory Integration Assistant
 - Synchronization with third-party directories
2. The Oracle Identity Management component that created the new user entry invokes the Data Access Java plug-in.
3. The Data Access Java plug-in provisions the new user account in the application.

[Figure 12–2](#) illustrates the process of how an application is synchronously provisioned using command-line LDAP tools.

Figure 12–2 Synchronous Provisioning from Command-Line LDAP Tools

As illustrated in [Figure 12–2](#), synchronous provisioning from command-line LDAP tools follows this process:

1. A command-line LDAP tool creates a new user entry in Oracle Internet Directory.

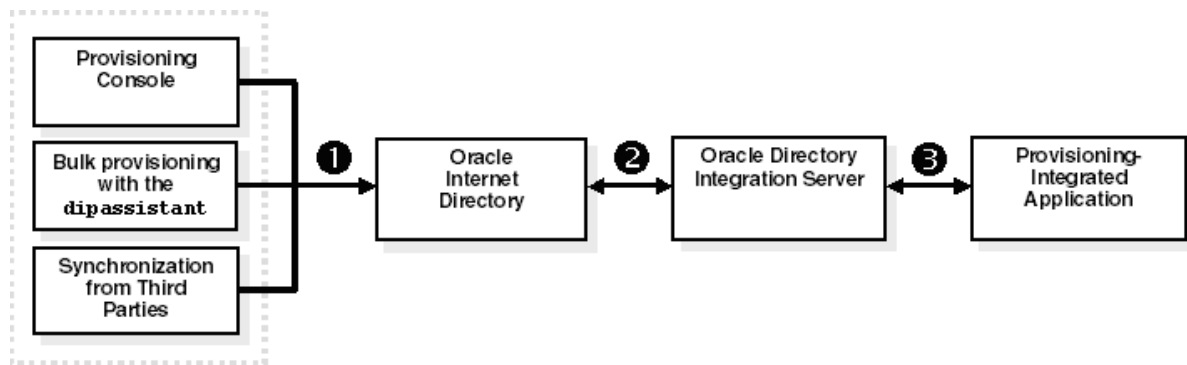
2. At the next scheduled synchronization interval, the Oracle directory integration server identifies new user entries in Oracle Internet Directory that require provisioning.
3. The Oracle directory integration server invokes the Data Access Java plug-in.
4. The Data Access Java plug-in provisions the new user accounts in the application.

Asynchronous Provisioning

The Oracle directory integration server propagates PL/SQL events to a provisioning-integrated application, which then executes a PL/SQL plug-in to process the events. Execution of a PL/SQL plug-in occurs within the application repository and not within the address space of any Oracle Identity Management component. Because, provisioning is handled by a PL/SQL plug-in and not by any component of Oracle Identity Management, provisioning-integrated applications that implement a PL/SQL plug-in are provisioned asynchronously. The PL/SQL plug-in returns the status of SUCCESS or FAILURE to the Oracle directory integration server. If the status of SUCCESS is returned for the PL/SQL plug-in, then a provisioning status is also returned, which is recorded in the user's provisioning status attribute in Oracle Internet Directory for the specific provisioning-integrated application. If the status of FAILURE is returned for new user provisioning requests, then the user's provisioning status is assigned a value of PROVISIONING_FAILURE. See ["Provisioning Status in Oracle Internet Directory"](#) on page 12-10 for a list of provisioning statuses.

Figure 12-3 illustrates the process of how an application is asynchronously provisioned from the Provisioning Console, by using bulk provisioning with the Directory Integration Assistant (dipassistant), or from third-party directories.

Figure 12-3 Asynchronous Provisioning Process



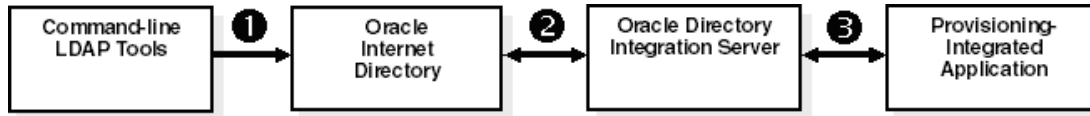
As illustrated in [Figure 12-3](#), asynchronous provisioning from the Provisioning Console, bulk provisioning with the Directory Integration Assistant (dipassistant), and third-party directories follows this process:

1. A new user entry and an associated entry containing application-specific user preferences are created in Oracle Internet Directory from one of the following sources:
 - Oracle Internet Directory Provisioning Console
 - Bulk provisioning with the Directory Integration Assistant
 - Synchronization with third-party directories

2. At the next scheduled synchronization interval, the Oracle directory integration server identifies new user entries in Oracle Internet Directory that require provisioning.
3. Provisioning events are sent from the Oracle directory integration server to the PL/SQL plug-in.

Figure 12–4 illustrates the process of how an application is asynchronously provisioned using command-line LDAP tools.

Figure 12–4 Asynchronous Provisioning using Command-Line LDAP Tools



As illustrated in Figure 12–4, asynchronous provisioning using command-line LDAP tools follows this process:

1. A new user entry is created in Oracle Internet Directory using a command-line LDAP tool.
2. At the next scheduled synchronization interval, the Oracle directory integration server identifies new users entries in Oracle Internet Directory that require provisioning, and creates an associated entry containing application-specific user preferences.
3. Provisioning events are sent from the Oracle directory integration server to the PL/SQL plug-in.

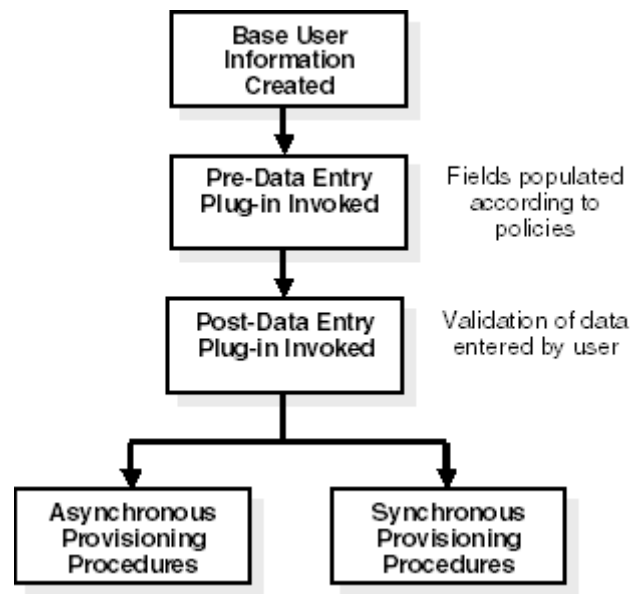
Provisioning Data Flow

Regardless of whether it is provisioned synchronously or asynchronously, an application can invoke the Pre-Data Entry and Post-Data Entry plug-ins to enhance provisioning intelligence and implement business policies. Both plug-ins are invoked by Oracle Identity Management components such as the Oracle Internet Directory Provisioning Console and bulk provisioning with the Directory Integration Assistant (dipassistant).

The Pre-Data Entry plug-in populates fields according to provisioning policies. The primary purpose of this plug-in is to determine whether a user should be provisioned in an application. For example, if an organization has a policy where only managers are provisioned for a financial application, the Pre-Data Entry plug-in can be used to identify which user entries to provision. Common user attributes are already populated when this plug-in is invoked, so it should have adequate information to make provisioning decisions.

The Post-Data Entry plug-in primarily validates data entered by users for common attributes and application-specific attributes. The validation for the plug-in must be successful for provisioning to continue.

Figure 12–5 illustrates the provisioning data flow using the Pre-Data Entry and Post-Data Entry plug-ins.

Figure 12–5 Provisioning Data Flow

As illustrated in [Figure 12–5](#), the provisioning data flow follows this process:

1. Base user information is created.
2. The Pre-Data Entry plug-in is invoked, which populates fields according to policies.
3. The Post-Data Entry plug-in is invoked, which validates data entered by the user.
4. Depending on the provisioning approach, either asynchronous or synchronous provisioning procedures are invoked.

If provisioning is performed with the Provisioning Console, then after the Pre-Data Entry Plug-in is invoked, but before the Post-Data Entry plug-in is invoked, an administrator can modify the application attributes.

Overview of Provisioning Methodologies

This section describes the procedures for provisioning users in Oracle Identity Management. It contains these topics:

- [Provisioning Users from the Provisioning Console](#)
- [Provisioning Users that are Synchronized from an External Source](#)
- [Provisioning Users Created with Command-Line LDAP Tools](#)
- [Bulk Provisioning](#)
- [On-Demand Provisioning](#)
- [Application Bootstrapping](#)

Provisioning Users from the Provisioning Console

You can use the Provisioning Console to centrally manage user provisioning and deprovisioning of one or more users simultaneously. The console includes a wizard-based interface for creating, modifying, and deleting individual users, and for

selectively provision and deprovision users for any provisioning-integrated applications. The Provisioning Console also supports bulk user creation, modification, and deletion of users from an LDIF file. See ["Bulk Provisioning"](#) on page 12-8 for more information.

Provisioning Users that are Synchronized from an External Source

When Oracle Internet Directory is used as a central repository and enterprise user entries are synchronized from third-party directories to Oracle Internet Directory, each user identity is automatically provisioned according to the default provisioning policy of each provisioning-integrated application.

Provisioning Users Created with Command-Line LDAP Tools

Any tools developed by Oracle or third-party vendors that use standard command-line LDAP syntax can create user entries in Oracle Internet Directory. As with user entries that are synchronized from external sources, any user entries created with command-line LDAP tools or any other means are provisioned according to the default provisioning policies for each provisioning-integrated application.

Bulk Provisioning

You can use the Provisioning Console or the Directory Integration Assistant (`dipassistant`) to create and provision user entries by providing an LDAP Data Interchange Format (LDIF) file containing user data. The LDIF file should contain only LDAP-specific attributes. When user entries in an LDIF file are created in Oracle Internet Directory, each entry is provisioned according to the default provisioning policy of each provisioning-integrated application.

On-Demand Provisioning

On-demand provisioning occurs when a user accesses an application and the application has no knowledge of the user in its repository. The application determines whether to provision a user account based on its default provisioning policies. After provisioning a user account in its repository, an application will update the provisioning status of the user entry in Oracle Internet Directory.

Application Bootstrapping

The Oracle Directory Integration Platform Service notifies newly registered applications of all existing user entries in Oracle Internet Directory and attempts to provision each existing user entry as if they were a new user in the application.

Organization of User Profiles in Oracle Internet Directory

This section discusses the organization of user profiles in Oracle Internet Directory. It contains these topics:

- [Organization of Provisioning Entries in the Directory Information Tree](#)
- [Understanding User Provisioning Statuses](#)

Organization of Provisioning Entries in the Directory Information Tree

The Oracle Directory Integration Platform Provisioning relies on user profiles in the directory information tree (DIT) that consist of attributes containing personal

information and preferences for the various applications in which the user is provisioned. These user attributes for the Oracle Directory Integration Platform Service can be categorized as follows:

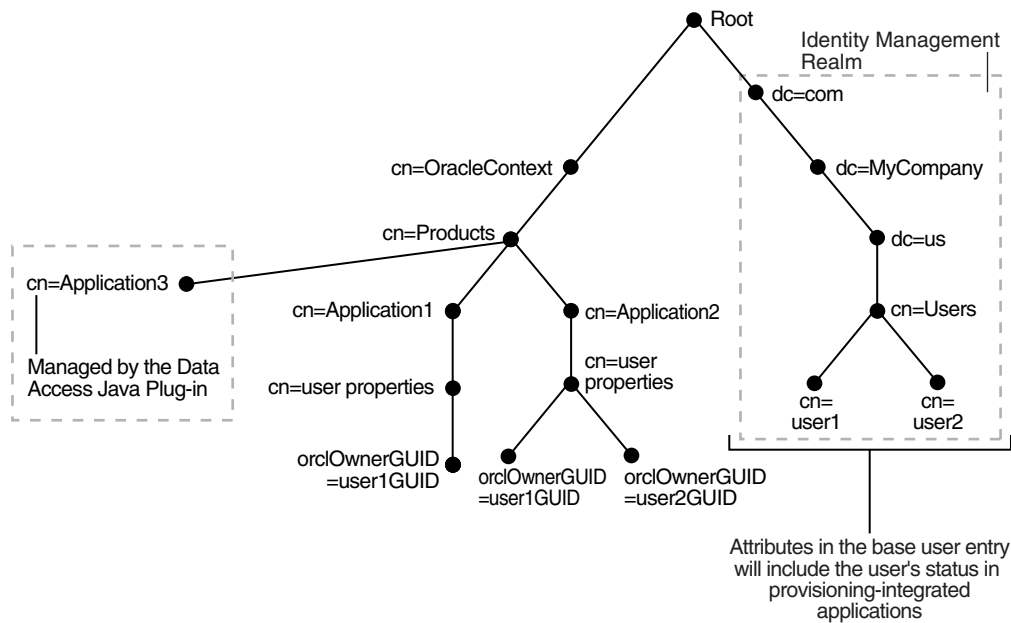
- Base attributes that are available for every user entry
- Application-specific attributes that are only available if a user is provisioned in an application

Base user attributes primarily belong to standard LDAP object classes such as `organizationalPerson` and `inetOrgPerson`, and consist of personal details that include first name, last name, given name, e-mail address, and telephone numbers. Base user attributes also consist of Oracle application-specific attributes that belong to the `orclUserV2` auxiliary class.

Oracle Internet Directory is the primary repository for both base attributes and application-specific attributes. Both types of attributes are stored in each user's profile. However, an application can cache user attributes that are updated with the provisioning event notification service.

As shown in [Figure 12-6](#), user attributes are stored in two locations within the DIT. Base user entries, which include attributes belonging to `inetorgperson` and `orcluserV2`, are stored under `cn=users,Realm DN`. The provisioning status of each user entry is also stored in the base user entry. Application-specific attributes reside in separate entries in the application container. The LDAP schema relating to the application-specific attribute definitions and the object classes are created during the installation or upgrade process. Application-specific attributes are qualified by an auxiliary object class, which will enable searching for the application-specific user properties of the entry. By default, application-specific entries are stored as `orclOwnerGUID=GUID of the Base User` under the `cn=User Properties, cn=Application Type, cn=Products, cn=OracleContext, Realm DN` container.

Some applications manage their own application attributes and implement the Data Access Java plug-in, which is described in ["Understanding Provisioning Concepts"](#) on page 12-3. The Oracle Directory Integration Platform Service invokes this plug-in whenever the base user attributes or application-specific attributes are modified.

Figure 12–6 Base User and Application-Specific Attributes

Understanding User Provisioning Statuses

This section discusses the user provisioning statuses in Oracle Internet Directory. It contains these topics:

- [Provisioning Status in Oracle Internet Directory](#)
- [Provisioning Status Transitions](#)
- [Upgrading and Coexistence Provisioning Statuses](#)
- [Provisioning Statuses and Exception Handling](#)

Provisioning Status in Oracle Internet Directory

The Oracle Provisioning Service records a user's provisioning status in Oracle Internet Directory for each provisioning-integrated application. Provisioning status can be set by the Oracle directory integration server, with bulk provisioning using the Directory Integration Assistant (dipassistant), or by a provisioning-integrated application. [Table 12–1](#) lists the provisioning statuses.

Table 12–1 Provisioning Statuses in Oracle Internet Directory

Internal Status	GUI Status	Description
Provisioning Statuses		
PROVISIONING_REQUIRED	Pending	Provisioning required. This status is selected by an administrator or set according to an application's provisioning policies. Note that this status determines whether a user has been provisioned.
PROVISIONING_IN_PROGRESS	In Progress	Provisioning in progress. The user can access the application when this is the current status if the application performs provisioning at scheduled intervals. The application can also provision the user on-demand.
PROVISIONING_SUCCESSFUL	Successful	Provisioning successful. This status is updated automatically by the Oracle directory integration server, with bulk provisioning using the Directory Integration Assistant (dipassistant), or a provisioning-integrated application.
PROVISIONING_NOT_REQUIRED	Not Requested	Provisioning not required. This status is selected by an administrator or set according to an application's provisioning policies. Note that this status determines whether a user will be provisioned.
PROVISIONING_FAILURE	Failed	Provisioning failed. This status is updated automatically by the Oracle directory integration server, with bulk provisioning using the Directory Integration Assistant (dipassistant), or a provisioning-integrated application. The user cannot access the application when this is the current status.
Deprovisioning Statuses		
DEPROVISIONING_REQUIRED	Pending de-provisioning	Deprovisioning required. The user is still provisioned when this is the current status.
DEPROVISIONING_IN_PROGRESS	De-provisioning In Progress	Deprovisioning in progress.
DEPROVISIONING_SUCCESSFUL	Successfully de-provisioned	Deprovisioning successful. The user cannot access the application when this is the current status.
DEPROVISIONING_FAILURE	Failed de-provisioning	Deprovisioning failed. The user is still provisioned when this is the current status.
Upgrade Statuses		
PENDING_UPGRADE	Pending Upgrade	Provisioning upgrade pending.
UPGRADE_IN_PROGRESS	Upgrade In Progress	Provisioning upgrade in progress.
UPGRADE_FAILURE	Upgrade Failed	Provisioning upgrade failed.

The provisioning status for each application is stored in the `orclUserApplnProvStatus` attribute in a user entry. This attribute is indexed in Oracle Internet Directory and is searchable. A subtyped `orclUserApplnProvStatus` attribute is created for each provisioning-integrated application. For example, the following statements store a user's provisioning statuses for an e-mail application and a scheduling application. The user's provisioning status

for the e-mail application is `PROVISIONING_SUCCESS` while his or her provisioning status for the scheduling application is `PROVISIONING_FAILURE`.

```
orclUserApplnProvStatus;CORP-MAIL_E-MAIL:PROVISIONING_SUCCESS
orclUserApplnProvStatus;CORP-SCHEDULE_CALENDAR:PROVISIONING_FAILURE
```

Additional information about a user's provisioning status in an application is stored in the `orclUserApplnProvStatusDesc` attribute and the provisioning failure account for each application is stored in the `orclUserApplnProvFailureCount` attribute. As with the `orclUserApplnProvStatus` attribute, separate `orclUserApplnProvStatusDesc` and `orclUserApplnProvFailureCount` attributes are created for each provisioning-integrated application. The format for the `orclUserApplnProvStatusDesc` attribute is the same as the `orclUserApplnProvStatus` attribute, except that a timestamp and descriptive information are appended to the application name and type, as follows:

```
orclUserApplnProvStatusDesc;CORP-MAIL_E-MAIL:20040101010101^Missing employee ID
```

The `orclUserApplnProvStatus`, `orclUserApplnProvStatusDesc`, and `orclUserApplnProvFailureCount` attributes are contained in the `orclUserProvStatus` object class as optional attributes.

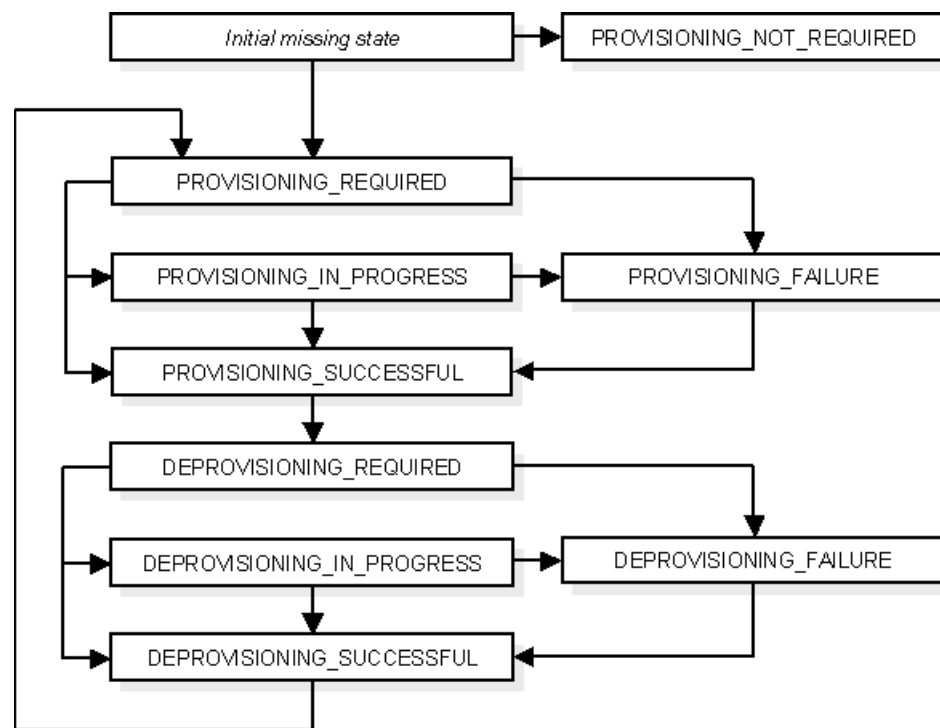
Provisioning Status Transitions

Table 12–2 lists the valid provisioning status transitions.

Table 12–2 Valid Provisioning Status Transitions in Oracle Internet Directory

Internal Status	GUI Status	Valid Transition From
Provisioning Statuses		
PROVISIONING_REQUIRED	Pending	<i>Initial missing state</i> DEPROVISIONING_SUCCESSFUL
PROVISIONING_IN_PROGRESS	In Progress	PROVISIONING_REQUIRED
PROVISIONING_SUCCESSFUL	Successful	PROVISIONING_REQUIRED PROVISIONING_IN_PROGRESS PROVISIONING_FAILURE
PROVISIONING_NOT_REQUIRED	Not Requested	<i>Initial missing state</i>
PROVISIONING_FAILURE	Failed	PROVISIONING_REQUIRED PROVISIONING_IN_PROGRESS
Deprovisioning Statuses		
DEPROVISIONING_REQUIRED	Pending de-provisioning	PROVISIONING_SUCCESSFUL
DEPROVISIONING_IN_PROGRESS	De-provisioning In Progress	PROVISIONING_SUCCESSFUL
DEPROVISIONING_SUCCESSFUL	Successfully de-provisioned	DEPROVISIONING_REQUIRED DEPROVISIONING_IN_PROGRESS DEPROVISIONING_FAILURE
DEPROVISIONING_FAILURE	Failed de-provisioning	DEPROVISIONING_REQUIRED DEPROVISIONING_IN_PROGRESS

Figure 12–7 illustrates the valid provisioning status transitions.

Figure 12-7 Valid Provisioning Status Transitions

Upgrading and Coexistence Provisioning Statuses

In Oracle Identity Management 10g (10.1.4.2), a user entry can be physically represented in Oracle Internet Directory by multiple LDAP entries. In addition to the base user entry, separate LDAP entries can exist for each provisioning-integrated application.

In a typical upgrade of Oracle Identity Management, multiple middle tiers are not upgraded simultaneously. This means that following an Oracle Identity Management upgrade, middle tiers from a previous version may need to run in parallel with middle tiers from the upgraded version. When a middle tier is upgraded, all of a user's application-specific data that was previously stored in the application metadata repository, will be migrated on-demand. For each user entry that is present in Oracle Internet Directory prior to the upgrade, the Oracle directory integration server will initiate a new user event and assign a provisioning status of `PENDING_UPGRADE` to the user entry. If a new user entry is created from an older middle tier or some unsupported route, such as an existing application using the standard LDAP SDK, the provisioning status attribute will be missing. In this case, the Oracle directory integration server also initiates a new user event and assign a provisioning status of `PENDING_UPGRADE` to the user entry.

Once a provisioning-integrated application receives the event, it will return a response to the Oracle directory integration platform indicating whether or not the user is provisioned. The Oracle directory integration platform then updates the provisioning status in the user entry accordingly.

Provisioning Statuses and Exception Handling

If a new user entry created with the Provisioning Console or through synchronization with an external data source does not contain enough information to provision the user in a particular application, provisioning may fail. Provisioning can also fail for a

variety of other reasons. The Oracle Directory Integration Platform Service identifies user provisioning failures as exceptions.

Whenever an application responds to a `USER_ADD` event with a failure status, the Oracle directory integration server will change the user's provisioning status to `PROVISIONING_FAILURE`. The Oracle directory integration server will then send notifications to the applications of the failed cases also just like a new user case. This will serve as a retry for the provisioning request.

The provisioning status of a user displays in the Provisioning Console. The administrator can make the necessary changes to fix the problem, and the provisioning would get retried automatically. This will result in invocation of the data access plug-in if the provisioning is synchronous. However, an event will be propagated if the provisioning is asynchronous.

This sequence of steps will be retried as long as the user is not provisioned successfully.

Understanding Provisioning Flow

This section discusses the flow of information and control in various provisioning scenarios. It contains these topics:

- [Creating and Modifying Users with the Provisioning Console](#)
- [Deleting Users with the Provisioning Console](#)
- [User Provisioning from an External Source](#)

Creating and Modifying Users with the Provisioning Console

You can use the Provisioning Console to create and provision new user entries in Oracle Internet Directory. The console uses a wizard-based interface to perform the following steps:

1. The initial user creation screen shows a list of required base user attributes. The base user attributes are populated after the Provisioning Console invokes the Pre-Data Entry plug-in. For user creation, the plug-in processes the base user attributes and generates the application's default provisioning policy and attributes. For user modification, the Provisioning Console retrieves user information from Oracle Internet Directory, and the plug-in retrieves application information.
2. The next step in the wizard displays how a user will be provisioned in each application, based on the application's default provisioning policy. For user modification, this step displays one list with applications for which the user is currently provisioned and another list in which the user can be provisioned. You can select one of the following values for an application in which the user is not yet provisioned:
 - **User Policy.** The selected value for this field is based on each application's default provisioning policy. This field can display one of two values: `Provision` or `Do Not Provision`.
 - **Override Policy to perform Provision.** Selecting this option overrides the application's default policy and provisions the user.
 - **Override Policy NOT to perform Provision.** Selecting this option override the application's default policy and does not provision the user.

For applications in which the user is currently provisioned, there will be an option for deprovisioning the user.

3. For applications in which the user is not provisioned, the next step in the wizard displays attributes for the applications to be provisioned, with the default values returned by the Pre-Data Entry plug-in. For applications in which the user is provisioned, current application information is listed. You can make any necessary changes to the attributes in this step before clicking **Next**. When you click **Next**, the Post-Data Entry plug-in is invoked, which validates the data you entered.
4. The final step in the wizard enables you to review application attributes and values. Click **Finish**. After you click **Finish**, the Provisioning Console creates or updates the user information in Oracle Internet Directory, and then invokes the Data Access Java plug-in for applications that are provisioned synchronously to create or update the application

Deleting Users with the Provisioning Console

Before a user is deleted, the Provisioning Console displays a read-only page listing the base user and the application attributes. After the user confirms the deletion, the Provisioning Console deletes the base user information and any application-specific information, or invokes the Data Access Java plug-in for applications that are provisioned synchronously. For asynchronous applications, a `USER_DELETE` event is propagated.

User Provisioning from an External Source

The majority of deployments are expected to provision users from an external source, such a third-party enterprise user repository. In these types of deployments, the third-party repository bootstraps Oracle Internet Directory. Oracle Directory Integration Platform will provide ongoing synchronization between Oracle Internet Directory and the third-party repository. Example of third-party user repositories include Oracle Human Resources and LDAP directories such as Microsoft Active Directory and Sun Java System Directory, Novell eDirectory, and OpenLDAP.

The Oracle Directory Synchronization Service will create the user entry in Oracle Internet Directory. Because the information coming from the external source may not be sufficient to provision the user in various applications, the application defaults will be used to create the application information. User creation by the Oracle Directory Synchronization Service occurs as follows:

1. The Oracle Directory Synchronization Service evaluates the provisioning policies specified by the applications to determine whether the user should be provisioned in the application.
2. The Oracle Directory Synchronization Service evaluates any other plug-ins that the application has registered.
3. The Oracle Directory Integration Platform Service invokes the PL/SQL plug-in or the Data Access Java plug-in to deliver the user information to the application.
4. The provisioning status of the user is returned by the application using the event interfaces.
5. The Oracle Directory Integration Platform Service updates the provisioning status of the user for the application.

How Are Administrative Privileges Delegated?

Administrative rights in Oracle Delegated Administration Services vary according to the privileges delegated to each administrator. An administrator can be granted rights to manage and provision users, manage applications, or any combination of these privileges, as described in the following scenarios:

- [Provisioning Administration Model](#)
- [Oracle Delegated Administration Services Privileges](#)
- [Provisioning Administration Privileges](#)
- [Application Administration Privileges](#)
- [Oracle Delegated Administration Services and Provisioning Administration Privileges](#)
- [Application Administration and Oracle Delegated Administration Services Privileges](#)
- [Provisioning and Application Administration Privileges](#)
- [Oracle Delegated Administration Services, Provisioning, and Application Administration Privileges](#)

Provisioning Administration Model

The following types of provisioning information is managed in Oracle Internet Directory:

- Base user information.
- Application-specific information.
- User provisioning status in each provisioning-integrated application; this information is stored in the base user entry but is administered separately.

Administrators and users each require the following types of privileges:

- Administrators require privileges for managing base user attributes and application-specific information.
- Users require privileges for managing their own base attributes and application-specific information.

User accounts with administrative privileges are represented by the group entry "cn=User Provisioning Admins,cn=Groups,cn=OracleContext". To manage application-specific information, the application must grant privileges to the "cn=User Provisioning Admins,cn=Groups,cn=OracleContext" group. If an application already defines a group with administrative privileges, then the application needs to add this group as a member of the group.

Oracle Delegated Administration Services Privileges

For administrators with privileges for Oracle Delegated Administration Services administration, **Create**, **Delete**, and **Edit** buttons are available in the Provisioning Console for performing user creation, deletion, and modification. When an administrator who only has administrative rights for Oracle Delegated Administration Services clicks one of these buttons, single-step procedures are used for performing the function.

Provisioning Administration Privileges

For administrators with provisioning privileges, **Create**, **Delete**, and **Edit** buttons are available in the Provisioning Console for performing user creation, deletion, and modification. However, unlike the single-step procedures that occur for administrators with Oracle Delegated Administration Services privileges, wizard-based procedures perform creation and modification for administrators with provisioning privileges. User deletion is performed with the same single-step procedure that is available with Oracle Delegated Administration Services privileges, as described in ["Oracle Delegated Administration Services Privileges"](#) on page 12-16.

Application Administration Privileges

For administrators with application administration privileges, but not Oracle Delegated Administration Services privileges or provisioning privileges, **Create** and **Delete** buttons are not available in the Provisioning Console. However, there is an **Edit** button that launches the same wizard that is available with provisioning administration privileges, as described in ["Provisioning Administration Privileges"](#) on page 12-17. If the application administrator does not have provisioning privileges, then the first page in the wizard, which is used for general user provisioning, is read-only. Yet, the application administrator can modify the application provisioning attributes that are available on other pages in the wizard.

Oracle Delegated Administration Services and Provisioning Administration Privileges

Administrators with Oracle Delegated Administration Services privileges and provisioning privileges have the same rights that are available with provisioning administration privileges, as described in ["Provisioning Administration Privileges"](#) on page 12-17.

Application Administration and Oracle Delegated Administration Services Privileges

This section explains how privileges are delegated if an administrator is assigned various Oracle Delegated Administration Services privileges and also has administrative privileges.

Application Administration Privileges and Oracle Delegated Administration Services User Creation Privileges

For application administrators with user creation privileges in Oracle Delegated Administration Services, but not user editing or deletion privileges, the **Create** and **Edit** buttons are available in the Provisioning Console, but not the **Delete** button. User creation is performed with the same wizard-based procedure that is available with provisioning administration privileges, as described in ["Provisioning Administration Privileges"](#) on page 12-17. User editing privileges are the same as those available with application administration privileges, as described in ["Application Administration Privileges"](#) on page 12-17.

Application Administration Privileges and Oracle Delegated Administration Services User Editing Privileges

For application administrators with user editing privileges in Oracle Delegated Administration Services, but not user creation or deletion privileges, the **Edit** button is available in the Provisioning Console, but not the **Create** or **Delete** buttons. User editing is performed with the same wizard-based procedure that is available with

provisioning administration privileges, as described in "[Provisioning Administration Privileges](#)" on page 12-17.

Application Administration Privileges and Oracle Delegated Administration Services User Deletion Privileges

For application administrators with user deletion privileges in Oracle Delegated Administration Services, but not user creation or modification privileges, the **Delete** and **Edit** buttons are available in the Provisioning Console, but not the **Create** button. User deletion is performed with the same single-step procedure that is available with Oracle Delegated Administration Services privileges, as described in "[Oracle Delegated Administration Services Privileges](#)" on page 12-16. User editing is performed with the same wizard-based procedure that is available with provisioning administration privileges, as described in "[Provisioning Administration Privileges](#)" on page 12-17.

Provisioning and Application Administration Privileges

Administrators with provisioning privileges and application administration privileges have the same rights that are available with provisioning administration privileges, as described in "[Provisioning Administration Privileges](#)" on page 12-17.

Oracle Delegated Administration Services, Provisioning, and Application Administration Privileges

Administrators with Oracle Delegated Administration Services privileges and application administration privileges have the same rights that are available with provisioning administration privileges, as described in "[Application Administration Privileges](#)" on page 12-17.

Deploying Provisioning-Integrated Applications

This chapter explains how to deploy provisioning-integrated applications with the Oracle Provisioning Service. It contains these topics:

- [Deployment Overview for Provisioning-Integrated Applications](#)
- [Registering Applications for Provisioning](#)
- [Configuring Application Provisioning Properties](#)

See Also:

- [Chapter 4, "Managing the Oracle Directory Integration Platform"](#)
- ["Troubleshooting Provisioning"](#) on page C-19

Deployment Overview for Provisioning-Integrated Applications

To deploy provisioning-integrated applications with the Oracle Provisioning Service, you perform these general steps:

1. Install Oracle Internet Directory, which includes Oracle Directory Integration Platform.
2. Load user information into Oracle Internet Directory.

See Also: *Oracle Internet Directory Administrator's Guide*

3. Start the Oracle directory integration server by following the procedures in ["Starting, Stopping, and Restarting the Oracle Directory Integration Platform"](#) on page 4-8.
4. Install the applications and use the Provisioning Subscription Tool to create a provisioning profile for each application.

See Also: The chapter on Oracle Directory Integration Platform tools in the *Oracle Identity Management User Reference* for information about the Provisioning Subscription Tool

5. Configure application registration by following the procedures described in ["Registering Applications for Provisioning"](#) on page 13-2.
6. Configure application provisioning by following the procedures described in ["Configuring Application Provisioning Properties"](#) on page 13-4.

7. Periodically monitor the status of the provisioning event propagation for each application. You can do this by using the Oracle Enterprise Manager 10g Application Server Control Console.

See Also: The chapter on logging, auditing, and monitoring the directory in *Oracle Internet Directory Administrator's Guide*

Registering Applications for Provisioning

After you install an application and use the Provisioning Subscription Tool to create a provisioning profile for it, you must perform the following steps to register the application for provisioning:

1. Perform the initial provisioning registration and create a provisioning-integration profile. The Oracle Directory Integration Platform Service uses the provisioning-integration profiles to identify provisioning-integrated applications.
2. Provide the Oracle Directory Integration Platform Service with application-specific attributes, default values, and whether an attribute is mandatory when provisioning users for the application.
3. Register any plug-ins that are required by the provisioning-integrated application. This can include application-specific plug-ins that the application uses to enforce business policies.

Note: The Oracle Directory Integration Platform Service does not support instance-level provisioning of applications that support a multiple instance architecture. If you install multiple instances of the same application, the Oracle Directory Integration Platform Service treats each instance as a separate provisioning-integrated application.

When creating users with the Provisioning Console, an administrator can assign user attributes for a specific provisioning-integrated application. Because Oracle Internet Directory is the primary directory for attributes that the Provisioning Console manages, application-specific attributes are stored in Oracle Internet Directory for each user that is provisioned for an application. For better performance, provisioning-integrated applications usually cache a local copy of user attributes instead of retrieving them from Oracle Internet Directory. Applications are notified of user creations, user deletions, and attribute modifications either synchronously with the Data Access Java plug-in or asynchronously with a PL/SQL plug-in.

Registration creates a unique identity for an application in Oracle Internet Directory. Oracle applications typically register themselves for provisioning by using the repository APIs located in the repository.jar file, which Oracle Application Server installs by default in the \$ORACLE_HOME/jlib directory. In addition to creating an application entry in Oracle Internet Directory, the repository APIs can be used to add applications to privileged groups.

For non-Oracle applications that are not capable of using the registration APIs, you can use LDAP commands and LDIF templates to create identities for the applications in Oracle Internet Directory. You create a container for the application under `cn=Products, cn=OracleContext` or `cn=Products, cn=OracleContext, Realm DN`. The container where you create an application identity depends on whether the application will be available to users in a single realm or multiple realms. In most cases, you should create an application identity in the `cn=Products, cn=OracleContext` container so the application is not bound by the identity

management policies of a specific Oracle Internet Directory identity management realm.

You can install multiple instances of the same application. Installing a new instance of a provisioning-integrated application creates a separate entry for the new instance under the application identity container. Although some configuration settings are instance-specific, other settings are shared across multiple instances of the same application. As an example, consider an application that is similar to Oracle Files. You can deploy multiple instances of Oracle Files in an environment where each instance is independent of other instances. You define each instance as a separate provisioning-integrated application. You can also provision users in multiple instances of the application.

When you install the first instance of an application, you must create in Oracle Internet Directory the entries shown in the following example. The example creates the application identity in the `cn=Products`, `cn=OracleContext` container, and assumes the application name and type are `Files-App1` and `FILES`.

```
dn: cn=FILES,cn=Products,cn=OracleContext
changetype: add
objectclass: orclContainer
dn: orclApplicationCommonName=Files-App1,cn=FILES,cn=Products,cn=OracleContext
changetype: add
objectclass: orclApplicationEntity
orclappfullname: Files Application Instance 1
userpassword: password
description: This is a test application instance.
protocolInformation: protocol information
orclVersion: 1.0
orclaci: access to entry by group="cn=odisgroup,cn=DIPAdmins,cn=Directory
Integration Platform,cn=Products,cn=OracleContext" (browse,proxy) by
group="cn=User Provisioning Admins,cn=Groups,cn=OracleContext" (browse,proxy)
orclaci: access to attr=(*) by group="cn=odisgroup,cn=DIPAdmins,cn=Directory
Integration Platform,cn=Products,cn=OracleContext" (search,read,write,compare) by
group="cn=User Provisioning Admins,cn=Groups,cn=OracleContext"
(search,read,write,compare)
```

When you install the second instance of an application, you must create in Oracle Internet Directory the entries shown in the following example. The example also creates the application identity in the `cn=Products`, `cn=OracleContext` container, and assumes the application name is `Files-App2`.

```
dn: orclApplicationCommonName=Files-App2,cn=FILES,cn=Products,cn=OracleContext
changetype: add
objectclass: orclApplicationEntity
orclappfullname: Files Application Instance 2
userpassword: password
description: This is a test Application instance.
protocolInformation: protocol information
orclVersion: 1.0
orclaci: access to entry by group="cn=odisgroup,cn=DIPAdmins,cn=Directory
Integration Platform,cn=Products,cn=OracleContext" (browse,proxy) by
group="cn=User Provisioning Admins,cn=Groups,cn=OracleContext" (browse,proxy)
orclaci: access to attr=(*) by group="cn=odisgroup,cn=DIPAdmins,cn=Directory
Integration Platform,cn=Products,cn=OracleContext" (search,read,write,compare) by
group="cn=User Provisioning Admins,cn=Groups,cn=OracleContext"
(search,read,write,compare)
```

After you successfully register a provisioned-integrated application with Oracle Internet Directory, you may need to add the application to various privileged groups. [Table 13–1](#) lists common privileged groups in Oracle Internet Directory.

Table 13–1 Common Privileged Groups in Oracle Internet Directory

Group	Description
OracleDASCreateUser	Create users
OracleDASEditUser	Edit users
OracleDASDeleteUser	Delete users
OracleDASCreateGroup	Create groups
OracleDASEditGroup	Edit groups
OracleDASDeleteGroup	Delete groups

The following LDIF file demonstrates how to grant create user privileges in all realms to the Files-App1 application:

```
dn:cn=OracleCreateUser,cn=Groups,cn=OracleContext
changetype: modify
add: uniquemember
uniquemember:
orclApplicationCommonName=Files-App1,cn=FILES,cn=Products,cn=OracleContext
```

Configuring Application Provisioning Properties

After you register a provisioning-integrated application, you must configure its properties. Each application's provisioning profile maintains its own provisioning configuration properties. Provisioning-integrated applications use properties to store the following types of metadata:

- Application identity information
- Identity realm information
- Default application provisioning policies
- Application attribute properties and defaults
- Application provisioning plug-ins
- Application event interface information
- Application event propagation information

Oracle Directory Integration Platform Provisioning supports three versions of provisioning profiles: 1.1, 2.0, and 3.0. Version 3.0 provisioning profiles are only available with Oracle Identity Management 10g (10.1.4.2). Different applications support different provisioning profile versions. For example, many Oracle applications only support version 2.0. However, Oracle Collaboration Suite supports provisioning profile version 3.0. The primary differences between the provisioning profile versions are as follows:

- You can only use the Provisioning Console to provision target applications that support provisioning profile version 3.0. Although applications that only support provisioning profile versions 1.1 and 2.0 will not be available in the Provisioning Console, they will be notified of events for which they are configured.

- Provisioning applications that support provisioning profile versions 1.1 and 2.0 is a single-step process involving the `oidprovtool` utility, which is described in the chapter on Oracle Directory Integration Platform tools in the Oracle Identity Management User Reference. However, provisioning applications that support provisioning profile version 3.0 is a multiple-step process, which is described in the centralized user provisioning Java API reference chapter of *Oracle Identity Management Application Developer's Guide*.
- Oracle Directory Integration Platform Provisioning only maintains user provisioning status for applications that support provisioning profile version 3.0.

See Also: The centralized user provisioning Java API reference chapter of *Oracle Identity Management Application Developer's Guide*

Managing with the Oracle Internet Directory Provisioning Console

This chapter explains how to manage with the Oracle Internet Directory Provisioning Console. It contains these topics:

- [Managing Users with the Provisioning Console](#)
- [Managing Applications with the Provisioning Console](#)

See Also:

- [Chapter 4, "Managing the Oracle Directory Integration Platform"](#)
- ["Troubleshooting Provisioning"](#) on page C-19

Managing Users with the Provisioning Console

This section describes how to manage users with the Provisioning Console. It contains these topics:

- [Searching for Users Based on Provisioning Criteria](#)
- [Creating Users with the Provisioning Console](#)
- [Provisioning and Deprovisioning Users with the Provisioning Console](#)

Note: User administration that is not specifically related to provisioning, such as user deletion, is handled by the Oracle Internet Directory Self-Service Console. For more information, see *Oracle Identity Management Guide to Delegated Administration*.

Searching for Users Based on Provisioning Criteria

To search for users based on provisioning criteria:

1. Click the **Directory** tab, then select **Users**. From the Users page, click **Provisioning Search**. The Provisioning Search window appears.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

2. Select one of the following options to determine how you want to search for users:
 - **Show users that match all conditions**
 - **Show users that match any condition**

3. Select one of the following conditions from the first box to the right of each application that you want to search for a user's provisioning status:
 - **is (default)**
 - **is not**
 - **is present**
 - **is not present**
4. Select one of the following provisioning statuses from the second box to the right of each application that you want to search.
 - **Pending**
 - **Not Requested**
 - **Successful**
 - **Failed**
 - **In Progress**
 - **Pending de-provisioning**
 - **Successfully de-provisioned**
 - **Failed de-provisioning**
 - **De-provisioning In Progress**
 - **Pending Upgrade**
 - **Upgrade in Progress**
 - **Upgrade Failed**
5. To add additional search attributes, select an attribute name from the **Add Another** box, then click **Add**.
6. Click **Go** to display the entries that match the criteria you entered.

Creating Users with the Provisioning Console

To create a user with the Provisioning Console:

1. In the Oracle Internet Directory Self-Service Console, select the **Directory** tab, then click **Users**. The Search for Users window appears.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

2. Click **Create** to display the General Provisioning window.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

3. In the General Provisioning window, enter the appropriate information. To reset the password for an existing user entry, enter a new value in the **Password** field.

Note: The **User ID** field cannot contain spaces or any of the following characters: & ' % ? \ / + = () * ^ , ; | ' ~

4. Click **Next** to display the Application Provisioning window.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

5. In the Application Provisioning window, select the applications for which you want to provision the user entry. The available applications listed in this window will vary according to your environment. The default provisioning policy determines which applications are provisioned by default whenever a new user is created. Depending on the default policy, you may be able to override the policy for one or more applications. If policy override is not available, the Provision or Do Not Provision columns (depending on the default) will be grayed out.

To change the default provisioning policy for an application, follow the instructions in ["Managing Applications with the Provisioning Console"](#) on page 14-4.

Note: In Oracle Application Server 10g (10.1.4.0.1), only components that are part of Oracle Collaboration Suite can be provisioned with the Provisioning Console.

6. Click **Next** to display the Application Attributes window.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

7. In the Application Attributes window, enter attribute values for the applications you selected to provision for the user entry. Depending on how your applications are configured, default values can be entered for some of the attributes.

See Also: ["Managing Applications with the Provisioning Console"](#) on page 14-4

8. Click **Next** to display the Provisioning Review window.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

9. After reviewing the provisioning options for the user entry, click **Finish**.

Provisioning and Deprovisioning Users with the Provisioning Console

To provision or deprovision a user with the Provisioning Console:

1. In the Oracle Internet Directory Self-Service Console, click the **Directory** tab, then select **Users**. The Search for Users window appears.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

2. In the **Search for User** field, enter the first few characters of the user's first name, last name, e-mail address, or user ID. For example, if you are searching for Anne Smith, you could enter Ann or Smi. To generate a list of all users in the directory, leave this field blank.
3. Click **Go** to display the search results.
4. Select the user you want to provision or deprovision, then click **Edit** to display the General Provisioning window.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

Note: If you do not have sufficient privileges to edit a user entry, then the **Edit** button does not appear.

5. In the General Provisioning window, enter the appropriate information. To reset the password for an existing user entry, enter a new value in the **Password** field.

Note: The **User ID** field cannot contain spaces or any of the following characters: & ' % ? \ / + = () * ^ , ; | ' ~

6. Click **Next** to display the Application Provisioning window.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

7. In the Application Provisioning window, select the applications for which you want to provision or deprovision the user entry. The available applications listed in this window will vary according to your environment. The default provisioning policy determines which applications are provisioned by default whenever a new user is created. Depending on how your applications are configured, you may be able to override the policy for one or more applications. If policy override is not available, the Provision or Do Not Provision columns (depending on the default) will be grayed out.

To change the default provisioning policy for an application, follow the instructions in "[Managing Applications with the Provisioning Console](#)" on page 14-4.

Note: In Oracle Application Server 10g (10.1.4.0.1), only components that are part of Oracle Collaboration Suite can be provisioned with the Provisioning Console.

8. Click **Next** to display the Application Attributes window.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

9. In the Application Attributes window, enter attribute values for the applications you selected to provision for the user entry. Depending on your environment, default values can be entered for some of the attributes.

See Also: "[Managing Applications with the Provisioning Console](#)" on page 14-4

10. Click **Next** to display the Provisioning Review window.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

11. After reviewing the provisioning options for the user entry, click **Finish**.

Managing Applications with the Provisioning Console

This section describes how to manage applications with the Provisioning Console. It contains these topics:

- [Managing Application Defaults](#)
- [Reloading the Application Cache](#)

Managing Application Defaults

This section explains how to manage defaults for provisioning-integrated applications. The available provisioning-enabled applications will vary according to your environment.

Note: In Oracle Application Server 10g (10.1.4.0.1), only components that are part of Oracle Collaboration Suite can be provisioned with the Provisioning Console.

To manage application defaults:

1. Select the **Directory** tab, then select **Applications** to display the Manage Defaults: Select Application window.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

2. In the Manage Defaults: Select Application window, select the applications for which you want to manage defaults.

3. Click **Manage** to display the Manage Defaults: Attributes window.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

4. In the Manage Defaults: Attributes window, enter default values in the attribute fields for the applications you selected in the Manage Defaults: Select Application window.

5. Click **Submit**.

Reloading the Application Cache

The application cache determines the provisioning-integrated applications that are available in the Provisioning Console. You should reload the application cache whenever a provisioning-integrated application is enabled or disabled in Oracle Internet Directory.

To reload the application cache:

1. In the Provisioning Console, select the **Directory** tab, then select **Applications**. The Manage Defaults: Select Application window appears.

This window is described in *Oracle Identity Management Guide to Delegated Administration*.

2. In the Manage Defaults: Select Application window, click **Refresh**.

Understanding the Oracle Provisioning Event Engine

This chapter discusses the Oracle provisioning event engine. It contains these topics:

- [What Are the Oracle Provisioning Events?](#)
- [Working with the Oracle Provisioning Event Engine](#)

What Are the Oracle Provisioning Events?

The Oracle provisioning event engine sends `USER_ADD`, `USER_MODIFY` and `USER_DELETE` events, depending on the operation performed on the user entries in Oracle Internet Directory. Because the user will be represented by multiple entries containing base user and application-specific user information, applications can subscribe to all of the attributes in the event.

The user events are also sent when a base entry or application entry is updated. However, no events are sent when an application entry is deleted because when an administrator requests the deprovisioning of a user from an application, a `USER_MODIFY` event is sent to the application with a provisioning status of `DEPROVISIONING_REQUIRED`. Once the application acknowledges the event by returning a value of `SUCCESS`, the application entry is deleted by the Oracle directory integration server.

To receive notification of provisioning status changes, an application must subscribe to the `orclUserApplnProvStatus;Application_Name` attribute. For example, to subscribe to the provisioning status change for an application named `CORP_EMAIL`, an application must subscribe to the `orclUserApplnProvStatus; CORP-EMAIL` attribute.

Working with the Oracle Provisioning Event Engine

The Oracle provisioning event engine generates events from add, modify, and delete operations that are performed on well-defined objects in Oracle Internet Directory. The Oracle provisioning event engine uses object definitions and event generation rules to generate events. This event generation model is extensible because it enables you to define custom objects and event generation rules. The Oracle provisioning event-engine, object definitions, and event generation rules are discussed in these topics:

- [Creating Custom Event Object Definitions](#)
- [Defining Custom Event Generation Rules](#)

Creating Custom Event Object Definitions

Table 15–1 lists the properties that you can use to identify objects for which events can be generated.

Table 15–1 Event Object Properties

Property	Description
ObjectName	Assigns a unique name to identify the object
ObjectCriteria	Identifies the LDAP object class to use for identifying the object
MustAttributeCriteria	Provides any additional attributes that are required for identifying the object
OptionalAttributeCriteria	Provides any optional attributes that may be required for identifying the object
FilterAttributeCriteria	Lists the attributes that should not be sent during event propagation

Table 15–2 lists the predefined objects for which the Oracle provisioning event engine can generate events.

Table 15–2 Predefined Event Objects

Object Name	Valid Object Class Values
Entry	*
User	orclUserV2, inetorgperson
Identity	orclUserV2, inetOrgPerson
Group	groupOfUniqueNames, orclGroup, orclPrivilegeGroup, groupOfNames
Subscription	orclServiceSubscriptionDetail
Subscriber	orclSubscriber

Note: The metadata for event objects is stored in the following container: cn=Object Definitions, cn=Directory Integration Platform, cn=Products, cn=OracleContext

Defining Custom Event Generation Rules

You specify event generation rules in XML format. The DTD for event generation rules is as follows:

```
<?xml version='1.0' ?>
  <!DOCTYPE EventRuleSet [
    <!ELEMENT ChangeType (#PCDATA)>
    <!ELEMENT Rule (#PCDATA)>
    <!ELEMENT EventName (#PCDATA)>
    <!ELEMENT ResEvent (Rule*, EventName)>
    <!ELEMENT EventRule (ChangeType, ResEvent*)>
    <!ELEMENT EventRuleSet (EventRule*) >
  ]>
```

The element definitions in the preceding DTD are as follows:

- The EventRuleSet root element identifies a set of event rules for an individual event object
- The EventRuleSet root element contains a list of EventRule elements
- Each EventRule element depends on the value assigned to the ChangeType element.
- The ChangeType and Rule elements determine the event name to be propagated to an application

Table 15–3 lists the event definitions that are supported by the Oracle provisioning event engine.

Table 15–3 Supported Event Definitions

Object Name	Change Type	Rule	Event Name
USER	Add	OrclApplnUserProvStatus=PENDING_UPGRADE	USER_ADD
	Add	OrclApplnUserProvStatus=PROVISIONING_REQUIRED	USER_ADD
	Modify	OrclApplnUserProvStatus= PENDING_UPGRADE	USER_ADD
		OrclApplnUserProvStatus=PROVISIONING_REQUIRED	USER_ADD
		OrclApplnUserProvStatus=PROVISIONING_FAILURE	USER_ADD
		OrclApplnUserProvStatus=DEPROVISIONING_REQUIRED	USER_MODIFY
		OrclApplnUserProvStatus=PROVISIONING_IN_PROGRESS	USER_MODIFY
		OrclApplnUserProvStatus=PROVISIONING_SUCCESSFUL	USER_MODIFY
	Delete	OrclApplnUserProvStatus=PROVISIONING_IN_PROGRESS	USER_DELETE
		OrclApplnUserProvStatus=PROVISIONING_SUCCESSFUL	USER_DELETE
		OrclApplnUserProvStatus=DEPROVISIONING_REQUIRED	
GROUP	Add		GROUP_ADD
	Modify		GROUP_MODIFY
	Delete		GROUP_DELETE
IDENTITY	Add		IDENTITY_ADD
	Modify		IDENTITY_MODIFY
	Delete		IDENTITY_DELETE
ENTRY	Add		ENTRY_ADD
	Modify		ENTRY_MODIFY
	Delete		ENTRY_DELETE
SUBSCRIPTION	Add		SUBSCRIPTION_ADD
	Modify		SUBSCRIPTION_MODIFY
	Delete		SUBSCRIPTION_DELETE

Table 15–3 (Cont.) Supported Event Definitions

Object Name	Change Type	Rule	Event Name
SUBSCRIBER	Add		SUBSCRIBER_ADD
	Modify		SUBSCRIBER_MODIFY
	Delete		SUBSCRIBER_DELETE

Note: The metadata for supported event objects is stored in the following container: cn=Event Definitions, cn=Directory Integration Platform, cn=Products, cn=OracleContext.

Integration of Provisioning Data with Oracle E-Business Suite

In Oracle Internet Directory 10g (10.1.4.2), you can use the Oracle Directory Integration Platform Service to synchronize user accounts and other user information from Oracle E-Business Suite.

See Also: Oracle E-Business Suite documentation for further details about this integration and how to administer it

The following notes on *OracleMetaLink* at <http://metalink.oracle.com/>:

- 233436.1—Installing Oracle Application Server 10g with Oracle E-Business Suite Release 11*i*
- 261914.1—Integrating Oracle E-Business Suite Release 11*i* with Oracle Internet Directory and Oracle Application Server Single Sign-On
- 233436.1—Installing Oracle Application Server 10g with Oracle E-Business Suite Release 11*i*

Part V

Integrating with Third-Party Directories

Part V discusses the concepts, components, and procedures involved in integrating with various third-party identity directories. It contains these chapters:

- [Chapter 17, "Third-Party Directory Integration Concepts and Considerations"](#)
- [Chapter 18, "Configuring Synchronization with a Third-Party Directory"](#)
- [Chapter 19, "Integrating with Microsoft Active Directory"](#)
- [Chapter 20, "Deploying the Oracle Password Filter for Microsoft Active Directory"](#)
- [Chapter 21, "Integrating with Sun Java System Directory"](#)
- [Chapter 22, "Integrating with Novell eDirectory or OpenLDAP"](#)
- [Chapter 23, "Managing Integration with a Third-Party Directory"](#)

Third-Party Directory Integration Concepts and Considerations

This chapter discusses the basic concepts of integrating Oracle Identity Management with a third-party directory along with various decisions to be made as part of the integration process.

Note: This chapter assumes that you are familiar with:

- The chapter in *Oracle Internet Directory Administrator's Guide* about the deployment of identity management realms
 - *Oracle Identity Management Guide to Delegated Administration*.
-

This chapter contains these topics:

- [Concepts and Architecture of Third-Party Directory Integration](#)
- [Planning Your Integration Environment](#)
- [Microsoft Active Directory Integration Concepts](#)
- [Sun Java System Directory Integration Concepts](#)
- [Novell eDirectory and OpenLDAP Integration Concepts](#)
- [Limitations of Third-Party Integration in Oracle Internet Directory 10g \(10.1.4.2\)](#)

See Also: The following chapters for specific implementation details on synchronizing with third-party directories:

- [Chapter 18, "Configuring Synchronization with a Third-Party Directory"](#)
- [Chapter 19, "Integrating with Microsoft Active Directory"](#)
- [Chapter 20, "Deploying the Oracle Password Filter for Microsoft Active Directory"](#)
- [Chapter 21, "Integrating with Sun Java System Directory"](#)
- [Chapter 22, "Integrating with Novell eDirectory or OpenLDAP"](#)
- [Chapter 23, "Managing Integration with a Third-Party Directory"](#)

Concepts and Architecture of Third-Party Directory Integration

Oracle provides centralized security administration for all Oracle components by integrating them with Oracle Identity Management. If your environment uses both

Oracle Identity Management and third-party directory, such as Microsoft Active Directory, you can use a connector to integrate the two systems and synchronize their data. A connector is a prepackaged connectivity solution that allows Oracle Internet Directory to synchronize with a connected directory.

This section discusses the Oracle components and architecture involved in integrating Oracle Identity Management with connected third-party directories. It contains these topics:

- [Supported Third-Party Directories and Servers](#)
- [Oracle Identity Management Components for Integrating with a Third-Party Directory](#)
- [Oracle Internet Directory Schema Elements for Synchronizing with Third-Party Directories](#)
- [Directory Information Tree in an Integration with a Third-Party Directory](#)

Supported Third-Party Directories and Servers

Oracle Internet Directory 10g (10.1.4.2) is certified for integration with the following third-party directories and servers:

- Microsoft Active Directory 2000/2003
- Microsoft Exchange 2000/2003
- Sun Java System Directory 5.2. Sun Java System Directory has formerly been known as Sun ONE Directory Server, iPlanet Directory Server, and Netscape Directory Server, respectively. Oracle Internet Directory 10g (10.1.4.2) is certified for integration with all versions starting with Netscape Directory Server 4.13.
- Novell eDirectory 8.6.2 and 8.7
- OpenLDAP-2.2

Oracle Identity Management Components for Integrating with a Third-Party Directory

This section describes the following components that are used to integrate Oracle Identity Management with a third-party directory:

- [Oracle Internet Directory](#)
- [Oracle Directory Integration Platform](#)
- [Oracle Delegated Administration Services](#)
- [Oracle Access Manager](#)
- [Oracle Application Server Single Sign-On](#)
- [External Authentication Plug-ins](#)

See Also: [Chapter 3, "Oracle Directory Integration Platform Administration Tools"](#) for a description of the tools used to integrate Oracle Internet Directory with a third-party directory

Oracle Internet Directory

Oracle Internet Directory is the repository in which Oracle components and third-party applications store and access user identities and credentials. It uses the Oracle directory server to authenticate users by comparing the credentials entered by

users with the credentials stored in Oracle Internet Directory. When credentials are stored in a third-party directory and not in Oracle Internet Directory, users can still be authenticated. In this case, Oracle Internet Directory uses an external authentication plug-in that authenticates users against the third-party directory server.

See Also: The chapter on security in *Oracle Internet Directory Administrator's Guide* for a discussion of security in Oracle Internet Directory

Oracle Directory Integration Platform

Oracle Directory Integration Platform is installed as part of the Oracle Application Server infrastructure. You can configure it to run on the same host as Oracle Internet Directory or on a different host.

Oracle Directory Integration Platform enables:

- Synchronization between Oracle Internet Directory and other directories and user repositories
- Automatic provisioning services for Oracle components

Oracle Directory Integration Platform includes connectors to synchronize Oracle Internet Directory with other LDAP directories or data stores. The Oracle Directory Integration Platform integration connectors allow you to:

- Configure either one-way or two-way synchronization with a third-party directory.
- Designate a specific subset of attributes for synchronization. You do this by configuring the appropriate mapping rules, which you can then change at run time.

See Also: ["Attribute-Level Mapping"](#) on page 6-7 for a discussion about configuring attribute mapping rules

Oracle Delegated Administration Services

Oracle Delegated Administration Services is a set of pre-defined, Web-based units for performing directory operations on behalf of a user. It frees directory administrators from the more routine directory management tasks by enabling them to delegate specific functions to other administrators and to end users. It provides most of the functionality that directory-enabled applications require, such as creating a user entry, creating a group entry, searching for entries, and changing user passwords. To administer application data in the directory, you use the Oracle Internet Directory Self-Service Console, a tool based on Oracle Delegated Administration Services. This tool comes ready to use with Oracle Internet Directory. Or, you can use Oracle Delegated Administration Services to develop your own tools for administering application data.

See Also: *Oracle Identity Management Guide to Delegated Administration*

Oracle Access Manager

In addition to Oracle Delegated Administration Services, you can also use Oracle Access Manager to perform directory operations. Oracle Access Manager (formerly known as Oblix NetPoint and Oblix COREid) provides a full range of identity administration and security functions that include Web single sign-on, user self-service and self-registration, sophisticated workflow functionality, user provisioning,

reporting and auditing, policy management, dynamic group management, and delegated administration.

See Also: *Oracle Access Manager Identity and Common Administration Guide*

Oracle Application Server Single Sign-On

OracleAS Single Sign-On enables users to access Oracle Web-based components by logging in only once.

Oracle components delegate the login function to the OracleAS Single Sign-On server. When a user first logs in to an Oracle component, the component directs the login to the OracleAS Single Sign-On server. The OracleAS Single Sign-On server compares the credentials entered by the user to those stored in Oracle Internet Directory. After verifying the credentials, the OracleAS Single Sign-On server grants the user access to all components the user is authorized to use throughout the current session.

Oracle Application Server Single Sign-On enables native authentication in a Microsoft Windows environment. Once logged in to the Windows environment, the user automatically has access to Oracle components. OracleAS Single Sign-On automatically logs in the user to the Oracle environment using the user's Kerberos credentials.

See Also: *Oracle Application Server Single Sign-On Administrator's Guide* for information about OracleAS Single Sign-On

External Authentication Plug-ins

External authentication plug-ins, such as the Microsoft Active Directory external authentication plug-in, are part of the Oracle directory server, and enable users to log in to the Oracle environment by using their Microsoft Windows credentials. When an external authentication plug-in is in place, it is invoked by the Oracle directory server. This plug-in verifies the user's credentials in a third-party directory. If the verification is successful, then the Oracle directory server notifies OracleAS Single Sign-On.

Oracle Internet Directory Schema Elements for Synchronizing with Third-Party Directories

To identify objects that are synchronized with those in a third-party directory, Oracle Internet Directory contains schema elements that correspond to attributes that are specific to third-party directories, such as Microsoft Active Directory. These schema elements are described in the *Oracle Identity Management User Reference* and in the following sections:

- [Oracle Internet Directory Schema Elements for Microsoft Active Directory](#)
- [Oracle Internet Directory Schema Elements for Sun Java System Directory](#)
- [Oracle Internet Directory Schema Elements for Novell eDirectory](#)
- [Oracle Internet Directory Schema Elements for OpenLDAP](#)

Directory Information Tree in an Integration with a Third-Party Directory

This section contains these topics:

- [About Realms in Oracle Internet Directory](#)
- [Planning the Deployment](#)

- [Example: Integration with a Single Third-Party Directory Domain](#)

See Also: The chapter on directory concepts and architecture in *Oracle Internet Directory Administrator's Guide* for a fuller discussion of directory information trees

About Realms in Oracle Internet Directory

In Oracle Internet Directory, an identity management realm defines an enterprise scope over which certain identity management policies are defined and enforced by the deployment. It comprises:

- A well-scoped collection of enterprise identities—for example, all employees in the US domain.
- A collection of identity management policies associated with these identities. An example of an identity management policy would be to require that all user passwords have at least one alphanumeric character.
- A collection of groups, that is, aggregations of identities that simplify setting the identity management policies

Multiple Realms

You can define multiple identity management realms within the same Oracle Identity Management infrastructure. This enables you to isolate user populations and enforce a different identity management policy,—for example, password policy, naming policy, self-modification policy—in each realm. This is useful in a hosted deployment of Oracle Application Server.

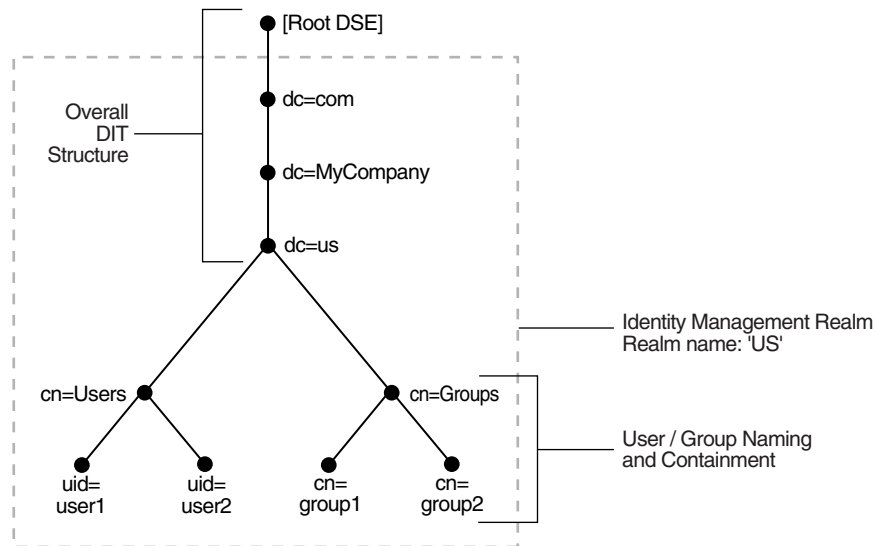
Each identity management realm is uniquely named to distinguish it from other realms. It also has a realm-specific administrator with complete administrative control over the realm.

The Default Realm

For all Oracle components to function, an identity management realm is required. One particular realm, created during installation of Oracle Internet Directory, is called the default identity management realm. It is where Oracle components expect to find users, groups, and associated policies whenever the name of a realm is not specified. This default realm facilitates proper organization of information and enforces proper access controls in the directory.

There can be only one default identity management realm in the directory. If a deployment requires multiple identity management realms, then one of them must be chosen as the default.

[Figure 17–1](#) illustrates the default identity management realm.

Figure 17–1 The Default Identity Management Realm

As [Figure 17–1](#) shows, the default identity management realm is part of a global DIT. The node that follows the root DSE is `dc=com`, followed by `dc=MyCompany`, then `dc=us`. These four nodes represent the overall DIT structure. The node `dc=us` is the root of the default identity management realm. It has two subtrees for containing user and group information: `cn=Users` and `cn=Groups`. For illustration purposes, the `cn=Users` node contains two leaves: `uid=user1` and `uid=user2`. Similarly, the `cn=Groups` node contains `cn=group1` and `cn=group2`.

Access Control Policies in the Realm

You must configure appropriate ACLs in Oracle Internet Directory to enable Oracle Directory Integration Platform to:

- Enable the import profile to add, modify and delete objects in the `users` and `groups` containers. By default, import profiles are part of the Realm Administrators group, which can perform all operations on any entry under the realm DN. If you have customized ACLs in the realm, then be sure that the import profiles have the appropriate privileges to perform these operations on the subtree to be synchronized or on either the user container, the group container, or both depending on where the synchronization takes place.
- Enable Oracle components to manage the users and groups in the realm. By default, Oracle components can manage users and groups in the `users` and `groups` containers respectively. If you have updated your `usersearchbase` and `groupsearchbase` in the realm, then set up appropriate ACLs on the `users` container and `groups` container.

See Also: The chapter on deployment of Oracle Identity Management realms in *Oracle Internet Directory Administrator's Guide* for a description of the default realm installed with Oracle Internet Directory

Planning the Deployment

When planning the DIT, the most important decisions to make before synchronization are:

- Which directory is to be the central one

- What objects to synchronize, for example:
 - The portion of the DIT that you want to synchronize. You can synchronize the entire DIT or just a portion of it.
 - For each entry, the specific contents that you want to synchronize. You can synchronize the entire content of the entry or just a portion of it.
- Where to synchronize. You have two options:
 - You can synchronize so that the relative position of each entry in the DIT is the same in the source and destination directories. This configuration, called one-to-one distinguished name mapping, is the most commonly used configuration. Because the source DN is the same as the destination DN, this configuration provides better performance than when the two DNs are different.
 - You can synchronize so that the relative position in the DIT of each entry in the destination directory is different from that in the source directory. In this configuration, the Oracle directory integration platform must change the DN values of all entries being mapped, including their references in group entries. This requires more intensive computation.

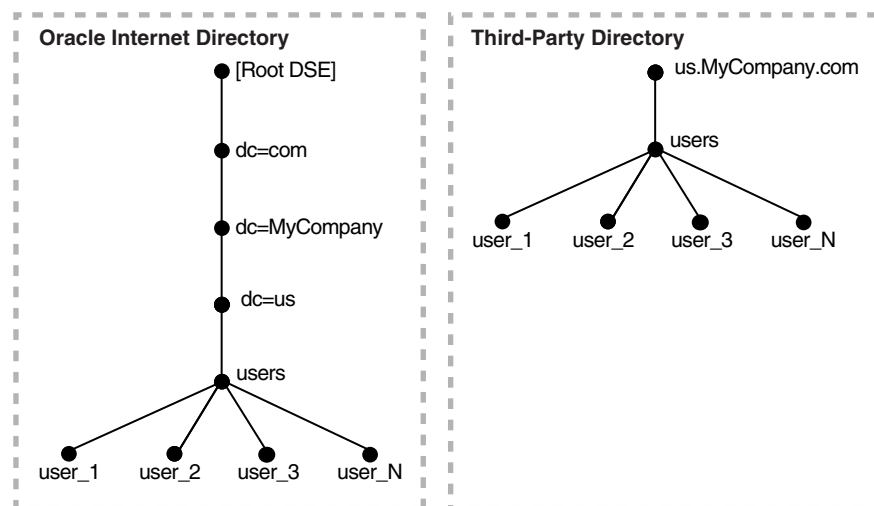
If you synchronize in this way, you need to use the `dnconvert` mapping rule as described in ["Supported Attribute Mapping Rules and Examples"](#) on page 6-9.

See Also: The section ["Choose the Structure of the Directory Information Tree"](#) on page 17-15 for more information about planning the directory information tree

Example: Integration with a Single Third-Party Directory Domain

[Figure 17-2](#) shows an example of one-to-one mapping between Oracle Internet Directory and a third-party directory.

Figure 17-2 Default DIT Structures in Oracle Internet Directory and a Third-Party Directory When Both Directory Hosts Are Under the Domain *us.MyCompany.com*



In the one-to-one mapping illustrated in [Figure 17-2](#):

- Both Oracle Internet Directory and the third-party directory hosts have the same topology.
- Users are synchronized only from the third-party directory to Oracle Internet Directory. All users to be synchronized are stored in one container in the third-party directory, in this case `users.us.MyCompany.com`.
- The same DIT structure is maintained in both the third-party directory and Oracle Internet Directory. All users appear in the same users subtree identified by the value `cn=users,dc=us,dc=MyCompany,dc=com`.

In the example shown in [Figure 17-2](#), only the `users` subtree must be synchronized from the third-party directory to Oracle Internet Directory using one-to-one domain mappings.

Note: In [Figure 17-2](#), the two directories have the same topology, but be aware that this is for illustration purposes only. The two directories do not need to be in the same domain. Oracle Internet Directory can be anywhere in the network, provided it can connect to the third-party directory.

In addition, although the synchronization in the example is one-way, from the third-party directory to Oracle Internet Directory, the synchronization can, alternatively, be bi-directional.

Planning Your Integration Environment

This section describes how to plan your integration environment. It contains these topics:

- [Preliminary Considerations for Integrating with a Third-Party Directory](#)
- [Choose the Directory for the Central Enterprise Directory](#)
- [Customizing the LDAP Schema](#)
- [Choose Where to Store Passwords](#)
- [Choose the Structure of the Directory Information Tree](#)
- [Select the Attribute for the Login Name](#)
- [Select the User Search Base](#)
- [Select the Group Search Base](#)
- [Decide How to Address Security Concerns](#)
- [Administering Your Deployment with Oracle Access Manager](#)

Preliminary Considerations for Integrating with a Third-Party Directory

If you are deploying Oracle Internet Directory in an enterprise that already has an LDAP directory server, then you must configure both directories to coexist in the same environment.

The coexistence of directories requires either of two different types of deployments:

- Simple synchronization with Oracle Internet Directory to support Enterprise User Security. Use this approach if your environment supports enterprise users by using a database server.

- Complete integration with the Oracle Application Server infrastructure. This enables all enterprise users to use the various components in the Oracle Application Server suite. Use this approach if your environment uses a third-party directory as the enterprise directory and deploys an Oracle Application Server suite of applications.

Because all Oracle Application Server components depend on the identity management realm, complete integration with the Oracle Application Server infrastructure requires you to make some decisions about the container for that realm. Once you have made these decisions, you can configure bootstrapping and synchronization between the directories.

Choose the Directory for the Central Enterprise Directory

This section explains how to choose which directory is to be the central enterprise directory. It contains these topics:

- [Oracle Internet Directory as the Central Enterprise Directory](#)
- [Third-Party Directory as the Central Enterprise Directory](#)

Oracle Internet Directory as the Central Enterprise Directory

If Oracle Internet Directory is the central directory, then, once the user, group, and realm objects are created, Oracle Internet Directory becomes the source of provisioning information for all Oracle components and third-party directories. The user and group objects for the entire enterprise are then provisioned in various Oracle components and third-party directories from Oracle Internet Directory.

[Table 17–1](#) describes the typical requirements in this deployment.

Table 17–1 *Typical Requirements with Oracle Internet Directory as the Central Enterprise Directory*

Requirement	Description
Initial startup	The Directory Integration Assistant (diassist) populates the third-party directory with users and groups stored in Oracle Internet Directory.
Synchronization	<p>User and group information is managed in Oracle Internet Directory. Changes to that information are synchronized with the third-party directory by the Oracle directory integration server when an import profile has been configured.</p> <p>Synchronization from the third-party directory into Oracle Internet Directory can be achieved by configuring an import profile.</p>
Passwords and password verifiers	<p>Passwords are managed in Oracle Internet Directory by using Oracle tools such as the Oracle Internet Directory Self-Service Console. Password changes are synchronized with the third-party directory by the Oracle directory integration server. However, before this server can synchronize the password changes, the password synchronization must be configured in the mapping rules.</p> <p>Because the password is securely managed, the communication for synchronizing passwords to the third-party directory must be over SSL. Run the Oracle directory integration server in the server authentication mode with the proper certificate from the third-party directory. Be sure that the third-party directory is also enabled for SSL.</p> <p>If the Oracle environment requires a password verifier, then the password verifier is automatically generated when a new user entry is created or when a password is modified.</p>
Oracle Application Server Single Sign-On	<p>Users log in to the Oracle environment by using the OracleAS Single Sign-On server.</p> <p>When called upon by the OracleAS Single Sign-On server to authenticate a user, the Oracle directory server uses credentials available locally. No external authentication is involved.</p> <p>Users must log in only once to access various components in the Oracle environment.</p>

New users or groups in Oracle Internet Directory can be automatically provisioned by the Oracle Directory Integration Platform. This automatic provisioning requires that:

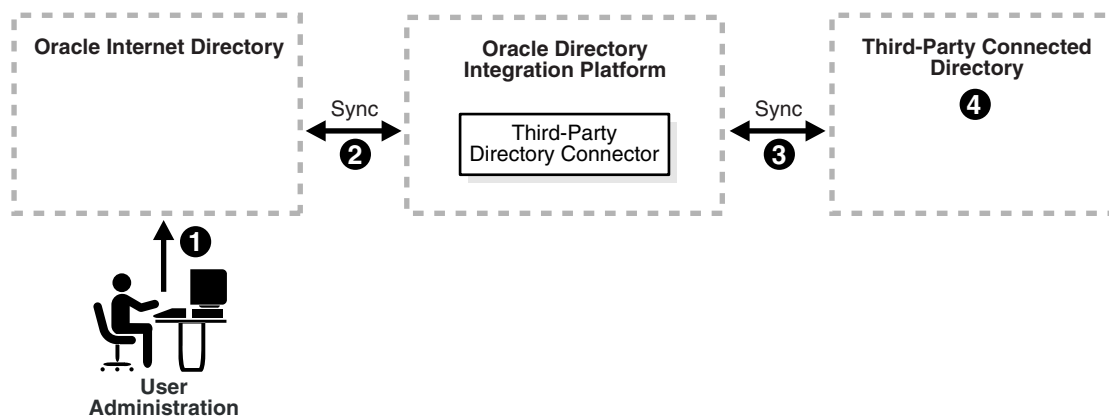
- The Oracle directory server is running with the change log enabled
- The change log is not purged

If these two conditions are not met, then you must dump the entries in Oracle Internet Directory to an LDIF file and upload the data to the third-party directory.

See Also: The chapter on garbage collection in *Oracle Internet Directory Administrator's Guide* for information about purging the change log

Figure 17–3 shows a typical deployment in which Oracle Internet Directory is the central enterprise directory.

Figure 17–3 Interaction Among Components with Oracle Internet Directory as the Central Enterprise Directory



As Figure 17–3 on page 17-10 shows, when Oracle Internet Directory is the central enterprise directory, typical provisioning of a user or group follows this process:

1. The user or group entry is created in Oracle Internet Directory by using the Oracle Internet Directory Self-Service Console, Oracle Directory Manager, or the command-line tools.
2. At the next scheduled interval, that entry creation event is read by the third-party directory connector in Oracle Directory Integration Platform.
3. Following the mapping information in the integration profile, the user or group attributes in Oracle Internet Directory are appropriately mapped to the corresponding user or group attributes as required by the schema in the third-party directory.
4. The user and group entry is created in the third-party directory.

A user entry is modified in Oracle Internet Directory, when:

- A new attribute gets added to the entry.
- The value of an existing attribute is modified.
- An existing attribute is deleted.

When Oracle Internet Directory is the central enterprise directory, the sequence of events during modification of a user or group entry is as follows:

1. The entry is modified by using the Oracle Internet Directory Self-Service Console, Oracle Directory Manager, or the command-line tools.
2. At the next scheduled interval, that entry modification event is read by the third-party directory connector in Oracle Directory Integration Platform.
3. Following the mapping information in the integration profile, the attribute in Oracle Internet Directory is appropriately mapped to the corresponding attribute in the connected directory.
4. The user entry is modified in the third-party directory.

Third-Party Directory as the Central Enterprise Directory

If a third-party directory is the central enterprise directory, then, once the user, group, and realm objects are created, the third-party directory becomes the source of provisioning information for all Oracle components and other directories. In this case, Oracle Internet Directory is deployed to support Oracle components. To provide this support, Oracle Internet Directory stores a footprint that enables it to identify entries in the third-party directory.

Table 17–2 describes the typical requirements in this deployment.

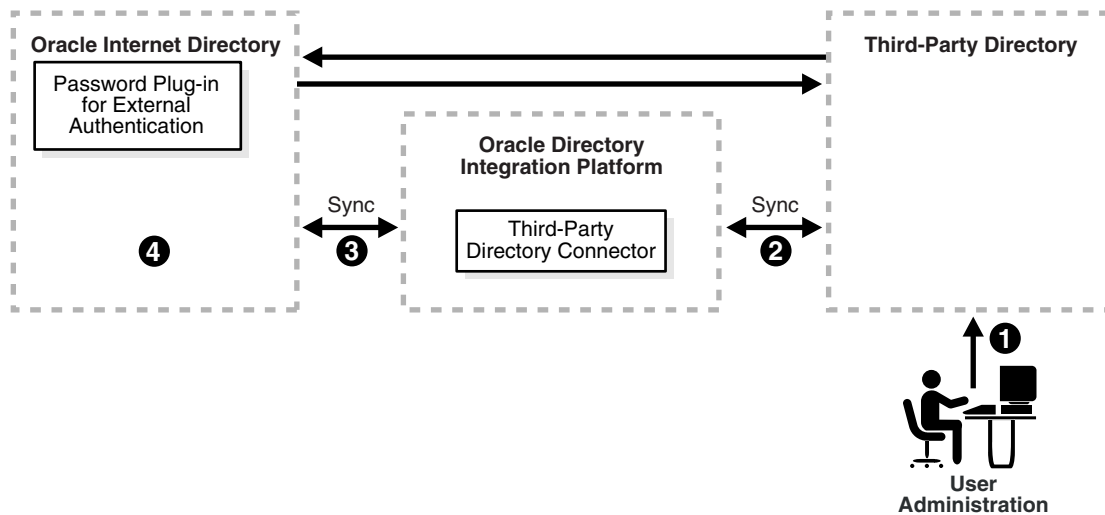
Table 17–2 Typical Requirements with a Third-Party Directory as the Central Enterprise Directory

Requirement	Description
Initial startup	<p>The Directory Integration Assistant (diassist) populates Oracle Internet Directory with users and groups stored in the third-party directory.</p> <p>You can choose to manage user information, including password credentials, in the third-party directory only. In such deployments, to enable single sign-on in the Oracle environment, the Oracle directory integration server can synchronize only those user entry attributes required by Oracle components.</p> <p>Passwords are not migrated from the third-party directory to Oracle Internet Directory.</p>
Synchronization	<p>The central directory for user and group information is a third-party directory. Changes to user and group information in the third-party directory are synchronized with Oracle Internet Directory by the Oracle directory integration server when an import profile has been configured.</p> <p>Synchronization from Oracle Internet Directory to the third-party directory is achieved by configuring an export profile.</p>
Passwords and password verifiers	<p>Passwords are managed in the third-party directory. The Oracle directory integration server does not synchronize password changes into Oracle Internet Directory.</p>
Oracle Application Server Single Sign-On	<p>Users log in to the Oracle environment only once by using the OracleAS Single Sign-On server.</p> <p>Users with credentials only in the third-party directory are authenticated by the Oracle directory server invoking the external authentication plug-in.</p> <p>Users with credentials in Oracle Internet Directory are authenticated locally by the Oracle directory server.</p>
Third-party directory external authentication plug-in	<p>When user credentials are managed in the third-party directory, this plug-in is required. To authenticate a user, the OracleAS Single Sign-On server calls upon the Oracle directory server. The plug-in then performs the authentication of the user against the user credentials stored in the third-party directory.</p>

New users or groups created in the third-party directory are automatically synchronized into Oracle Internet Directory by the Oracle directory integration server. Before the provisioning can take place, a one-way synchronization between the third-party directory and Oracle Internet Directory must be established.

Figure 17–4 shows a typical deployment where a third-party directory is the central enterprise directory.

Figure 17–4 Interaction of Components with a Third-Party Directory as the Central Enterprise Directory



Process for Provisioning of a User or Group As Figure 17–4 shows, when a third-party directory is the central enterprise directory, typical provisioning of a user or group follows this process:

1. The user or group entry is created in the third-party directory.
2. At the next scheduled interval, the entry creation event is read by the third-party directory connector in Oracle Directory Integration Platform.
3. Following the mapping information in the integration profile, the user or group attributes in the third-party directory are mapped to the corresponding attributes in Oracle Internet Directory.
4. The user or group entry is created in Oracle Internet Directory.

Process for Modifying a User or Group Entry An entry is modified in the third-party directory when:

- A new attribute gets added to the entry.
- The value of an existing attribute is modified.
- An existing attribute is deleted.

When a third-party directory is the central enterprise directory, modification of a user or group entry follows this process:

1. The entry is modified in the third-party directory.
2. At the next scheduled interval, that entry modification event is read by the third-party directory connector in Oracle Directory Integration Platform.
3. Following the mapping information in the integration profile, the attribute in the third-party directory is appropriately mapped to the corresponding attribute in Oracle Internet Directory.
4. The user or group entry is modified in Oracle Internet Directory.

As [Figure 17–4](#) shows, when a third-party directory is the central enterprise directory, modification of passwords happens asynchronously in the directory that serves as the password repository. This happens by using plug-ins.

Customizing the LDAP Schema

Customizing the LDAP schema is required if:

- A directory deployment contains schema extensions such as custom object classes and attributes
- The custom attributes must be synchronized from one directory server to the other

To customize the LDAP schema, you must:

- Identify the schema extensions on the source directory
- Create those extensions on the target directory before starting the data migration and the synchronization

Note: In addition to creating schema extensions, you must also add the attribute to be synchronized with the corresponding object classes to the mapping rules.

See Also:

- The chapter on administering the schema in *Oracle Internet Directory Administrator's Guide* for instructions on customizing the schema in Oracle Internet Directory
- Microsoft documentation available at <http://msdn.microsoft.com/> for instructions on customizing the schema in Microsoft Active Directory

Choose Where to Store Passwords

Regardless of which directory is the central enterprise directory, the password can be stored in one or both directories. There are advantages and disadvantages to each option. This section compares the two options in these topics:

- [Advantages and Disadvantages of Storing the Password in One Directory](#)
- [Advantages and Disadvantages of Storing Passwords in Both Directories](#)

Advantages and Disadvantages of Storing the Password in One Directory

Storing the password in one directory can make the password more secure because it reduces the number of points of entry. Further, it eliminates synchronization issues when the password is modified.

On the other hand, storing the password in one directory provides a single point of failure for the entire network. If third-party directory fails, then even though user footprints are available in Oracle Internet Directory, users cannot access Oracle components.

Although storing passwords in the central directory eliminates possible synchronization issues, it requires you to enable applications to authenticate users to that directory. This involves using the appropriate plug-ins. For example, if you are using Microsoft Active Directory as both the central enterprise directory and the

central password store, then you must enable applications to authenticate users to Microsoft Active Directory. You do this by using an external authentication plug-in.

Note: Oracle components use password verifiers to authenticate users, and, when passwords are stored in a third-party directory, those verifiers are not stored in Oracle Internet Directory. If a password is modified by using an Oracle component, then the verifiers are both generated and stored in Oracle Internet Directory.

Advantages and Disadvantages of Storing Passwords in Both Directories

If you decide to store passwords in both Oracle Internet Directory and a third-party directory, then passwords need to be synchronized, ideally in real-time.

In Oracle Internet Directory 10g (10.1.4.2), passwords are not synchronized in real time, but according to a schedule. This can mean an observable delay between the time the password is changed in the central enterprise directory and the time that the change is recorded in the other directory.

In deployments with Oracle Internet Directory as the central directory, password values are synchronized regularly from Oracle Internet Directory to the connected directory. This requires you to enable both the password policy of the realm and reversible encryption.

See Also:

- The chapter in *Oracle Internet Directory Administrator's Guide* about password policies for information about setting password policies
- The chapter in *Oracle Internet Directory Administrator's Guide* about directory storage of password verifiers for information about reversible encryption

In general, password values are hashed. If both directories use the same hashing algorithm, then the hashed values can be synchronized as they are. For example, suppose that you have an environment in which Sun Java System Directory and Oracle Internet Directory are integrated. Both of these directories support common hashing algorithms. If the passwords are hashed and stored in Sun Java System Directory by using a hashing technique supported by Oracle Internet Directory, then synchronizing Sun Java System Directory passwords to Oracle Internet Directory is the same as with any other attribute. If both directories do not support the same hashing algorithm, then passwords must be synchronized in clear text format only. For security reasons, password synchronization is possible with Oracle Internet Directory only in SSL server authentication mode.

If Oracle Internet Directory is the central directory, and if the hashing algorithm it supports is not supported by the other directory, then synchronization is still possible through SSL server authentication mode when reversible password encryption is enabled.

If Microsoft Active Directory is the central directory, then, when a password is modified in Microsoft Active Directory, a plug-in intercepts the password changes and sends them to Oracle Internet Directory. When Oracle Internet Directory is the central directory and the central password store, Oracle Directory Integration Platform reads the password changes as a privileged user and sends them to the corresponding directory.

Note: In deployments where both directories do not use the same hashing algorithm, password synchronization is not available in an out-of-the-box installation of Oracle Internet Directory. You must configure it.

In deployments where Oracle Internet Directory is not the central directory, the password policy is enforced by the third-party directory. When there is an authentication request to the third-party directory, the latter replies that the authentication either succeeded or failed. However, any detailed password policy errors from the third-party directory are not delivered to Oracle Internet Directory and then to the client applications.

See Also: The following chapter for information about plug-ins:

- The chapter in *Oracle Internet Directory Administrator's Guide* about the directory plug-in framework
- The chapter in *Oracle Internet Directory Administrator's Guide* about customizing the external authentication plug-in

Choose the Structure of the Directory Information Tree

At installation, each directory server creates a default domain and a default **directory information tree (DIT)** structure. The Oracle Internet Directory infrastructure installation creates a default realm with designated containers for storing enterprise users and groups. When integrating with a third-party directory, you must create identical DIT structures in both directories to use the default installation of Oracle Internet Directory. Alternatively, you can perform domain-level mapping.

This section contains these topics:

- [Create Identical DIT Structures on Both Directories](#)
- [Distinguished Name Mapping and Limitations](#)

Create Identical DIT Structures on Both Directories

Oracle recommends that you configure identical DITs on both directories. This enables all the user and group objects to be synchronized as they are, and eliminates the task of mapping entries with distinguished names in one directory to URLs in the other. It also eliminates the performance problems that those mappings can cause.

To create identical DITs, first decide which directory is the central enterprise directory, and then change the DIT of the other one to match. Be sure to update the directory integration profile to reflect the domain-level rules.

To enable users to access Oracle applications through Oracle Application Server Single Sign-On, Oracle recommends that you identify the DIT as a separate identity management realm with its own authentication and authorization domain.

See Also: The chapter about deploying identity management realms in *Oracle Internet Directory Administrator's Guide*

Distinguished Name Mapping and Limitations

If it is not feasible to have identical DITs on both directories, then you need to map the domains between Oracle Internet Directory and the connected directory. For example, suppose that all entries under the container `dc=mydir`, `dc=com` must be synchronized

under `dc=myoid,dc=com` in Oracle Internet Directory. To achieve this, you specify it in the domain-level mapping rules.

If the objective is to synchronize all users and groups, then all user entries can be synchronized with the appropriate DN mapping. However, group entry synchronization can be both time consuming and carry some additional limitations. This section provides examples of both user and group synchronization when there is a DN mapping.

Example: User Entry Mapping Suppose that, in a mapping file, the entries in the Sun Java System Directory have the format `uid=name,ou=people,o=iplanet.org`. Suppose further that the entries in Oracle Internet Directory have the format `cn=name,cn=users,dc=iplanet,dc=com`. Note that the naming attribute on Sun Java System Directory is `uid`, but on Oracle Internet Directory it is `cn`.

The mapping file has rules similar to these:

```
DomainRules
ou=people,o=iplanet.org: cn=users,dc=iplanet,dc=com: cn=%,
cn=users,dc=iplanet,dc=com
AttributeRules
Uid:1: :person:cn: :inetorgperson:
```

The value of 1 in the second column of the last line indicates that, for every change to be propagated from Sun Java System Directory to Oracle Internet Directory, the `uid` attribute must be present. This is because the `uid` must be available for constructing the DN of the entry in Oracle Internet Directory.

Example: Group Entry Mapping When there is a DN mapping, synchronizing group entries is somewhat complex. The group memberships, which are DNs, must have valid DN values after synchronization. This means that whatever DN mapping was done for user DNs must be applied to group membership values.

For instance, suppose that the user DN values are mapped as follows:

```
ou=people,o=iplanet.org: cn=users,dc=iplanet,dc=com:
```

This implies that all the user entries under `ou=people,o=iplanet.org` are moved to `cn=users,dc=iplanet,dc=com`.

Group memberships need to be mapped as follows:

```
uniquemember: : : groupofuniquenames: uniquemember:
:groupofuniquenames:dnconvert(uniquemember)
```

For example, if the value of `uniquemember` is `cn=testuser1,ou=people,o=iplanet.org`, then it becomes `cn=testuser1,cn=users,dc=iplanet,dc=com`.

Moreover, if the value of `uniquemember` is `cn=testuser1,dc=subdomain,ou=people,o=iplanet.org`, then it becomes `cn=testuser1,dc=subdomain,cn=users,dc=iplanet,dc=com`.

This is a feasible solution as long as the naming attribute or RDN attribute remains the same on both the directories. However, if the naming attribute is different on different directories—as, for example,

```
ou=people,o=iplanet.org:cn=users,dc=iplanet,dc=com:cn=%,cn=users
,dc=iplanet,dc=com—then deriving the actual DNs for group memberships is not
achievable through the given set of mapping rules. In this case, DN mapping for the
uniquemember or other DN type attributes is not currently feasible.
```

If you want to synchronize group memberships, remember to keep the naming attribute in the source and destination directories the same.

See Also: ["Configuring Mapping Rules"](#) on page 6-4 for instructions about how to specify a mapping rule

Select the Attribute for the Login Name

The attribute for the login name contains the identity of the end user when logging into any Oracle component. It is stored in Oracle Internet Directory as the value of the attribute `orclcommonnicknameattribute`, under the container `cn=common,cn=products,cn=oracleContext,identity_management_realm`.

By default, `orclcommonnicknameattribute` attribute has `uid` as its value. This means that the identity used to log in is stored in the `uid` attribute of the user entry.

If the connected directory has a specific attribute for logging in, then that attribute needs to be mapped to the right `orclcommonnicknameattribute` in Oracle Internet Directory. This needs to be one of the mapping rules in the mapping file for the connector associated with synchronizing with the third-party directory.

For example, suppose that you are synchronizing Oracle Internet Directory with Microsoft Active Directory, and that, in the latter, the login identifier is contained in the `userPrincipalName` attribute of the user entry. You would synchronize the value of the `userPrincipalName` attribute to Oracle Internet Directory, storing it in the `uid` attribute, which is the value of the `orclcommonnicknameattribute` attribute. This mapping needs to be reflected in the mapping rules in the directory integration profile.

You can also use any other attribute for the login identifier. For example, if you want to use `employeeID` for logins, then mapping rules can be set accordingly. Doing this does not affect your configuration.

Note: The `orclcommonnicknameattribute` attribute is used extensively by Oracle Application Server Single Sign-On, so be sure to plan carefully how you intend to map the attribute to a third-party directory attribute. After you modify this attribute, you must refresh Oracle Application Server Single Sign-On for the change to take effect.

See Also: *Oracle Identity Management Guide to Delegated Administration* for instructions about setting the attribute for login name

Select the User Search Base

The user search context is represented by a multivalued attribute that lists all the containers under which users exist. Depending on your deployment, either set the user search context value to cover the entire user population, or add the container to the user search context attribute by using the Oracle Internet Directory Self-Service Console.

See Also: *Oracle Identity Management Guide to Delegated Administration* for instructions about setting the user search context

Select the Group Search Base

The group search context is represented by a multivalued attribute that lists all the containers under which groups exist. Depending on your deployment, either set the group search context value to cover all group entries, or add the container to the group search context attribute by using the Oracle Internet Directory Self-Service Console.

See Also: *Oracle Identity Management Guide to Delegated Administration* for instructions about setting the group search context

Decide How to Address Security Concerns

There are three main security concerns you need to consider:

- Access policies—The user and group search bases should be appropriately protected from access by any malicious users.
- Synchronization—You can configure the Oracle directory integration server to use SSL when connecting to Oracle Internet Directory and third-party directories. If you do this, then all information exchanged among the directory servers is secure.
- Password synchronization—Depending on the configuration, passwords can be synchronized. For instance, when Oracle Internet Directory is the central enterprise directory, password changes can be communicated to the connected directory. If passwords are to be synchronized, then Oracle recommends that you configure communication between the directories in SSL server authentication mode.

See Also: ["Configuring the Third-Party Directory Connector for Synchronization in SSL Mode"](#) on page 18-10

Administering Your Deployment with Oracle Access Manager

To use Oracle Access Manager to administer an Oracle Internet Directory deployment that synchronizes with a third-party directory, you must ensure that synchronized users are visible with Oracle Access Manager.

See Also: *Oracle Access Manager Identity and Common Administration Guide* for information about how to administer users in Oracle Access Manager

Microsoft Active Directory Integration Concepts

This section contains additional considerations for integrating Oracle Internet Directory with Microsoft Active Directory. It contains these topics:

- [Synchronizing from Microsoft Active Directory to Oracle Internet Directory](#)
- [Windows Native Authentication](#)
- [Oracle Internet Directory Schema Elements for Microsoft Active Directory](#)
- [Integration with Multiple Microsoft Active Directory Domain Controllers](#)
- [Synchronizing with a Multiple-Domain Microsoft Active Directory Environment](#)
- [Foreign Security Principals](#)

See Also: [Chapter 19, "Integrating with Microsoft Active Directory"](#)

Synchronizing from Microsoft Active Directory to Oracle Internet Directory

To synchronize changes from Microsoft Active Directory to Oracle Internet Directory, Oracle Directory Integration Platform imports incremental changes made available by Microsoft Active Directory change tracking mechanisms. Oracle Directory Integration Platform supports the following two Microsoft Active Directory change tracking mechanisms:

- The DirSync approach, which uses an LDAP control that is supported by Microsoft Active Directory
- The USN-Changed approach, which uses an attribute of the entry

In each approach, the directory from which changes are derived is queried at scheduled intervals by Microsoft Active Directory Connector. Each approach has advantages and disadvantages. [Table 17-3](#) compares the two approaches.

Table 17-3 Comparing the DirSync Approach to the USN-Changed Approach

Considerations	DirSync Approach	USN-Changed Approach
Change key	Presents changes to the <code>ObjectGUID</code> , the unique identifier of the entry	Presents changes to the distinguished name. The <code>ObjectGUID</code> is used to keep track of modifications of the DN.
Error handling	If synchronization stops as a result of an error condition, then, during the next cycle, all changes that are already applied are read and skipped.	Does not require synchronization to be atomic. If synchronization stops, then the next synchronization cycle starts from the entry where the synchronization was interrupted.
Information in the search results	Changes consist of only the changed attributes and the new values. This can be quicker than the USN-Changed approach.	All attributes of the changed entry are retrieved. The retrieved values are compared to the old values stored in Oracle Internet Directory and updated. This can be more time consuming than the DirSync approach.
Changes to multivalued attributes	Reflects incremental changes made to multivalued attributes as a complete replacement of the attribute value.	Reflects incremental changes made to multivalued attributes as a complete replacement of the attribute value.
How synchronization point is tracked	When queried for changes in the directory, presents incremental changes based on a cookie value that identifies the state of the directory.	The changes are queried in the directory based on the <code>USNChanged</code> attribute, which is a long integer, that is, 8 bytes. You can modify the value to adjust where to start the synchronization.
Required user privileges	Requires the user to have the Replicate Changes privilege on the naming context of interest. This enables reading all objects and attributes in Microsoft Active Directory regardless of the access protections on them. See Also: The Microsoft Knowledge Base Article 303972 available at http://support.microsoft.com/ for instructions on how to assign privileges to Microsoft Active Directory users when using the DirSync approach. Apply to this context the instructions used for Microsoft Active Directory management agent in this article.	Requires the Microsoft Active Directory user to have the privilege to read all required attributes to be synchronized to Oracle Internet Directory. See Also: Microsoft networking and directory documentation available in the Microsoft library at the following URL: http://msdn.microsoft.com/ for instructions about how to assign privileges to Microsoft Active Directory users when using the USN-Changed approach.

Table 17-3 (Cont.) Comparing the DirSync Approach to the USN-Changed Approach

Considerations	DirSync Approach	USN-Changed Approach
Support of multiple domains	Requires separate connections to different domain controllers to read changes made to the entries in different domains.	Can obtain changes made to the multiple domains by connecting to the Global Catalog server. See Also: "Synchronizing with a Multiple-Domain Microsoft Active Directory Environment" on page 17-24
Synchronization from a replicated directory when switching to a different Microsoft Active Directory domain controller	Synchronization can continue. The synchronization key is the same when connecting to a replicated environment.	Requires: <ul style="list-style-type: none"> ■ Full synchronizing to a known point ■ Updating the USNChanged value ■ Starting synchronization with the failover directory See Also: "Switching to a Different Microsoft Active Directory Domain Controller in the Same Domain" on page 19-18
Synchronization scope	Reads all changes in the directory, filters out changes to the required entries, and propagates to Oracle Internet Directory	Enables synchronization of changes in any specific subtree
Usability in an environment with multiple Microsoft Active Directory servers behind a load balancer	-	Either connect to a specific Microsoft Active Directory domain controller, or connect to a Global Catalog. Connect to Global Catalog if: <ul style="list-style-type: none"> ■ You are interested in import operations only ■ The Global Catalog contains all entries and attributes to be synchronized ■ Performance of the Global Catalog is acceptable

See Also: ["Synchronizing from Oracle Internet Directory to a Connected Directory"](#) on page 5-3

Windows Native Authentication

This section describes how Windows Native Authentication can be used with the Oracle Directory Integration Platform. It contains these topics:

- [Understanding Windows Native Authentication](#)
- [Authenticating Users Against Multiple Microsoft Active Directory Domains](#)
- [Overriding an Application Authentication Mechanism with Windows Native Authentication](#)

Understanding Windows Native Authentication

Windows Native Authentication is an authentication scheme for users of Microsoft Internet Explorer on Microsoft Windows. When this feature is enabled in OracleAS Single Sign-On, users log in to OracleAS Single Sign-On partner applications automatically. To do this, they use Kerberos credentials obtained when the user logged in to a Windows domain.

Using the Simple and Protected GSS-API Negotiation Mechanism (SPNEGO) protocol, Internet Explorer version 5.0 and later can automatically pass the user's Kerberos

credentials to a requesting Kerberos-enabled Web server. The Web server can then decode the credentials and authenticate the user.

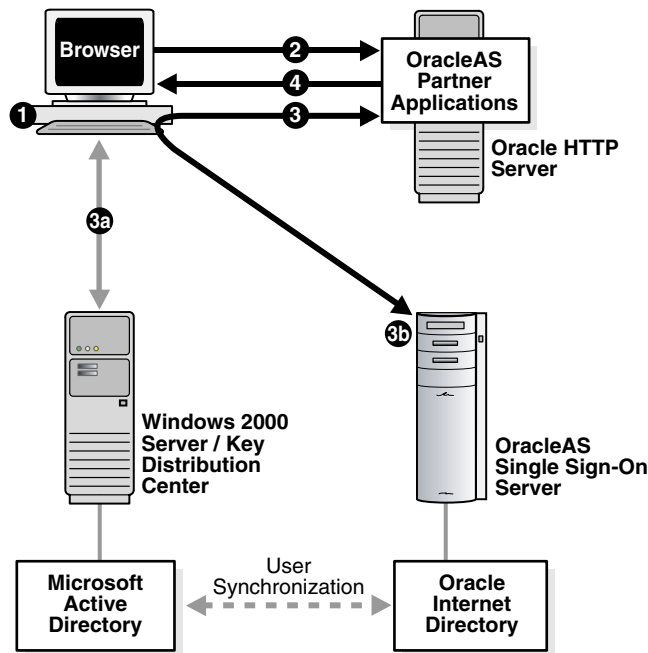
You cannot use Microsoft integrated security or any other type of security mechanism when integrating Oracle Application Server Single Sign-On with Windows Native Authentication. Although the SPNEGO protocol supports both Kerberos version 5 and NT Lan Manager (NTLM) authentication schemes, Oracle Application Server 10g (10.1.4.2) supports only Kerberos V5 with SPNEGO.

Note: Although this chapter refers only to Windows 2000, Windows Native Authentication is also supported on the Windows XP platform.

If the browser is not Internet Explorer 5.0 or higher, then Oracle Identity Management authenticates the user by using OracleAS Single Sign-On. Authentication to an external directory is performed by using an external authentication plug-in.

The following steps, shown in [Figure 17-5](#) on page 17-22, describe what happens when a user tries to access a single-sign-on-protected application:

1. The user logs in to a Kerberos realm, or domain, on a Windows computer.
2. The user attempts to access a single-sign-on partner application using Internet Explorer.
3. The application routes the user to the single sign-on server for authentication. As part of this routing, the following occurs:
 - a. The browser obtains a Kerberos session ticket from the Key Distribution Center (KDC).
 - b. The OracleAS Single Sign-On server verifies the Kerberos session ticket and, if the user is authorized, then the user is allowed to access the requested URL.
4. The application provides content to the user.

Figure 17-5 Flow for Windows Native Authentication

When the user logs out of the Windows session, this application and any single sign-on applications accessed are logged out at the same time.

To use Windows Native Authentication in deployments where Microsoft Active Directory is the central directory, a user must exist in Microsoft Active Directory. If Windows Native Authentication is enabled, then, for local Oracle Internet Directory users to invoke the single sign-on server, you must populate the attributes `orclsamaccountname` and `krbprincipalname` for each user entry.

Authenticating Users Against Multiple Microsoft Active Directory Domains

To authenticate users against multiple Microsoft Active Directory domains that are part of a single forest, create a global catalog and have Oracle Application Server Single Sign-On connect to the global catalog for authentication. However, if the domains are not part of the same forest, then you must create domain trusts between the domains. For detailed configuration procedures, refer to ["Configuring Windows Native Authentication"](#) on page 19-8.

Overriding an Application Authentication Mechanism with Windows Native Authentication

Windows Native Authentication does not automatically override an application's existing authentication mechanism. To use Windows Native Authentication and Oracle Application Server Single Sign-On with an application that contains an internal authentication mechanism, you must perform one of the following tasks:

- Remove the application's internal authentication mechanism.
- Configure the application as an Oracle Application Server Single Sign-On external application. This requires storing a valid application user name and password in the application configuration, making the authentication process transparent to the user after he or she logs in with Oracle Application Server Single Sign-On. For more information, refer to the *Oracle Application Server Single Sign-On Administrator's Guide*.

Oracle Internet Directory Schema Elements for Microsoft Active Directory

Table 17–4 lists the schema elements in Oracle Internet Directory for users that are imported from Microsoft Active Directory.

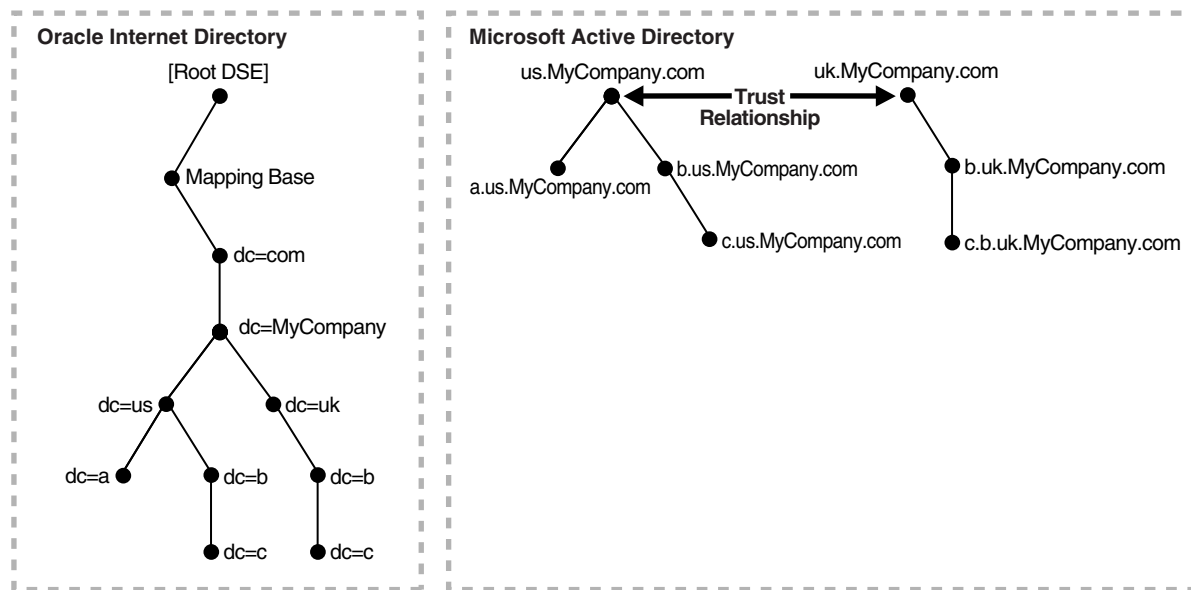
Table 17–4 Oracle Internet Directory Schema Elements for Microsoft Active Directory

Schema Element	Description
orclObjectGUID	Stores Microsoft Active Directory's OBJECTGUID attribute value for users and groups migrated to Oracle Internet Directory from Microsoft Active Directory.
orclObjectSID	Stores Microsoft Active Directory's OBJECTSID attribute value for users and groups migrated to Oracle Internet Directory from Microsoft Active Directory.
orclSAMAccountName	Stores the value of Microsoft Active Directory's SAMAccountName attribute. In Oracle Internet Directory, this attribute is defined as a directory string type. However, in Microsoft Active Directory this attribute cannot accept any special or non-printable characters. If any entry is added in Oracle Internet Directory with this attribute, it can only contain a simple text string or synchronization from Oracle Internet Directory to Microsoft Active Directory will fail.
orclUserPrincipalName	Stores the Kerberos user principal name for Microsoft Active Directory users.
orclADGroup	Contains Microsoft Active Directory group attributes, which are used to synchronize Microsoft Active Directory group objects with Oracle Internet Directory group objects in an Oracle Directory Integration environment.
orclADUser	Contains Microsoft Active Directory user attributes, which are used to synchronize Microsoft Active Directory user objects with Oracle Internet Directory user objects in an Oracle Directory Integration and Provisioning environment.
orclSourceObjectDN	Represents the DN for the respective entry in Microsoft Active Directory. This value is required to perform external authentication if different domains are mapped between both directories.

See Also: *Oracle Identity Management User Reference* for detailed information about the Oracle Internet Directory schema elements for Microsoft Active Directory

Integration with Multiple Microsoft Active Directory Domain Controllers

A deployment of Microsoft Active Directory with multiple domains can have either a single DIT or a combination of two or more DITs. In Microsoft Active Directory, a group of DITs is called a forest. Figure 17–6 shows how a forest in Microsoft Active Directory is reflected in Oracle Internet Directory.

Figure 17–6 Mapping Between Oracle Internet Directory and a Forest in Microsoft Active Directory

In this directory, two domain trees constitute a forest. These trees are in a trust relationship, that is, users in one domain are authenticated by the domain controller in the other domain. This forest in Microsoft Active Directory maps to an identically structured subtree in Oracle Internet Directory.

Considerations for Deployments where Oracle Internet Directory is the Central Directory

If there are multiple Microsoft Active Directory domains, then the Directory Integration Assistant (`dipassistant`) must be run as many times as there are Microsoft Active Directory domains. Each time you do this, you choose the specific data set required by the target Microsoft Active Directory domain.

The Oracle directory integration platform provisions users and groups in the respective Microsoft Active Directory domains. Before provisioning can take place, you must configure a one-way synchronization from Oracle Internet Directory to the Microsoft Active Directory domain.

Considerations for Deployments where Microsoft Active Directory as the Central Directory

If there are multiple Microsoft Active Directory servers, then you must bootstrap the data from each Microsoft Active Directory domain. If you use the Global Catalog for one-way synchronization from Microsoft Active Directory to Oracle Internet Directory, then you need to bootstrap only once from the Global Catalog server.

The Oracle directory integration platform synchronizes users and groups from the respective Microsoft Active Directory domains into Oracle Internet Directory. Before the provisioning can take place, a one-way synchronization between Oracle Internet Directory and a domain controller on each Microsoft Active Directory domain must be established.

Synchronizing with a Multiple-Domain Microsoft Active Directory Environment

This section describes considerations for synchronizing with a multiple-domain Microsoft Active Directory environment. It contains these topics:

- [Configuration Required for Importing from Microsoft Active Directory to Oracle Internet Directory](#)
- [Configuration Required for Exporting from Oracle Internet Directory to Microsoft Active Directory](#)
- [Example: Integration with Multiple Third-Party Directory Domains](#)

Configuration Required for Importing from Microsoft Active Directory to Oracle Internet Directory

Normally, importing requires configuring one import profile for each Microsoft Active Directory domain regardless of whether you are using the DirSynch approach or the USN-Changed approach. However, if you are using the USN-Changed approach, you can use the Global Catalog to import from an entire Microsoft Active Directory forest. You only need to configure a single import profile to use Global Catalog, but keep in mind the following considerations:

- Because Global Catalog is read-only, you can use it only for importing data into Oracle Internet Directory
- Global Catalog does not contain all the attributes, although the available attributes can be configured in Microsoft Active Directory
- Because Global Catalog is a point of authentication, you may incur additional overhead if synchronization is started from this point

See Also: The Microsoft Knowledge Base Article 256938 available from Microsoft Help and Support at <http://support.microsoft.com/> for information about Global Catalog attributes in the Microsoft Active Directory schema

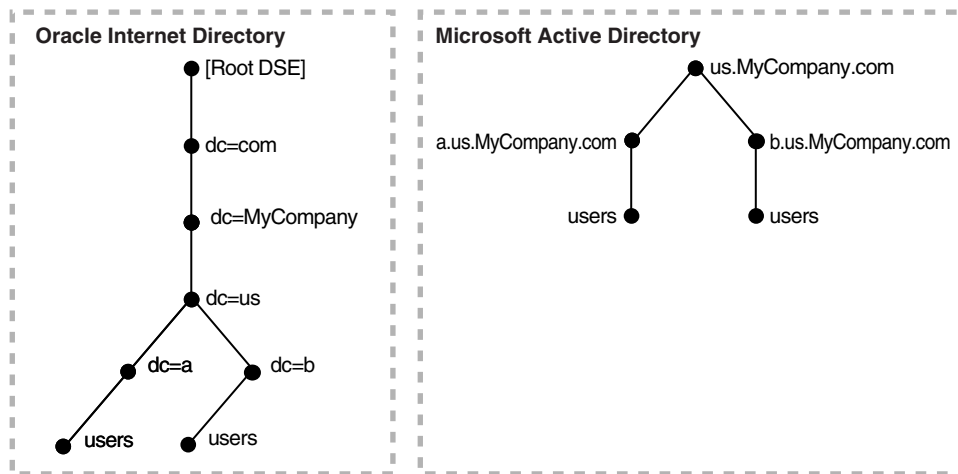
Configuration Required for Exporting from Oracle Internet Directory to Microsoft Active Directory

To integrate with multiple-domain Microsoft Active Directory environments, the Oracle directory integration platform obtains configuration information from each Microsoft Active Directory domain. You must configure as many export profiles as there are Microsoft Active Directory domains.

Example: Integration with Multiple Third-Party Directory Domains

A deployment of a third-party directory with multiple domains can have either a single DIT or a combination of two or more DITs. [Figure 17-7](#) shows how multiple domains in a third-party directory are mapped to a DIT in Oracle Internet Directory.

Figure 17–7 Example of a Mapping Between Oracle Internet Directory and Multiple Domains in Microsoft Active Directory



In Figure 17–7, the third-party directory environment has a parent and two children.

The first child domain `a.us.MyCompany.com` maps to `dc=a`, `dc=us`, `dc=MyCompany`, `dc=com` in Oracle Internet Directory. The second child domain `b.us.MyCompany.com` maps to `dc=b`, `dc=us`, `dc=MyCompany`, `dc=com` in Oracle Internet Directory. The common domain component in the third-party directory environment `us.MyCompany.com` maps to the default identity management realm in Oracle Internet Directory, in this case `dc=us`, `MyCompany`, `dc=com`.

Foreign Security Principals

A Microsoft Active Directory user or computer account represents a physical entity such as a computer or person. User accounts and computer accounts, as well as groups, are called security principals. Security principals are directory objects that are automatically assigned security identifiers. Objects with security identifiers can log on to the network and access domain resources. A user or computer account is used to:

- Authenticate the identity of the user or computer
- Authorize or deny access to domain resources
- Administer other security principals
- Audit actions performed using the user or computer account

For example, the user and computer accounts that are members of the Enterprise Administrators group are automatically granted permission to log on at all of the domain controllers in the forest.

User and computer accounts are added, disabled, reset, and deleted by using Microsoft Active Directory Users and Computers.

In a trust relationship in Microsoft Active Directory, users in one domain are authenticated by a domain controller in another domain. The trust relationship can be transitive or non transitive.

- In a transitive trust relationship, the trust relationship extended to one domain is automatically extended to all other domains that trust that domain. For example, suppose you have three domains: A, B, and C in which both B and C are in a direct

trust relationship with A. In this scenario, both B and C also trust each other. This is because, although they are not in a direct trust relationship with each other, they are in a direct trust relationship with A.

- In a non transitive trust relationship, the trust is bound by the two domains in the trust relationship; it does not flow to any other domains in the forest.

When a trust is established between a Windows 2000 domain in a particular forest and a Windows 2000 domain outside of that forest, security principals from the external domain can be granted access to resources in the forest. A security principal from an external domain is called a *foreign security principal* and is represented in Microsoft Active Directory as a "foreign security principal" object. These foreign security principals can become members of domain local groups, which can have members from domains outside of the forest.

Foreign security principals are used when there is a non transitive trust between two domains in a Microsoft Active Directory environment.

In a non transitive trust relationship in a Microsoft Active Directory environment, when one domain recognizes a foreign security principal from the other domain, it represents that entity similar to a DN entry. In that entry, the RDN component is set to the SID of the original entry in the trusted domain. In the case of groups, the DNs of the foreign security principals are represented as member values, not as the DNs of the original entries in the trusted domain. This can create a problem when foreign security principals are synchronized with Oracle Internet Directory.

Sun Java System Directory Integration Concepts

This section contains additional considerations for integrating Oracle Internet Directory with Sun Java System Directory. It contains these topics:

- [Synchronizing from Sun Java System Directory to Oracle Directory Integration Platform](#)
- [Oracle Internet Directory Schema Elements for Sun Java System Directory](#)

See Also: [Chapter 21, "Integrating with Sun Java System Directory"](#)

Synchronizing from Sun Java System Directory to Oracle Directory Integration Platform

Sun Java System Directory maintains a change log in which it stores incremental changes made to directory objects. Synchronization from Sun Java System Directory to Oracle Internet Directory makes use of this change log.

See Also:

- ["Synchronizing from Oracle Internet Directory to a Connected Directory"](#) on page 5-3.
- The Oracle Internet Directory server administration tools chapter of the *Oracle Identity Management User Reference* for instructions on how to start an Oracle directory server with change logging enabled.
- Sun Java System Directory documentation for instructions on how to configure change logging. If you plan to synchronize with Sun Java System Directory versions 5.0 or later, the retro change log plug-in must be enabled.

Oracle Internet Directory Schema Elements for Sun Java System Directory

Oracle Internet Directory includes the `orclSourceObjectDN` element for users that are imported from Sun Java System Directory. The `orclSourceObjectDN` element represents the DN for the respective entry in Sun Java System Directory. This value is required to perform external authentication if different domains are mapped between both directories.

Novell eDirectory and OpenLDAP Integration Concepts

This section contains additional considerations for integrating Oracle Internet Directory with Novell eDirectory or OpenLDAP. It contains these topics:

- [Synchronizing from Novell eDirectory or OpenLDAP to Oracle Internet Directory](#)
- [Oracle Internet Directory Schema Elements for Novell eDirectory](#)
- [Oracle Internet Directory Schema Elements for OpenLDAP](#)

See Also: [Chapter 22, "Integrating with Novell eDirectory or OpenLDAP"](#)

Synchronizing from Novell eDirectory or OpenLDAP to Oracle Internet Directory

To synchronize changes from Novell eDirectory or OpenLDAP to Oracle Internet Directory, the Oracle directory integration platform evaluates the modification timestamp of each Novell eDirectory or OpenLDAP entry. Entries with timestamps that are more recent than the execution time of the last synchronization are updated in Oracle Internet Directory.

For entries that have been deleted in Novell eDirectory or OpenLDAP, the Oracle Directory Integration Platform identifies the deleted entries by performing a linear comparison between the entries in Oracle Internet Directory and Novell eDirectory or OpenLDAP. In other words, entries in both directories are compared at specified intervals. Entries that are not available in both Oracle Internet Directory and Novell eDirectory or OpenLDAP are deleted. To avoid decreased performance on the server as directory entries are compared, you can customize the comparison to search specific subsets of the DIT.

See Also:

- ["Synchronizing from Oracle Internet Directory to a Connected Directory" on page 5-3](#)
- ["Step 6: Customizing the Novell eDirectory or OpenLDAP Connector to Synchronize Deletions" on page 22-4](#) for information about how to search specific subsets of the DIT when synchronizing deletions between Oracle Internet Directory and Novell eDirectory or OpenLDAP

Oracle Internet Directory Schema Elements for Novell eDirectory

[Table 17-5](#) lists the schema elements in Oracle Internet Directory for users that are imported from Novell eDirectory.

Table 17–5 Oracle Internet Directory Schema Elements for Novell eDirectory

Schema Element	Description
orclSourceObjectDN	Represents the DN for the respective entry in Novell eDirectory. This value is required to perform external authentication if different domains are mapped between both directories.
orclndsobjectguid	Required for reconciliation. Represents the GUID value for the respective entry in Novell eDirectory. This value is used as the synchronization key.
orclsourcemodifytimestamp	Required. Represents the modifytimestamp attribute of the respective entry in Novell eDirectory. This value is used in getting the entries that needs to be synchronized.
orclsourceCreateTimestamp	Required. Represents the createtimestamp attribute of the respective entry in Novell eDirectory. This value is used in synchronization of deleted entries.
orclndsobject	Represents the NDS object in Novell eDirectory.

See Also: *Oracle Identity Management User Reference* for detailed information about the Oracle Internet Directory schema elements for Novell eDirectory

Oracle Internet Directory Schema Elements for OpenLDAP

[Table 17–6](#) lists the schema elements in Oracle Internet Directory for users that are imported from OpenLDAP.

Table 17–6 Oracle Internet Directory Schema Elements for OpenLDAP

Schema Element	Description
orclSourceObjectDN	Represents the DN for the respective entry in OpenLDAP. This value is required to perform external authentication if different domains are mapped between both directories.
orclOpenLdapEntryUUID	Required for reconciliation. Represents the entryUUID value for the respective entry in OpenLDAP. This value is used as the synchronization key.
orclsourcemodifytimestamp	Required. Represents the modifytimestamp attribute of the respective entry in OpenLDAP. This value is used in getting the entries that needs to be synchronized.
orclsourceCreateTimestamp	Required. Represents the createtimestamp attribute of the respective entry in OpenLDAP. This value is used in synchronization of deleted entries.
orclopenldapobject	Represents the OpenLDAP object.

See Also: *Oracle Identity Management User Reference* for detailed information about the Oracle Internet Directory schema elements for OpenLDAP

Limitations of Third-Party Integration in Oracle Internet Directory 10g (10.1.4.2)

Oracle Internet Directory 10g (10.1.4.2) does not support the synchronization of the schema and ACLs. If you are changing the schema or ACLs, then you must apply the

changes manually. Use the `schemasync` tool to synchronize the schema between Oracle Internet Directory and a third-party directory.

See Also: The `schemasync` section in the Oracle Directory Integration Platform tools chapter of the *Oracle Identity Management User Reference*

Configuring Synchronization with a Third-Party Directory

This chapter contains generic instructions for synchronizing Oracle Internet Directory with a third-party directory. It contains these topics:

- [Verifying Synchronization Requirements](#)
- [Creating Synchronization Profiles with Express Configuration](#)
- [Configuring Advanced Integration Options](#)

Note: This chapter assumes that you are familiar with [Chapter 17, "Third-Party Directory Integration Concepts and Considerations"](#).

See Also: The following chapters for step-by-step instructions about configuring integration between Oracle Internet Directory and a specific third-party directory:

- [Chapter 19, "Integrating with Microsoft Active Directory"](#)
- [Chapter 21, "Integrating with Sun Java System Directory"](#)
- [Chapter 22, "Integrating with Novell eDirectory or OpenLDAP"](#)

Verifying Synchronization Requirements

To prepare for synchronization between Oracle Internet Directory and a third-party directory:

1. Verify that Oracle Internet Directory and your third-party directory are running.
2. Create a user account in the third-party directory with sufficient privileges to read and write the relevant entries in the containers that will be synchronized. If the directory supports tombstone, the account should also have sufficient privileges to read tombstone entries.
 - **For Import Operations from a Third-Party Directory:** Grant the user account read access privileges to the subtree root. The user account must be able to read all objects under the source container (subtree root) in the third-party directory that are to be synchronized with the Oracle directory integration platform. To verify whether a third-party directory user account has the necessary privileges to all objects to be synchronized with Oracle Internet Directory, use the command-line `ldapsearch` utility to perform a subtree search, as follows:

```
$ORACLE_HOME/bin/ldapsearch -h directory host -p directory port -b "DN of subtree" -s sub -D "DN of privileged directory user" -w "password for privileged directory user" "objectclass=*
```

The return results from the `ldapsearch` utility should include all objects of interest, including all attributes and values that will be synchronized.

- **For Export Operations to a Third-Party Directory:** Grant the user account the following privileges to the subtree root that is the parent of all the containers to which the Oracle directory integration platform will export users:
 - Write
 - Create all child objects
 - Delete all child objects

See Also: Your third-party directory documentation for information how to grant privileges to user accounts

You must also ensure that Oracle Internet Directory is running with change logging enabled, and that the change log purge duration is set to a minimum of seven days.

See Also:

- The Oracle Internet Directory server administration tools chapter of the *Oracle Identity Management User Reference* for instructions on how to start an Oracle directory server with change logging enabled
- The `orclPurgeTargetAge` section of the *Oracle Identity Management User Reference* for instructions on how to set the change log purge duration

Creating Synchronization Profiles with Express Configuration

This section describes how to create and configure synchronization profiles with express configuration. It contains these topics:

- [Understanding Express Configuration](#)
- [Running Express Configuration](#)

Understanding Express Configuration

The Directory Integration Assistant (`dipassistant`) includes an express configuration option that creates two synchronization profiles, one for import and one for export, using predefined assumptions. If the directory integration server is already running, then after enabling the profiles, you can immediately begin synchronizing users and groups between the containers in which users and groups are stored in the third-party directory and `cn=users, default_realm/` `cn=groups, default_realm` in Oracle Internet Directory.

To simplify the configuration, the express configuration option assumes the following:

- Entries for users of the default realm in Oracle Internet Directory are located in the container `cn=users, default_realm_DN`.
- Entries for groups of the default realm in Oracle Internet Directory are located in the container `cn=groups, default_realm_DN`

- The Oracle Directory Integration Platform master mapping rules files created during installation are located in `$ORACLE_HOME/ldap/odi/conf`.
- Master domain mapping rules are located in `$ORACLE_HOME/ldap/odi/samples`.
- The logon credential is that of a Oracle Directory Integration Platform administrator with sufficient privileges to configure a profile, a realm, and access controls on the Users container in the Oracle directory server. Members of the Oracle Directory Integration Platform Administrators group (`cn=dipadmingrp,cn=dipadmin,cn=directory integration platform,cn=products,cn=oraclecontext`) have the necessary privileges.

Perform the following steps to run express configuration and verify that users and groups are synchronizing between `cn=users,default_naming_context` in the third-party directory and `cn=users,default_realm` in Oracle Internet Directory:

1. Run express configuration by following the instructions in ["Running Express Configuration"](#) on page 18-4.
2. Express configuration creates two profiles named `profile_nameImport` and `profile_nameExport`. By default, both profiles are disabled. Enable the `profile_nameImport` profile if you need to synchronize from a third-party directory to Oracle Internet Directory and enable the `profile_nameExport` profile if you need to synchronize from Oracle Internet Directory to a third-party directory. To enable a profile, you use the Directory Integration Assistant (`dipassistant`) utility with the `modifyprofile` operation. For example, the following command enables an import profile named `myprofileImport`:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -host myhost -port myport
-file import.profile -dn bind_DN -passwd password_of_bind_DN
-profile myprofileImport odip.profile.status=ENABLE
```

3. Start the Oracle directory integration platform by following the instructions described in ["Starting, Stopping, and Restarting the Oracle Directory Integration Platform"](#) on page 4-8.
4. Wait until the scheduling interval has elapsed and verify that synchronization has started by entering the following command:

```
$ORACLE_HOME/bin/ldapsearch -h OID host -p OID port
-w "password for privileged directory user" -D "DN of privileged OID user"
-b "orclodipagentname=import profile,cn=subscriber profile,cn=changelog
subscriber,cn=oracle internet directory" -s base "objectclass=*"
orclodipsynchronizationstatus orclodioplastsuccessfulexecutiontime
```

Note: The default scheduling interval is 60 seconds (1 minute). You can use the Directory Integration Assistant (`dipassistant`) to change the default scheduling interval. For more information, see [Chapter 3, "Oracle Directory Integration Platform Administration Tools"](#).

When synchronization is successfully started:

- The value of the `Synchronization Status` attribute is `Synchronization Successful`.
- The value of the `Last Successful Execution Time` attribute is the specific date and time of that execution. Note that this must be close to the current date and time.

An example of a result indicating successful synchronization is:

```
Synchronization successful 20060515012615
```

Note:

- The date and time must be close to current date and time
 - When running the `ldapsearch` command, you need the `dipadmin` password, which, as established at installation, is the same as `orcladmin` password
-

5. After verifying that synchronization has started, examine the entries in Oracle Internet Directory and the third-party directory to confirm that users and groups are synchronizing between `cn=users, default_naming_context` in the third-party directory and `cn=users, default_realm` in Oracle Internet Directory.

Running Express Configuration

You can run express configuration with either the Directory Integration Assistant (`dipassistant`) or the Oracle Directory Integration Server Administration tool. The express configuration option with the Oracle Directory Integration Server Administration tool is only available for integrations with Microsoft Active Directory. For all other supported third-party directories, you must run express configuration with the Directory Integration Assistant. How to run express configuration for each tool is described in these topics:

- [Running Express Configuration with the Directory Integration Assistant](#)
- [Running Express Configuration with the Oracle Directory Integration Server Administration Tool](#)

Note: While customizing the synchronization profiles for your environment, you may need to add test users and groups to facilitate your deployment effort. Be sure to remove any test users and groups when you are finished customizing and testing your synchronization profiles.

CAUTION: In order to successfully customize your import and export synchronization profiles, do not enable SSL until you have finished with all other configuration tasks.

Running Express Configuration with the Directory Integration Assistant

This section describes how to run express configuration with the Directory Integration Assistant (`dipassistant`). You can use this command with any supported third-party directory.

To run express configuration with the Directory Integration Assistant:

1. Launch the Directory Integration Express Configuration Tool:

```
$ORACLE_HOME/bin/dipassistant expressconfig  
[-h oracle_internet_directory_host  
-p oracle_internet_directory_port -3rdpartyds directory_name
```

```
-grpID myProfile
```

The arguments in the preceding example are listed in [Table 18–1](#).

Table 18–1 Arguments for the Directory Integration Express Configuration Tool

Argument	Description
<code>oracle_internet_directory_host</code>	Host of the Oracle directory server. The default is the local host.
<code>oracle_internet_directory_port</code>	Non-SSL port for Oracle Internet Directory. The default is 389.
<code>directory_name</code>	The name of the third-party directory. Enter one of the following values: <ul style="list-style-type: none"> ■ Active Directory ■ Iplanet ■ Novell eDirectory ■ Openldap ■ adforexchange
<code>group</code>	The connector group with which to associate the profile.

2. When prompted, enter the following information:

- Oracle Internet Directory credentials. You must specify the super user, that is, `cn=orcladmin`, or any user that is a member of the Oracle Directory Integration Platform Administrators group (`cn=dipadmingrp`, `cn=dipadmin`, `cn=directory integration platform`, `cn=products`, `cn=oraclecontext`).
- Third-party directory connection details and credentials of a privileged user. When synchronizing with Microsoft Active Directory, the privileged user must have the necessary administrative privileges to read deleted entries.
- For Novell eDirectory, OpenLDAP, and Sun Java System Directory, you must also specify the containers to synchronize.
- Name to identify the synchronization profiles to be created. For example, if you specify the name `abc`, then the tool creates two profiles: `abcImport` and `abcExport`.
- (Optional) Appropriate ACLs on the `cn=users` container. You can choose to enable users and groups to be managed by Oracle components under the `cn=users` container. If you customize ACLs in this way, then the original ACLs are saved in `$ORACLE_HOME/ldap/odi/archive/profile_name_prefix_useracl.ldif`.

Running Express Configuration with the Oracle Directory Integration Server Administration Tool

This section describes how to run express configuration with the Oracle Directory Integration Server Administration tool.

To run express configuration with the Oracle Directory Integration Server Administration tool:

1. Launch the Oracle Directory Integration Server Administration tool by entering:

```
$ORACLE_HOME/bin/dipassistant -gui
```

2. In the Oracle Directory Integration Server Administration tool, select **LDAP Connector Express Setup**. The [LDAP Connector Express Setup Window](#) window appears in the right pane.
3. In the LDAP Connector Express Setup tab page, enter the appropriate values.
4. Choose **Apply**.

Configuring Advanced Integration Options

When you install Oracle Directory Integration Platform, sample import and export synchronization profiles are automatically created for each of the supported third-party directories. You can also use the express configuration option of the Directory Integration Assistant (`dipassistant`) to create additional synchronization profiles, as described in ["Running Express Configuration"](#) on page 18-4. The import and export synchronization profiles created during the install process or with express configuration are only intended as a starting point for you to use when deploying your integration of Oracle Internet Directory and a third-party directory. Because the default synchronization profiles are created using predefined assumptions, you must further customize them for your environment, as described in these topics:

- [Configuring the Realm](#)
- [Customizing Access Control Lists](#)
- [Customizing Mapping Rules](#)
- [Configuring the Third-Party Directory Connector for Synchronization in SSL Mode](#)
- [Enabling Password Synchronization from Oracle Internet Directory to a Third-Party Directory](#)
- [Configuring External Authentication Plug-ins](#)

See Also: The individual third-party directory integration chapters for information on the sample synchronization profiles that were created during the installation process

Before customizing the sample synchronization profiles that were created during the installation process, be sure to copy them with the `createprofilelike (cpl)` command of the Directory Integration Assistant, then enable the copies with the `modifyprofile` command of the Directory Integration Assistant.

Configuring the Realm

To configure the realm, do the following:

1. Choose the realm DN structure as described in the section ["Choose the Structure of the Directory Information Tree"](#) on page 17-15, and, more specifically, in the section ["Planning the Deployment"](#) on page 17-6.
2. Select the attribute for the login name of the user. This attribute contains the name of the attribute used for logging in. By default, it is `uid`. For more information, see the section ["Select the Attribute for the Login Name"](#) on page 17-17.
 - If you are integrating with Microsoft Active Directory, and the `userprincipalname` attribute is used for logging in, then you would map `userprincipalname` to the `uid` attribute in Oracle Internet Directory

- If you are integrating with Novell eDirectory or OpenLDAP, and the `mail` attribute is used for logging in, then you would map `mail` to the `uid` attribute in Oracle Internet Directory
- 3. Set up the `usersearchbase` and `groupsearchbase` values in Oracle Internet Directory. These values indicate to the various Oracle components where to look for users and groups in Oracle Internet Directory. They are set to default values during installation. However, you may need to reset these values so that they correspond to the DIT structures in the two directories. Be sure to set them correctly. Otherwise, even if the synchronization seems to function properly, components still may be unable to access users and groups in Oracle Internet Directory.

To illustrate how you might configure the user search base and group search base: In the example in [Figure 17-2](#) on page 17-7, the value of `usersearchbase` should be set to `cn=users,dc=us,dc=MyCompany,dc=com` or one of its parents. Similarly, assuming there is a subtree named `groups` in the DIT, the multivalued `groupsearchbase` attribute should be set to both of the following:

- `cn=groups,dc=us,dc=MyCompany,dc=com` or one of its parents
- `cn=users,dc=us,dc=MyCompany,dc=com`

To configure the user search base and group search base, use the Oracle Internet Directory Self-Service Console.

- 4. Set up the `usercreatebase` and `groupcreatebase` values in Oracle Internet Directory. These values indicate to the various Oracle components where users and groups can be created. They are set to default values during installation.

To illustrate how to configure the user create base and group create base: In the example in [Figure 17-2](#) on page 17-7, the value of `usercreatebase` should be set to `cn=users,dc=us,dc=MyCompany,dc=com` or one of its parents. Similarly, the `groupcreatebase` should be set to `cn=groups,dc=us,dc=MyCompany,dc=com` or one of its parents.

To configure the user create base and group create base, use the Oracle Internet Directory Self-Service Console.

See Also: The section about modifying configuration settings for an identity management realm in *Oracle Identity Management Guide to Delegated Administration*

Customizing Access Control Lists

This section discusses how to customize ACLs for import profiles, export profiles, and for other Oracle components. It contains these topics:

- [Customizing ACLs for Import Profiles](#)
- [Customizing ACLs for Export Profiles](#)
- [ACLs for Other Oracle Components](#)

Customizing ACLs for Import Profiles

The import profile is the identity used by the Oracle directory integration platform to access Oracle Internet Directory. ACLs must enable the import profile to add, modify, and delete objects in either the users and groups containers or the subtree where entries are accessed. By default, import profiles are part of the Realm Administrators group (`cn=RealmAdministrators, cn=groups, cn=OracleContext, realm_`

DN) in the default realm. This group has privileges to perform all operations on any entry under the DN of the default realm.

You should not need to customize the ACLs for import synchronization with the default realm that is installed with Oracle Internet Directory Release 10g (10.1.4.2). If you are upgrading from an earlier version of Oracle Internet Directory, or if the synchronization is with a nondefault Oracle Internet Directory realm, then be sure that the necessary privileges in the proper subtree or containers are granted to the import profiles handling the synchronization.

For an ACL template in LDIF format, see the file `$ORACLE_HOME/ldap/schema/oid/oidRealmAdminACL.sbs`. If you have not changed the ACLs on the default realm, then this template file can be applied directly after instantiating the substitution variables, replacing `%s_SubscriberDN%` with the default realm DN in Oracle Internet Directory and replacing `%s_OracleContextDN%` with `cn=OracleContext,default_realm_DN` respectively. For example, if `realmacl.ldif` is the instantiated file, then you can upload it by using the following `ldapmodify` command:

```
$ORACLE_HOME/bin/ldapmodify -h OID host -p OID port
-D "DN of privileged OID user" -w "password for privileged directory user"
-v -f realmacl.ldif
```

See Also: The chapter about access controls in *Oracle Internet Directory Administrator's Guide*

Customizing ACLs for Export Profiles

To enable the Oracle directory integration platform to access a third-party directory, you must create an identity in third-party directory. This identity is configured in each export profile.

ACLs for Other Oracle Components

Default ACLs enable you to create, modify, and delete users and groups, but only in the users and groups containers under the default realm. To synchronize objects in other containers, you must customize the ACLs.

There are sample ACL files that you can use to customize ACLs for Oracle Components. These sample files are installed in the `$ORACLE_HOME/ldap/schema/oid` directory. They are:

- `oidUserAdminACL.sbs`—Grants necessary rights to the subtree for Oracle components to manage and access users
- `oidGroupAdminACL.sbs`—Grants necessary rights to the subtree for Oracle components to manage and access groups
- `oidUserAndGroupAdminACL.sbs`—Grants the privileges for Oracle components to manage and access users and groups in the subtree.

You can customize your ACL policy to grant privileges on a container-by-container basis with the required rights.

See Also: The chapter about access controls in *Oracle Internet Directory Administrator's Guide* for instructions on customizing ACLs

Customizing Mapping Rules

Mapping rules, an important part of the synchronization profile, determine the directory information to be synchronized and how it is to be transformed when synchronized. You can change mapping rules at run time to meet your requirements.

Each sample synchronization profile includes default mapping rules. These rules contain a minimal set of default user and group attributes configured for out-of-the-box synchronization.

Note: When a synchronization is underway, it relies on the mapping rules configured prior to any changes in the directory. To ensure consistent mapping, you may need to remove an already synchronized entry or perform a full synchronization.

Mapping rules govern the way data is transformed when a source directory and a destination directory are synchronized. Customize the default mapping rules found in the sample profiles when you need to do the following:

- Change distinguished name mappings. The distinguished name mappings establish how the third-party directory DIT maps to the Oracle Internet Directory DIT.
- Change the attributes that need to be synchronized.
- Change the transformations (mapping rules) that occur during the synchronization.

You can perform any mapping if the resulting data in the destination directory conforms to the schema in that directory.

See Also:

- The section "[Configuring Mapping Rules](#)" on page 6-4 for a full discussion of mapping rules
- The section "[Supported Attribute Mapping Rules and Examples](#)" on page 6-9 for examples of how attribute values are transformed when synchronized from one directory to another
- The file `$ORACLE_HOME/ldap/odi/conf/activeimp.map.master` for an example of import mapping rules

Once you have established a working synchronization between Oracle Internet Directory and a third-party directory, you can customize the attribute mapping rules for your synchronization profiles to meet the needs of your deployment. When you use express configuration to create import and export synchronization profiles, mapping files are created for each profile in the `$ORACLE_HOME/ldap/conf` directory. The mapping files are named *profile_name*Import.map and *profile_name*Export.map. For example, if you enter "abc" when express configuration prompts you for the name of your profile, your import mapping files will be named abcImport.map and abcExport.map.

To customize the attribute mapping rules for your synchronization profiles:

1. Make a duplicate of the sample mapping rules file. The sample mapping rules files are stored in the `$ORACLE_HOME/ldap/odi/conf` directory with the extension of map.master for the various profiles.

2. Edit the sample mapping rules file to make the previously discussed modifications. You can find instructions for editing mapping rules in ["Configuring Mapping Rules"](#) on page 6-4.
3. After the changes are made, enter the following command:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -profile profile_name  
-host oid_host -port oid_port -dn DN -passwd password  
odip.profile.mapfile=path_name
```

For example:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -profile my_profile  
-host my_host -port 3060 -dn cn=orcladmin -passwd welcome1  
odip.profile.mapfile=my_profile.map
```

See Also: The `dipassistant` section in the Oracle Directory Integration Platform tools chapter of the *Oracle Identity Management User Reference*

4. Wait until the scheduling interval has elapsed, and then check the synchronized users and groups to ensure that the attribute mapping rules meet your requirements.

Tip: You may find it helpful to add test users and groups to Oracle Internet Directory or the third-party directory when customizing attribute mapping rules.

Configuring the Third-Party Directory Connector for Synchronization in SSL Mode

By default, SSL is not enabled for the import and export synchronization profiles created with express configuration. Whether or not you synchronize in the SSL mode depends on your deployment requirements. For example, synchronizing public data does not require SSL, but synchronizing sensitive information such as passwords does. To synchronize password changes between Oracle Internet Directory and a third-party directory, you must use SSL server authentication mode.

Note: Be sure that you can successfully synchronize users in non-SSL mode before attempting to configure your synchronization profiles for SSL.

Securing the channel requires:

- Enabling SSL between Oracle Internet Directory and the Oracle directory integration platform
- Enabling SSL between the Oracle directory integration platform and the third-party directory

Although you can enable SSL either between Oracle Internet Directory and the Oracle directory integration platform or between that server and the third-party directory, Oracle recommends that you completely secure the channel before you synchronize sensitive information. In certain cases, such as password synchronization, synchronization can occur only over SSL.

Configuring SSL requires the following:

- Running the Oracle directory server in SSL mode as described in the chapter on Secure Sockets Layer (SSL) in *Oracle Internet Directory Administrator's Guide*.
- Running the Oracle directory integration platform in the SSL mode as described in [Chapter 2, "Security Features in Oracle Directory Integration Platform"](#). The SSL mode should be the same as the one in which Oracle Internet Directory server was started. When starting the Oracle directory integration platform, specify the `sslauth` parameter to 1 for no authentication or 2 for server authentication. If you do not include the `sslauth` parameter, the SSL mode defaults to no authentication.
- Running the third-party directory server in SSL mode. Communication with a third-party directory over SSL requires SSL server authentication. This requires that both Oracle Internet Directory and the Oracle directory integration platform be run in SSL server authentication mode.

Perform the following steps to configure communication with a connected directory in SSL mode:

1. In the integration profile, to indicate that the mode of communication is SSL, configure the `connectedDirectoryURL` attribute in the form of `host:port:1`. Make sure the port number is the SSL port. The default SSL port number is 636.
2. Generate a certificate from the connected directory. What is required is the trust point certificate from the server. You do not need to use any external certificate server.
3. Export the certificates to Base 64 encoded format.
4. Import the certificates as trust points in the Oracle Wallet by using Oracle Wallet Manager. When you save the wallet, be sure to enable Auto Login by selecting **Wallet** from the menu bar, and then by selecting the check box next to the **Auto Login** menu item.
5. Specify the wallet location in the `odi.properties` file in `$ORACLE_HOME/ldap/odi/conf`.
6. Modify the third-party directory connection information, including the host name and profile, using the Directory Integration Assistant's `modifyprofile` command, as follows:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -h hostName -p ssl_port
-U ssl_mode -profile profile_name
odip.profile.condirurl=ad_host_name:636:1
```

7. Enter the following command to create the `certWalletPwd` file:

```
dipassistant wpasswd
```

This command reads the `odi.properties` file for the location where the `certWalletPwd` file will be created. Enter the wallet password when prompted.

8. Use the `odisrvreg` utility to register the server. The following command demonstrates how to use the `odisrvreg` utility to register the server in non-SSL mode:

```
odisrvreg -h hostname -p port -D bindDN -w password
```

See Also: *Oracle Identity Management User Reference* information on how to use the `odisrvreg` utility

9. Restart the Oracle directory integration platform in SSL mode by following the instructions ["Starting, Stopping, and Restarting the Oracle Directory Integration Platform"](#) on page 4-8.
10. Add a test user and verify that it synchronizes successfully. If the test user does not synchronize successfully, then troubleshoot your SSL configuration.

Note: The Oracle Directory Integration Platform does not support SSL in client/server authentication mode.

See Also:

- *Oracle Identity Management User Reference* for information on how to run the `dipassistant` command in SSL mode
- ["Managing the SSL Certificates of Oracle Internet Directory and Connected Directories"](#) on page 4-7

Enabling Password Synchronization from Oracle Internet Directory to a Third-Party Directory

To synchronize passwords from Oracle Internet Directory to a third-party directory, you must enable the password policy and reversible password encryption in the Oracle directory server. To do this, assign a value of 1 to the `orclPwPolicyEnable` and `orclPwEncryptionEnable` attributes in the entry `cn=PwPolicyEntry,cn=common,cn=products,cn=oraclecontext,DN_of_realm`. You can do this by using either Oracle Directory Manager or `ldapmodify` by uploading an LDIF file containing the following entries:

```
dn:cn=PwPolicyEntry,cn=common,cn=products,cn=oraclecontext,DN_of_realm.
changetype: modify
replace: orclPwPolicyEnable
orclPwPolicyEnable: 1
-
replace: orclPwEncryptionEnable
orclPwEncryptionEnable: 1
```

See Also: *Oracle Internet Directory Administrator's Guide* for information on how to set the password policy

Configuring External Authentication Plug-ins

Starting in 10g (10.1.4.2), Oracle Directory Integration Platform supports Java-based external authentication plug-ins. Oracle recommends that you use the Java plug-ins instead of the older, PL/SQL-based plug-ins, which only support Microsoft Active Directory and Sun Java System Directory.

The configuration tool for the new plug-ins is a Java program called `oidexcfg`. You use it to configure Java-based external authentication plug-ins for Microsoft Active Directory, Sun Java System Directory, Novell eDirectory, and OpenLDAP. The tool only sets up an external authentication plug-in to work with a single domain. You must perform additional steps to set up an external authentication plug-in to work with multiple domains.

This section contains these topics:

- [Configuring an External Authentication Plug-in](#)
- [Configuring External Authentication Against Multiple Domains](#)

Configuring an External Authentication Plug-in

To configure an external authentication plug-in, you use the `extauth` operation of the Directory Integration Assistant (`dipassistant`) utility. See the `dipassistant` section in the Oracle Directory Integration Platform tools chapter of *Oracle Identity Management User Reference* for information on how to use the `extauth` operation.

Configuring External Authentication Against Multiple Domains

If you want to set up an external authentication plug-in to work with multiple external authentication domains, you must perform some manual instructions after you run the external configuration tool. Proceed as follows:

1. Configure the external authentication plug-in as described in ["Configuring an External Authentication Plug-in"](#).
2. Search for the plug-in configuration entries created by the configuration tool in step 1, and redirect the search output to a file. Use an `ldapsearch` command similar to this:

```
ldapsearch -p 3060 -D cn=orcladmin -w password -s sub -L \
  -b "cn=plugin,cn=subconfigsubentry" cn="oidexplg_*_ad" >> output.ldif
```

The example shows an Microsoft Active Directory `cn`. Use the correct plug-in `cn` for the type of plug-in you configured, as shown in [Table 18-2](#). You can use `*` as a wildcard, as shown in the example.

Table 18-2 Distinguished Names of External Authentication Plug-ins

Plug-in Type	DN
Microsoft Active Directory	cn=oidexplg_compare_ad, cn=plugin,cn=subconfigsubentry cn=oidexplg_bind_ad, cn=plugin,cn=subconfigsubentry
Sun Java System Directory	cn=oidexplg_compare_iplanet, cn=plugin,cn=subconfigsubentry cn=oidexplg_bind_iplanet, cn=plugin,cn=subconfigsubentry
Novell eDirectory	cn=oidexplg_compare_Novell eDirectory, cn=plugin,cn=subconfigsubentry cn=oidexplg_bind_Novell eDirectory, cn=plugin,cn=subconfigsubentry
OpenLDAP	cn=oidexplg_compare_openldap, cn=plugin,cn=subconfigsubentry cn=oidexplg_bind_openldap, cn=plugin,cn=subconfigsubentry

3. Examine the output file. For an Microsoft Active Directory plug-in, the output file resembles the following:

```
dn: cn=oidexplg_compare_ad,cn=plugin,cn=subconfigsubentry
cn: oidexplg_compare_ad
objectclass: orclPluginConfig
objectclass: top
orclpluginname: oidexplg.jar
orclplugintype: operational
```

```
orclpluginkind: Java
orclplugintiming: when
orclpluginldapoperation: ldapcompare
orclpluginsecuredflexfield;walletpwd: welcome1
orclpluginsecuredflexfield;walletpwd2: welcome
orclpluginversion: 1.0.1
orclpluginisreplace: 1
orclpluginattributelist: userpassword
orclpluginentryproperties:
(!(&(objectclass=orcladobject)(objectclass=orcluserv2)))
orclpluginflexfield;host2: host.domain.com
orclpluginflexfield;port2: 636
orclpluginflexfield;isssl2: 1
orclpluginflexfield;host: host.domain.com
orclpluginflexfield;walletloc2: /location/wallet
orclpluginflexfield;port: 389
orclpluginflexfield;walletloc: /tmp
orclpluginflexfield;isssl: 0
orclpluginflexfield;isfailover: 0
orclpluginclassreloadenabled: 0
orclpluginenable: 0
orclpluginsubscriberdnlist: cn=users,dc=us,dc=oracle,dc=com

dn: cn=oidexplg_bind_ad,cn=plugin,cn=subconfigsubentry
cn: oidexplg_bind_ad
objectclass: orclPluginConfig
objectclass: top
orclpluginname: oidexplg.jar
orclplugintype: operational
orclpluginkind: Java
orclplugintiming: when
orclpluginldapoperation: ldapbind
orclpluginversion: 1.0.1
orclpluginisreplace: 1
orclpluginentryproperties:
(!(&(objectclass=orcladobject)(objectclass=orcluserv2)))
orclpluginclassreloadenabled: 0
orclpluginflexfield;walletloc2: /location/wallet
orclpluginflexfield;port: 389
orclpluginflexfield;walletloc: /tmp
orclpluginflexfield;isssl: 0
orclpluginflexfield;isfailover: 0
orclpluginflexfield;host2: host.domain.com
orclpluginflexfield;port2: 636
orclpluginflexfield;isssl2: 1
orclpluginflexfield;host: host.domain.com
orclpluginenable: 0
orclpluginsecuredflexfield;walletpwd: welcome1
orclpluginsecuredflexfield;walletpwd2: welcome
orclpluginsubscriberdnlist:
cn=users,dc=us,dc=oracle,dc=com
```

4. Create a new LDIF file from the output file as follows:
 - a. Change the entry names. In the example shown in the previous step, you would change `cn=oidexplg_compare_ad,cn=plugin,cn=subconfigsubentry` to `cn=oidexplg_compare_ad1,cn=plugin,cn=subconfigsubentry` and `cn=oidexplg_bind_ad,cn=plugin,cn=subconfigsubentry` to `cn=oidexplg_bind_ad1,cn=plugin,cn=subconfigsubentry`.

- b. Change the value for `orclpluginenable`. Use value 1 if you want to enable it, and use value 0 if you want to disable it.
 - c. Change the values for `orclpluginflexfield;host` and `orclpluginflexfield;port` for the external directory host name and port number.
 - d. Change the value for `orclpluginflexfield;isssl`. Use value 1 if you want to enable the SSL connection against the external directory, and use value 0 if you want to disable. If you use value 1, you will also need to change the value of `orclpluginflexfield;walletloc` and `orclpluginsecuredflexfield;walletpwd` for the wallet location and password.
 - e. Change `orclpluginflexfield;isfailover`. Use value 1 if to set up the failover against a backup external directory. If you use value 1, then you must also change the value of `orclpluginflexfield;host2`, `orclpluginflexfield;port2` for the host name and port number. To use an SSL connection against the backup directory server, you must to change the value for `orclpluginflexfield;walletloc2` and `orclpluginsecuredflexfield;walletpwd2`.
 - f. Modify `orclpluginsubscriberdnlist` for the plug-in invocation naming context.
 - g. Modify `orclPluginRequestGroup` for the plug-in request group. If this attribute is missing in the search out put, then just add the attribute and value in the LDIF file.
5. Add the modified plug-in configuration entries to the Oracle Internet Directory server. Use a command similar to the following:

```
$ORACLE_HOME/ldap/bin/ldapadd -h host -p port -D cn=orcladmin \
-w password -v -f input.ldif
```

Integrating with Microsoft Active Directory

This chapter outlines the procedures for integrating Oracle Identity Management with Microsoft Active Directory in a production environment. It contains these topics:

- [Verifying Synchronization Requirements for Microsoft Active Directory](#)
- [Configuring Basic Synchronization with Microsoft Active Directory](#)
- [Configuring Advanced Integration with Microsoft Active Directory](#)
- [Using DirSync Change Tracking for Import Operations](#)
- [Configuring Windows Native Authentication](#)
- [Configuring Synchronization of Oracle Internet Directory Foreign Security Principal References with Microsoft Active Directory](#)
- [Switching to a Different Microsoft Active Directory Domain Controller in the Same Domain](#)
- [Configuring the Microsoft Active Directory Connector for Microsoft Exchange Server](#)

Note: This chapter assumes familiarity with the chapter on Oracle Internet Directory concepts and architecture in *Oracle Internet Directory Administrator's Guide*. It also assumes familiarity with the earlier chapters in this book, especially:

- [Chapter 1, "Introduction to Oracle Identity Management Integration"](#)
- [Chapter 4, "Managing the Oracle Directory Integration Platform"](#)
- [Chapter 5, "Oracle Directory Synchronization Service"](#)
- [Chapter 17, "Third-Party Directory Integration Concepts and Considerations"](#)

If you are configuring a demonstration of integration with Microsoft Active Directory, then see the Oracle By Example series for Oracle Identity Management Release 10g (10.1.4.2), available on Oracle Technology Network at <http://www.oracle.com/technology/>

Verifying Synchronization Requirements for Microsoft Active Directory

Before configuring basic or advanced synchronization with Microsoft Active Directory, ensure that your environment meets the necessary synchronization requirements by following the instructions in "[Verifying Synchronization Requirements](#)" on page 18-1.

Configuring Basic Synchronization with Microsoft Active Directory

You use the express configuration command to quickly establish synchronization between Oracle Internet Directory and Microsoft Active Directory. Express configuration uses default settings to automatically perform all required configurations, and also creates two synchronization profiles, one for import and one for export. To use express configuration to synchronize with Microsoft Active Directory, follow the instructions in ["Creating Synchronization Profiles with Express Configuration"](#) on page 18-2.

Note: In addition to the general assumptions listed in ["Creating Synchronization Profiles with Express Configuration"](#) on page 18-2, the express configuration option assumes the following for integrations with Microsoft Active Directory:

- Only creation and modification of organizational units, users, and groups are synchronized
 - Entries for users and groups in the third-party directory are located in the container `cn=users,default_naming_context`
-

Configuring Advanced Integration with Microsoft Active Directory

When you install Oracle Directory Integration Platform, sample import and export synchronization profiles are automatically created for each of the supported third-party directories. The sample synchronization profiles created for Microsoft Active Directory are:

- `ActiveImport`—The profile for importing changes from Microsoft Active Directory to Oracle Internet Directory by using the DirSync approach
- `ActiveChgImp`—The profile for importing changes from Microsoft Active Directory to Oracle Internet Directory by using the USN-Changed approach
- `ActiveExport`—The profile for exporting changes from Oracle Internet Directory to Microsoft Active Directory

Notes:

- Whether you use `ActiveImport` or `ActiveChgImp` depends on the method you chose for tracking changes, either DirSync or USN-Changed.
- If you establish integration between Active Directory and Oracle Internet Directory for both exporting and importing users, then you must customize the `ActiveExport` search filter to prevent Oracle Directory Integration Platform from exporting or importing users twice. The following is an example of a customized `ActiveExport` search filter that may be used when both export and import operations are enabled for the same Active Directory instance:

```
odip.profile.condirfilter ="searchfilter=(|(objectclass=group)(objectclass= organizationalunit)(&(objectclass=user)(!(objectclass=computer))))"
```

See Also: ["Step 3: Customizing the Search Filter to Retrieve Information from Microsoft Active Directory"](#) on page 19-3 for information on customizing the search filter

You can also use the express configuration option of the Directory Integration Assistant (`dipassistant`) to create additional synchronization profiles, as described in ["Configuring Basic Synchronization with Microsoft Active Directory"](#) on page 19-2. The import and export synchronization profiles created during the install process or with express configuration are only intended as a starting point for you to use when deploying your integration of Oracle Internet Directory and Microsoft Active Directory. Because the default synchronization profiles are created using predefined assumptions, you must further customize them for your environment by performing the following steps in the order listed:

- [Step 1: Planning Your Integration](#)
- [Step 2: Configuring the Realm](#)
- [Step 3: Customizing the Search Filter to Retrieve Information from Microsoft Active Directory](#)
- [Step 4: Customizing the ACLs](#)
- [Step 5: Customizing Attribute Mappings](#)
- [Step 6: Synchronizing with Multiple Microsoft Active Directory Domains](#)
- [Step 7: Synchronizing Deletions from Microsoft Active Directory](#)
- [Step 8: Synchronizing in SSL Mode](#)
- [Step 9: Synchronizing Passwords](#)
- [Step 10: Configuring the Microsoft Active Directory External Authentication Plug-in](#)
- [Step 11: Performing Post-Configuration and Administrative Tasks](#)

Step 1: Planning Your Integration

Plan your integration by reading [Chapter 17, "Third-Party Directory Integration Concepts and Considerations"](#), particularly ["Microsoft Active Directory Integration Concepts"](#) on page 17-18. Be sure to create a new profile by copying the existing Active Directory template profile by following the instructions in ["Creating a Profile"](#) on page 7-1.

Step 2: Configuring the Realm

Configure the realm by following the instructions in ["Configuring the Realm"](#) on page 18-6.

Step 3: Customizing the Search Filter to Retrieve Information from Microsoft Active Directory

By default, Microsoft Active Directory Connector retrieves changes to all objects in the container configured for synchronization. If you are interested in retrieving only a certain type of change, for example only changes to users and groups, then you should configure an LDAP search filter. This filter screens out changes that are not required when Microsoft Active Directory Connector queries Microsoft Active Directory. The filter is stored in the `searchfilter` attribute in the synchronization profile.

In the sample profiles `activeChgImp` and `activeImport`, only groups and users are retrieved from Microsoft Active Directory. Computers are not retrieved. The value of the `searchfilter` attribute is set as:

```
searchfilter=(|(objectclass=group) (&(objectclass=user) (!(objectclass=computer))))).
```

You can use either Oracle Directory Integration Server Administration tool or Directory Integration Assistant (`dipassistant`) to update the `searchfilter` attribute.

To customize the search filter by using the Directory Integration Assistant:

1. Enter the following command to customize the Connected Directory Matching Filter (`orclODIPConDirMatchingFilter`) attribute:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -D bindDn -profile  
profName odip.profile.condirfilter=searchfilter=(|(objectclass=group)  
(objectclass=organizationalunit) (&(objectclass=user) (!(objectclass=computer))))
```

2. Enter the following command to customize the OID Matching Filter (`orclODIPOIDMatchingFilter`) attribute:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -D bindDn  
-profile profName odip.profile.oidfilter=orclObjectGUID
```

To customize the search filter by using the Oracle Directory Integration Server Administration tool:

1. Launch the Oracle Directory Integration Server Administration tool by entering:

```
$ORACLE_HOME/bin/dipassistant -gui
```
2. In the navigator pane, expand *directory_integration_server*, then expand **Integration Profile Configuration**.
3. Select the configuration set, and, in the right pane, select the profile you want to customize. The Integration Profile window appears.
4. In the Integration Profile window, select the **Mapping** tab. The fields in this tab page are described in ["Mapping Tab"](#) on page A-12.
5. In the Mapping tab page, in the Connected Directory Matching Filter (`orclODIPConDirMatchingFilter`) and the OID Matching Filter (`orclODIPOIDMatchingFilter`) fields, enter the appropriate values for the `searchfilter` attribute. Instructions for specifying the `searchfilter` attribute are provided in the section ["Filtering Changes with an LDAP Search"](#) on page 6-14.
6. Choose **OK**.

Note: All attributes specified in the `searchfilter` attribute should be configured as indexed attributes in Microsoft Active Directory.

See Also: The appendix about the LDAP filter definition in *Oracle Internet Directory Administrator's Guide* for instructions on configuring an LDAP search filter

Step 4: Customizing the ACLs

Customize ACLs as described in ["Customizing Access Control Lists"](#) on page 18-7.

Step 5: Customizing Attribute Mappings

When integrating with Microsoft Active Directory, the following attribute-level mapping is mandatory for all objects:

```
ObjectGUID: : : orclObjectGUID:
ObjectSID: : : orclObjectSID:
```

Example 19–1 Attribute-Level Mapping for the User Object in Microsoft Active Directory

```
SAMAccountName:1: :user:orclADSAMAccountName: :orclADUser
userPrincipalName: : :user:orclADUserPrincipalName::orclADUser:userPrincipalName
```

Example 19–2 Attribute-Level Mapping for the Group Object in Microsoft Active Directory

```
SAMAccountName:1: :group:orclADSAMAccountName: :orclADGroup
```

In the preceding examples, SAMAccountName and userPrincipalName from Microsoft Active Directory are mapped to orclADSAMAccountName and orclADUserPrincipalName in Oracle Internet Directory.

Customize the attribute mappings by following the instructions in "[Customizing Mapping Rules](#)" on page 18-9.

Step 6: Synchronizing with Multiple Microsoft Active Directory Domains

When synchronizing with multiple Microsoft Active Directory domains, you need separate import and export synchronization profiles for each domain in most cases. However, the profiles for each domain should be very similar. The only exception involves using Global Catalog with import synchronization profiles. In this case, you only need to create a single import synchronization profile for the entire Microsoft Active Directory forest. For more information, see "[Configuration Required for Importing from Microsoft Active Directory to Oracle Internet Directory](#)" on page 17-25.

Note: Be sure to perform attribute and DN mapping before attempting to synchronize with multiple domains.

The best approach to creating separate import and export synchronization profiles for multiple domains is as follows:

1. Customize the import and export synchronization profiles for a single domain, using the procedures described earlier in this section.
2. Once you have finished customizing the import and export synchronization profiles for the first domain, use the Directory Integration Assistant's createprofilelike command to duplicate profiles, as follows.

```
$ORACLE_HOME/bin/dipassistant createprofilelike [-h hostName] [-p port]
[-D bindDn] -profile origProfName -newprofile newProfName
```

3. Use the Directory Integration Assistant's modifyprofile command to customize the profiles for each additional Microsoft Active Directory domain, as follows:

```
$ORACLE_HOME/bin/dipassistant modifyprofile [-h hostName] [-p port]
[-D bindDn] {-f fileName | -profile profName [-updcn] }
[propName1=value] [propName2=value]...
```

4. If necessary, update the connection details for each domain by following the instructions listed in "[Configuring Connection Details](#)" on page 6-2.
5. Update the last change number in the import and export synchronization profiles for each domain by running the following command:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -profile profile_name -updlcn
```

6. Repeat Steps 2 through 5 for each Microsoft Active Directory domain with which you need to synchronize.

Step 7: Synchronizing Deletions from Microsoft Active Directory

To synchronize deletions in Microsoft Active Directory with Oracle Internet Directory, you must grant the necessary privilege to the Microsoft Active Directory user account that the Oracle directory integration server uses to perform synchronizations with Microsoft Active Directory. Microsoft Active Directory deletions can be synchronized with Oracle Internet Directory by querying for them in Microsoft Active Directory. The way to do this depends on whether you are using the DirSync approach or the USN-Changed approach.

For the DirSync approach, the Microsoft Active Directory user account that the Oracle directory integration platform uses to access Microsoft Active Directory must have Domain Administrative permissions, belong to the Domain Administrators group, or be explicitly granted Replicating Directory Changes permissions.

See Also: Article ID 303972 at <http://support.microsoft.com> for information on how to grant Replicating Directory Changes permissions

For the USN-Changed approach, the Microsoft Active Directory user account that the Oracle directory integration platform uses to access Microsoft Active Directory must have "List Content" and "Read Properties" permission to the cn=Deleted Objects container of a given domain. In order to set these permissions, you must use the dscls.exe command that is available with recent versions of Microsoft Active Directory Application Mode (ADAM). You can download the most recent version of ADAM at <http://www.microsoft.com/downloads/>.

Regardless of whether you are using the DirSync approach or the USN-Changed approach to synchronize deletions in Microsoft Active Directory with Oracle Internet Directory, if you create a matching filter for the `ActiveImport` profile (for the DirSync approach) or the `ActiveChgImp` profile (for the USN-Changed profile) be sure to include only the following key Microsoft Active Directory attributes:

- ObjectGUID
- ObjectSID
- ObjectDistName
- USNChanged

In you specify any attributes in a matching filter other than the preceding key attributes, deletions in Microsoft Active Directory are not propagated to Oracle Internet Directory.

See Also:

- Article ID 230113 at <http://support.microsoft.com> for more information on deleting items from Microsoft Active Directory
- The attribute reference chapter in *Oracle Identity Management User Reference* for a listing of the standard LDAP attributes that Oracle Internet Directory supports

Step 8: Synchronizing in SSL Mode

Configure the Microsoft Active Directory connector for synchronization in SSL mode by following the instructions in "[Configuring the Third-Party Directory Connector for Synchronization in SSL Mode](#)" on page 18-10.

Step 9: Synchronizing Passwords

To synchronize password changes from Oracle Internet Directory to Microsoft Active Directory:

1. Configure Oracle Internet Directory, Oracle directory integration platform, and Microsoft Active Directory to run in SSL server authentication mode, as described in "[Configuring the Third-Party Directory Connector for Synchronization in SSL Mode](#)" on page 18-10.
2. Enable password synchronization from Oracle Internet Directory to Microsoft Active Directory by following the instructions in "[Enabling Password Synchronization from Oracle Internet Directory to a Third-Party Directory](#)" on page 18-12.
3. Configure the Microsoft Active Directory connector to synchronize passwords by installing and configuring the Oracle Password Filter for Microsoft Active Directory, as described in [Chapter 20, "Deploying the Oracle Password Filter for Microsoft Active Directory"](#).

Step 10: Configuring the Microsoft Active Directory External Authentication Plug-in

Configure the Microsoft Active Directory external authentication plug-in by following the instructions in "[Configuring External Authentication Plug-ins](#)" on page 18-12.

Step 11: Performing Post-Configuration and Administrative Tasks

Read [Chapter 23, "Managing Integration with a Third-Party Directory"](#) for information on post-configuration and ongoing administration tasks.

Using DirSync Change Tracking for Import Operations

By default, the import synchronization profile created with express configuration uses the USN-Changed approach for tracking changes. If you want to use the DirSync change tracking approach, be sure to perform the steps in this section before beginning synchronization.

Note: You may want to back up your current import synchronization profile before performing the following procedures. You can create a backup copy of a profile by using the Directory Integration Assistant's `createprofilelike` command. For more information, see the `dipassistant` section in the Oracle Directory Integration Platform tools chapter of the *Oracle Identity Management User Reference*.

To modify the import synchronization profile so it uses the DirSync change tracking approach:

1. You can use the `activeimp.cfg.master` file, located in your `$ORACLE_HOME/ldap/odi/conf` directory, to change the import synchronization profile from the USN-Changed approach to DirSync. Use the following command to update the profile:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -profile profile_name  
odip.profile.configfile=$ORACLE_HOME/ldap/odi/conf/activeimp.cfg.master
```

2. Update the last change number by running the following command:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -profile profile_name -updlcn
```

Configuring Windows Native Authentication

This section describes the system requirements and tasks for configuring Windows Native Authentication. It contains these topics:

- [What are the System Requirements for Windows Native Authentication?](#)
- [Configuring Windows Native Authentication with a Single Microsoft Active Directory Domain](#)
- [Configuring Windows Native Authentication with Multiple Microsoft Active Directory Domains or Forests](#)
- [Implementing Fallback Authentication](#)
- [Understanding the Possible Login Scenarios](#)

See Also: ["Configuring Windows Native Authentication"](#) on page 19-8

What are the System Requirements for Windows Native Authentication?

Windows Native Authentication is intended for intranet Web applications. Your intranet deployment must include the following:

- Windows 2000 server with Microsoft Active Directory
- Kerberos service account established for OracleAS Single Sign-On server
- Oracle Application Server 10g (10.1.4.2) infrastructure installed

Note: Although the sample configurations in this section are for UNIX/Linux, Oracle Application Server can also be installed on Microsoft Windows.

- OracleAS Single Sign-On middle tier configured to use a Kerberos realm
- Synchronization of Microsoft Active Directory with Oracle Internet Directory
- Oracle Internet Directory configured to use the Windows external authentication plug-in

Configuring Windows Native Authentication with a Single Microsoft Active Directory Domain

To set up Windows Native Authentication, configure Oracle Internet Directory, the OracleAS Single Sign-On server, and the user's browser by performing the following tasks in the order listed.

Task 1: Configure the OracleAS Single Sign-On Server

To configure the single sign-on server, complete the tasks described in these topics:

- [Set Up a Kerberos Service Account for the OracleAS Single Sign-On Server](#)
- [Run the OracleAS Single Sign-On Configuration Assistant on each Oracle Application Server Single Sign-On Host](#)

Set Up a Kerberos Service Account for the OracleAS Single Sign-On Server Create a service account for the OracleAS Single Sign-On server in Microsoft Active Directory, then create a keytab file for the server, and map the service principal (the server) to the account name. The keytab file stores the server's secret key. This file enables the server to authenticate to the KDC. The service principal is the entity, in this case, the single sign-on server, to which the KDC grants session tickets.

1. Synchronize system clocks. The OracleAS Single Sign-On middle tier and the Windows 2000 server must match. If you omit this step, then authentication fails because there is a difference in the system time. Be sure the time, the date, and the time zones are synchronized.
2. Check the port number of the Kerberos server on the Microsoft Active Directory host. The port where the Kerberos server listens is selected from `/etc/services` by default. On Windows systems, the services file is found at `system_drive:\WINNT\system32\drivers\etc`. The service name is Kerberos. Typically the port is set to `88/udp` and `88/tcp` on the Windows 2000 server. When added correctly to the services file, the entries for these port numbers are:

```
kerberos5      88/udp      kdc           # Kerberos key server
kerberos5      88/tcp      kdc           # Kerberos key server
```

3. In the hosts file, located in the same directory as the services file, check the entry for the single sign-on middle tier. The fully qualified host name, which refers to the physical host name of the Oracle Application Server Single Sign-On server, must appear after the IP address and before the short name. The following is an example of a correct entry:

```
130.111.111.111 sso.MyCompany.com sso loghost
```

4. Perform the following tasks to create a user account and keytab file in Microsoft Active Directory that will be used by the logical Oracle Application Server Single Sign-On host:
 - a. Log in to the Microsoft Active Directory Management tool on the Windows 2000 server, then choose **Users**, then **New**, then **user**.

Enter the name of the OracleAS Single Sign-On host, omitting the domain name. For example, if the host name is `sso.MyCompany.com`, then enter `sso`. This is the account name in Microsoft Active Directory.

Note the password that you assigned to the account. You will need it later. Do *not* select **User must change password at next logon**.

- b. Create a keytab file for the OracleAS Single Sign-On server, and map the account name to the service principal name. You perform both tasks by running the following command on the Windows 2000 server:

```
C:> Ktpass -princ HTTP/sso.MyCompany.com@MyCompany.com -pass password  
-mapuser sso -out sso.keytab
```

The `-princ` argument is the service principal. Specify the value for this argument by using the format `HTTP/single_sign-on_host_name@KERBEROS_REALM_NAME`. Note that HTTP and the Kerberos realm must be uppercase.

Note that `single_sign-on_host_name` can be either the OracleAS Single Sign-On host itself or the name of a load balancer where multiple OracleAS Single Sign-On middle tiers are deployed. `MyCompany.com` is a fictitious Kerberos realm in Microsoft Active Directory. The user container is located within this realm. The `-pass` argument is the account password. The `-mapuser` argument is the account name of the OracleAS Single Sign-On middle tier. The `-out` argument is the output file that stores the service key.

Be sure to replace the example values given with values suitable for your installation. These values appear in boldface in the example.

Note:

- If the Ktpass is not found on your computer, then download the Windows Resource Kit from Microsoft to obtain the utility.
 - The default encryption type for Microsoft Kerberos tickets is RC4-HMAC. Microsoft also supports DES-CBC and DES-CBC-MD5, two DES variants used in MIT-compliant implementations. Ktpass converts the key type of the KDC account from RC4_HMAC to DES.
-
-

5. For each Oracle Application Server Single Sign-On host, copy or FTP the keytab file, `sso.keytab` to the OracleAS Single Sign-On middle tier, placing it in `$ORACLE_HOME/j2ee/OC4J_SECURITY/config`. If you use FTP, be sure to transfer the file in binary mode.

Be sure to give the Web server a unique identifier (UID) on the OracleAS Single Sign-On middle tier and to grant read permission for the file.

Run the OracleAS Single Sign-On Configuration Assistant on each Oracle Application Server Single Sign-On Host Running the `ossoca.jar` tool at this point does the following:

- Configures the Oracle Application Server Single Sign-On server to use the Sun JAAS login module
- Configures the server as a secured application

To run the `ossoca.jar` tool on the OracleAS Single Sign-On middle tier:

1. Back up the following configuration files:
 - `$ORACLE_HOME/sso/conf/policy.properties`
 - `$ORACLE_HOME/j2ee/OC4J_SECURITY/config/jazn.xml`
 - `$ORACLE_HOME/opmn/conf/opmn.xml`
 - `$ORACLE_HOME/j2ee/OC4J_SECURITY/config/jazn-data.xml`
 - `$ORACLE_HOME/j2ee/OC4J_SECURITY/applications/sso/web/WEB-INF/web.xml`
 - `$ORACLE_HOME/j2ee/OC4J_SECURITY/application-deployments/sso/orion-application.xml`

2. Run the ossoca.jar tool:

- UNIX/Linux:

```
$ORACLE_HOME/sso/bin/ssoca
wna -mode sso
-oh $ORACLE_HOME
-ad_realm AD_REALM
-kdc_host_port kerberos_server_host:port
-verbose
```

- Windows:

```
%ORACLE_HOME%\jdk\bin\java -jar %ORACLE_HOME%\sso\lib\ossoca.jar
wna -mode sso
-oh %ORACLE_HOME%
-ad_realm AD_REALM
-kdc_host_port kerberos_server_host:port
-verbose
```

`AD_REALM` is the Kerberos realm in Microsoft Active Directory. This is the user container. Note from the syntax that this value must be entered in uppercase. The default port number for the KDC is usually 88. To confirm this, see step 2 in the section ["Set Up a Kerberos Service Account for the OracleAS Single Sign-On Server"](#) on page 19-9.

3. Step 2 shuts down the OracleAS Single Sign-On server. Restart it:

```
$ORACLE_HOME/opmn/bin/opmnctl startall
```

Task 2: Configure Internet Explorer for Windows Native Authentication

Configure Internet Explorer to use Windows Native Authentication. How you do this depends on which version you have.

- [Internet Explorer 5.0 and Later](#)
- [Internet Explorer 6.0 Only](#)

Internet Explorer 5.0 and Later

To configure Internet Explorer 5.0 and later, perform the following steps:

1. From the menu bar, select **Tools**, then, from the **Tools** menu, select **Internet Options**.
2. In the Internet Options dialog box, select the **Security** tab.
3. On the Security tab page, select **Local Intranet**, then select **Sites**.

4. In the Local intranet dialog box, select **Include all sites that bypass the proxy server**; then click **Advanced**.
5. In the advanced version of the Local intranet dialog box, enter the URL of the OracleAS Single Sign-On middle tier. For example:
`http://sso.mydomain.com`
6. Click **OK** to exit the Local intranet dialog boxes.
7. In the Internet Options dialog box, select the **Security** tab; then choose **Local intranet**; then choose **Custom Level**.
8. In the Security Settings dialog box, scroll down to the User Authentication section and then select **Automatic logon only in Intranet zone**.
9. Click **OK** to exit the Security Settings dialog box.
10. From the menu bar, select **Tools**, then, from the **Tools** menu, select **Internet Options**.
11. In the Internet Options dialog box, select the **Connections** tab.
12. On the **Connections** tab page, choose **LAN Settings**.
13. Confirm that the correct address and port number for the proxy server are entered, then choose **Advanced**.
14. In the Proxy Settings dialog box, in the **Exceptions** section, enter the domain name for the OracleAS Single Sign-On server (`MyCompany.com` in the example).
15. Click **OK** to exit the Proxy Settings dialog box.

Internet Explorer 6.0 Only

If you are using Internet Explorer 6.0, perform steps 1 through 12 in "[Internet Explorer 5.0 and Later](#)"; then perform the following steps:

1. From the menu bar, select **Tools**, then, from the **Tools** menu, select **Internet Options**.
2. In the Internet Options dialog box, select the **Advanced** tab.
3. On the **Advanced** tab page, scroll down to the Security section.
4. Select **Enable Integrated Windows Authentication (requires restart)**.

Task 3: Reconfigure Local Accounts

After configuring Windows Native Authentication, you must reconfigure accounts for the Oracle Internet Directory administrator (`orcladmin`) and other local Windows users whose accounts are in Oracle Internet Directory. If you omit this task, then these users will not be able to log in.

Use the Oracle Directory Manager for Oracle Internet Directory to perform these steps:

1. Add the `orclADUser` class to the local user entry in Oracle Internet Directory.
2. Add the login ID of the local user to the `orclSAMAccountName` attribute in the user's entry. For example, the login ID of the `orcladmin` account is `orcladmin`.
3. Add the local user to the `exceptionEntry` property of the external authentication plug-in.

Configuring Windows Native Authentication with Multiple Microsoft Active Directory Domains or Forests

This section describes how to configure Windows Native Authentication with multiple Microsoft Active Directory domains or forests in the following types of deployments:

- Parent-child Microsoft Active Directory domains
- Microsoft Active Directory domains in the same forest with an established tree-root trust type
- Domains in different forests with an established forest trust type

Note: Forest trust types are only supported in Windows Server 2003 and later versions of Windows operating systems.

To configure Windows Native Authentication with multiple Microsoft Active Directory domains or forests, perform the following tasks in the order listed:

Task 1: Verify that Trust is Established Between the Microsoft Active Directory Domains

Refer to your Microsoft Active Directory documentation for information on how to verify trust between multiple Microsoft Active Directory domains.

Task 2: Enabling Windows Native Authentication with Oracle Application Server Single Sign-On through a Load Balancer or Reverse Proxy

Configure the Oracle Application Server Single Sign-On server to run behind a load balance or through reverse proxy by following the instructions in the advanced deployment options chapter of *Oracle Application Server Single Sign-On Administrator's Guide*.

Task 3: Configure the OracleAS Single Sign-On Server

Configure each Oracle Application Server Single Sign-On server by following the instructions in "[Task 1: Configure the OracleAS Single Sign-On Server](#)" on page 19-9. Be sure to use the same Microsoft Active Directory realm and corresponding key distribution center (KDC) when configuring each physical Oracle Application Server Single Sign-On server instance. Also, be sure to use the load balance or reverse proxy name as the logical Oracle Application Server Single Sign-On host name.

Note: With multiple Microsoft Active Directory forests, the Oracle Application Server Single Sign-On server's logical host name must belong to one of the Microsoft Active Directory domains. For example, assume you have two Microsoft Active Directory forests and each forest contains a single domain. The domain in the first forest is named `engineering.mycompany.com` and the domain in the second forest is named `finance.mycompany.com`. The Oracle Application Server Single Sign-On server's logical host name must reside in either the `engineering.mycompany.com` or the `finance.mycompany.com` domain.

Task 4: Configure Internet Explorer for Windows Native Authentication

Configure the Oracle Application Server Single Sign-On server by following the instructions in ["Task 2: Configure Internet Explorer for Windows Native Authentication"](#) on page 19-11.

Implementing Fallback Authentication

The only browsers that support SPNEGO-Kerberos authentication are Internet Explorer 5.0 or later. OracleAS Single Sign-On provides fallback authentication support for unsupported browsers such as Netscape Communicator. Depending upon the type of browser and how it is configured, the user is presented with the OracleAS Single Sign-On login form or the HTTP basic authentication dialog box. In either case, the user must provide a user name and password. The user name consists of the Kerberos realm name and the user ID. The default way to enter the user name is shown in the following example.

`domain_name\user_id`

The following example, based on the example provided in ["Set Up a Kerberos Service Account for the OracleAS Single Sign-On Server"](#) on page 19-9, illustrates how to enter the user name.

`MyCompany.COM\jdoe`

Note that the user name and password are case sensitive. Additionally, password policies for Microsoft Active Directory do not apply. You can configure a different synchronization profile by using the Oracle directory integration platform. If you do, the login format just provided does not apply.

Fallback authentication is performed against Microsoft Active Directory, using an external authentication plug-in for Oracle Internet Directory.

Note:

- HTTP basic authentication does not support logout. To clear credentials from the browser cache, users must close all open browser windows. Alternatively, they can log out of the Windows computer.
 - In cases where basic authentication is invoked, users must set their language preference manually in Internet Explorer. Select **Internet Options** from the Tools menu, select **Languages**, and then enter the desired language.
-

Understanding the Possible Login Scenarios

Users may encounter a number of different login behaviors within Internet Explorer depending upon which version they are using. [Table 19-1](#) on page 19-15 shows under what circumstances automatic sign-on and fallback authentication are invoked.

Table 19–1 Single Sign-On Login Options in Internet Explorer

Browser Version	Desktop Platform	Desktop Authentication Type	Integrated Authentication in Internet Explorer Browser	OracleAS Single Sign-On Login Type
5.0.1 or later	Windows 2000/XP	Kerberos V5	On	Automatic sign-on
5.0.1 or later but earlier than 6.0	Windows 2000/XP	Kerberos V5	Off	Single sign-on
6.0 or later	Windows 2000/XP	Kerberos V5 or NTLM	Off	HTTP basic authentication
5.0.1 or later but earlier than 6.0	Windows NT/2000/XP	NTLM	On or off	Single sign-on
6.0 or later	NT/2000/XP	NTLM	On	Single sign-on
5.0.1 or later	Windows 95, ME, Windows NT 4.0	Not applicable	Not applicable	Single sign-on
Earlier than 5.0.1	N/A	Not applicable	Not applicable	Single sign-on
All other browsers	All other platforms	Not applicable	Not applicable	Single sign-on

Configuring Synchronization of Oracle Internet Directory Foreign Security Principal References with Microsoft Active Directory

This section explains how to synchronize Oracle Internet Directory foreign security principal references with Microsoft Active Directory.

Although Microsoft Active Directory stores information for group members in a trusted domain as foreign security principal references, Oracle Internet Directory stores the DNs of these members as they appear in Oracle Internet Directory. This results in a mismatch between an entry and its value as a member of a group. The relationship between a user and a group cannot be directly established in Oracle Internet Directory.

To establish the relationship between users and groups, the member DNs that refer to the foreign security principals must be replaced by the DNs of the entries during the synchronization of such groups. This is called resolving foreign key references.

Note: Synchronization of foreign security principal references is supported only on Windows 2003.

Example 19–3 How Foreign Key References Are Resolved

The example in this section illustrates how foreign key references are resolved.

Assume that there are three domains: A, B and C.

Domain A has a one-way non-transitive trust to Domain B. It can have foreign security principal references for users and groups from Domain B.

Domain A has a one-way non-transitive trust to Domain C. It can have foreign security principal references for users and groups from Domain C.

Domain B has a one-way non-transitive trust to Domain C. It can have foreign security principal references for users and groups from Domain C.

In this example, the one-way non-transitive trusts are from Domain A to Domain B, from Domain A to Domain C, and from Domain B to Domain C.

Tasks to Resolve Foreign Key References

This section explains the steps for resolving foreign key references.

Task 1: Update Agent Configuration Information For each profile that can have foreign security principal references, perform the following steps. The sample configuration files referred further are available in `$ORACLE_HOME/ldap/odi/samples` directory.

1. Copy the `activeimp.cfg.fsp` file. The following is an example of the `activeimp.cfg.fsp` file:

```
[INTERFACEDetails]
  Package: gsi
  Reader: ActiveReader
[TRUSTEDPROFILES]
  prof1 : <Name of the profile1>
  prof2 : <Name of the profile2>
[FSPMAXSIZE]
  val=10000
```

The preceding example assumes you are using the DirSync change tracking approach. If you are using the USN-Changed approach for tracking changes, assign a value of `ActiveChgReader` to the `Reader` parameter.

2. In the `activeimp.cfg.fsp` file, under the `[TRUSTEDPROFILES]` tag, specify the profile names of the other domains that have foreign security principal references in this domain.

Referring to [Example 19-3](#) on page 19-15, agent configuration information for Domain A contains the following:

```
[INTERFACEDetails]
  Package: gsi
  Reader: ActiveReader
[TRUSTEDPROFILES]
  prof1: profile_name_for_domain_B
  prof2: profile_name_for_domain_C
```

Agent configuration information for domain B contains the following:

```
[INTERFACEDetails]
  Package: gsi
  Reader: ActiveReader
[TRUSTEDPROFILES]
  prof1: profile_name_for_domain_C
```

Agent configuration information for domain C has no changes because domain C has no foreign key references.

3. Under the `[FSPMAXSIZE]` tag, specify the foreign security principal cache size. This can be the average number of foreign security principals you can have. A sample value of 1000 is specified in the `activeimp.cfg.fsp` file.
4. Load the new agent configuration information file by using the Directory Integration Assistant as follows:

```
$ORACLE_HOME/bin/dipassistant modifyprofile
-profile profile_name_for_domain_A_or_B
```



```
-host host_name
-port port_name
-dn bind_DN
-passwd password_of_bind_DN
odip.profile.configfile=activeimp.cfg.fsp
```

5. Repeat this task for every profile of interest.

Task 2: Modify the Input Data Before Bootstrapping to Resolve the Foreign Security Principal References To do this, perform the following steps:

1. Get the LDIF dump from the Microsoft Active Directory with appropriate filtering so that the resultant LDIF file contains only the required objects, for example users and groups.

Note: The command to dump entries from Microsoft Active Directory to Oracle Internet Directory is `ldifde`. This command can be run only from a Microsoft Windows environment.

2. Resolve the foreign security principal references by entering the following command:

```
$ORACLE_HOME/ldap/odi/admin/fsptodn
host=oid_host
port=oid_port
dn= OID_privileged_DN (that is, superuser or dipadmin user)
pwd=OID_password
profile=profile_name_for_domain_A_or_B
infile=input_filename_of_the_LDIF_dump_from_Active_Directory
outfile=output_filename
[sslauth=0|1]
```

By default, `host` is set to `local_host`, `port` is set to 389, and `sslauth` is set to 0.

Note: You can verify the successful execution of the command by verifying that the output file contains no references to `cn=foreignsecurityprincipals` in the `member` attribute. This command performs no attribute-level mapping other than resolving foreign security principal references.

3. Use the `-bootstrap` option of the Directory Integration Assistant to bootstrap the data from Microsoft Active Directory to Oracle Internet Directory.

See Also: ["Bootstrapping Data Between Directories"](#) on page 23-2

Task 3: Update the Mapping Rules to Resolve the Foreign Security Principals During Synchronization After bootstrapping, modifications to groups must be reflected in Oracle Internet Directory with the correct group membership values. The `fsptodn` mapping rule enables you to do this when you synchronize. Modify this mapping rule in every profile that needs foreign security principal resolution. Referring to [Example 19-3](#) on page 19-15, the mapping rules must be modified for Domains A and B.

If you do not have DN mapping, then change your mapping rule for the `member` attribute to the following:

```
member: : :group:uniquemember: :groupofUniqueNames: fsptodn(member)
```

If you have DN mapping, then change the mapping rules as follows:

1. Add the DN mapping rules corresponding to each of the trusted domains. This is used to resolve the correct domain mapping. Referring to [Example 19–3](#) on page 19-15, the `domainrules` in the mapping file for Domain A should have content similar to the following:

```
DOMAINRULES
<Src Domain A >:<Dst domain A1 in OID>
<Src Domain B >:< Dst domain B1 in OID>
<Src Domain C>:<Dst domain C1 in OID>
```

2. Change your mapping rule for the `member` attribute to:

```
member:::group:uniquemember:::groupofUniqueNames:dnconvert(fsptodn(member))
```

3. Upload the mapping file for the different profiles using Directory Integration Assistant (`dipassistant`).

Switching to a Different Microsoft Active Directory Domain Controller in the Same Domain

This section explains how to change the Microsoft Active Directory domain controller to which changes are exported. There are two methods, one for the USN-Changed approach and the other for the DirSync approach.

How to Change the Microsoft Active Directory Domain Controller by Using the USN-Changed Approach

If you are using the USN-Changed approach, then perform the following:

1. Stop the current running profile. Modify the Microsoft Active Directory host connection information, that is, host, port, user, password, to point to the new host. Usually, the host name is the only item that you need to update.
2. Obtain the current value of the `highestCommittedUSN` by searching the new domain controller's root DSE for the current `highestUSNChanged` value (attribute value of the `highestCommittedUSN` attribute of the root DSE):

```
ldapsearch -h host -p port -b "" -s base -D user
DN -w "password" "objectclass=*" highestCommittedUSN
```

3. Use Oracle Directory Integration Platform to run a full synchronization from Microsoft Active Directory.
 - a. Run `ldifde`, the command to dump entries from Microsoft Active Directory to Oracle Internet Directory, using the intended LDAP search scope and search filter. Normally, the search filter should be the same as that specified in the running profile. For example, the following search filter is set in the sample properties file. Note that `ldifde` can be run only from a Microsoft Windows environment.

```
searchfilter=(&(|(objectclass=user)(objectclass=organizationalunit))(!(objectclass=group)))
```

Essentially, run `ldifde` with a search scope and search filter that retrieve all Oracle Internet Directory objects (entries) that were configured to be synchronized with Microsoft Active Directory by the running profile.

- b. Run Oracle Directory Integration Platform to upload the LDIF file generated in Step a using the same profile.
4. After the full synchronization is completed, update the `lastchangenumber` attribute with the `highestCommittedUSN` value obtained in Step 2.
5. Resume the normal synchronization, that is, incremental synchronization from Microsoft Active Directory using `USNChanged` attribute.

How to Change the Microsoft Active Directory Domain Controller by Using the DirSync Approach

If you are using the DirSync approach, perform the following steps:

1. Stop the current profile that is running.
2. Use the Directory Integration Assistant `createlike` option to create a new profile exactly the same as the profile already being used. In the newly created profile, modify the Microsoft Active Directory host connection information, that is, host, port, user, password, to point to the new host. Usually, the host name is the only item you need to update.
3. Resume normal synchronization with the modified profile. Note that all the domain controllers must be in the same Microsoft Active Directory domain.

Configuring the Microsoft Active Directory Connector for Microsoft Exchange Server

The Microsoft Active Directory Connector can be used for provisioning users in Microsoft Exchange. This is applicable in deployments having Microsoft Active Directory Server 2000 or later as their identity store.

To configure the Microsoft Active Directory connector for Microsoft Exchange Server, run express configuration with the Directory Integration Assistant (`dipassistant`) utility, as described in ["Running Express Configuration"](#) on page 4. When you run the `dipassistant` command, be sure to specify `adforexchange` as the value assigned to the `-3rdpartyds` parameter. To further customize your integration with Microsoft Exchange, follow the instructions in ["Configuring Advanced Integration with Microsoft Active Directory"](#) on page 19-2.

See Also: *Oracle Application Server MS Office Developer's Guide*

Deploying the Oracle Password Filter for Microsoft Active Directory

This chapter explains how to install and configure the Oracle Password Filter for Microsoft Active Directory. It contains these topics:

- [Overview of the Oracle Password Filter for Microsoft Active Directory](#)
- [Configuring and Testing Oracle Internet Directory with SSL Server-Side Authentication](#)
- [Importing a Trusted Certificate into a Microsoft Active Directory Domain Controller](#)
- [Testing SSL Communication Between Oracle Internet Directory and Microsoft Active Directory](#)
- [Installing and Reconfiguring the Oracle Password Filter for Microsoft Active Directory](#)
- [Deinstalling the Oracle Password Filter for Microsoft Active Directory](#)

Note: The setup.exe installation file for the Oracle Password Filter for Microsoft Active Directory is located in the `utils/adpwdfilter` directory on the Oracle Application Server CD-ROM (Disk 1) for Windows.

Overview of the Oracle Password Filter for Microsoft Active Directory

This section describes the purpose of the Oracle Password Filter for Microsoft Active Directory and how it works. It contains these topics:

- [What is the Oracle Password Filter for Microsoft Active Directory?](#)
- [How Does the Oracle Password Filter for Microsoft Active Directory Work?](#)
- [How Do I Deploy the Oracle Password Filter for Microsoft Active Directory?](#)

What is the Oracle Password Filter for Microsoft Active Directory?

Oracle Directory Integration Platform enables synchronization between Oracle Internet Directory and Microsoft Active Directory. The Oracle Directory Integration Platform can retrieve all Microsoft Active Directory attributes with the exception of user passwords. Oracle Application Server Single Sign-On uses an external authentication plug-in to verify user credentials in Microsoft Active Directory. Environments that do not use Oracle Application Server Single Sign-On can use the

Oracle Password Filter for Microsoft Active Directory to retrieve passwords from Microsoft Active Directory into Oracle Internet Directory. When users change their passwords from their desktops, the updated password is automatically synchronized with Oracle Internet Directory. More specifically, the Oracle Password Filter for Microsoft Active Directory monitors Microsoft Active Directory for password changes, which it then stores in Oracle Internet Directory. This allows Oracle Internet Directory users to be authenticated with their Microsoft Active Directory credentials and authorized to access resources by using information stored in Oracle Internet Directory. Storing Microsoft Active Directory user credentials in Oracle Internet Directory also provides a high availability solution in the event that the Microsoft Active Directory server is down. The Oracle Password Filter is installed on each Microsoft Active Directory server and automatically forwards password changes to Oracle Internet Directory.

Note: Enterprise User Security can only verify user credentials that are stored in Oracle Internet Directory. For this reason, to verify user credentials in Microsoft Active Directory with Enterprise User Security, you must use the Oracle Password Filter to retrieve passwords from Microsoft Active Directory into Oracle Internet Directory.

The Oracle Password Filter for Microsoft Active Directory does not require the Oracle Directory Integration Platform to synchronize passwords from Microsoft Active Directory to Oracle Internet Directory. The only requirement is that users synchronized from Microsoft Active Directory to Oracle Internet Directory must include the `ObjectGUID` attribute value to identify the user in both directories. The Oracle Password Filter for Microsoft Active Directory does not enforce password policies, or differences in password policies, between Microsoft Active Directory and Oracle Internet Directory. Instead, the system administrator must ensure that the password policies are consistent in both directories.

Password change requests occur when an account is created, an administrator resets a user's password, or when a user changes his or her own password. In order for the Oracle Password Filter for Microsoft Active Directory to capture Microsoft Active Directory passwords, one of these events must occur. Passwords that were set prior to installing the Oracle Password Filter for Microsoft Active Directory cannot be captured unless a system administrator forces a global password change request to all users.

Note: The Oracle Password Filter for Microsoft Active Directory only captures password changes for 32-bit or higher Windows systems that have been integrated with Microsoft Active Directory.

How Does the Oracle Password Filter for Microsoft Active Directory Work?

This section describes how the Oracle Password Filter for Microsoft Active Directory work. It contains these topics:

- [Clear Text Password Changes Captured](#)
- [Password Changes Stored when Oracle Internet Directory is Unavailable](#)
- [Password Synchronization Delayed Until Microsoft Active Directory Users are Synchronized with Oracle Identity Management](#)
- [Password Bootstrapping](#)

Clear Text Password Changes Captured

When a password change request is made, the Local Security Authority (LSA) of the Windows operating system calls the Oracle Password Filter for Microsoft Active Directory package that is registered on the system. When the LSA calls the Oracle Password Filter for Microsoft Active Directory package, it passes to it the user name and changed password. The Oracle Password Filter for Microsoft Active Directory then performs the synchronization.

Password Changes Stored when Oracle Internet Directory is Unavailable

When Oracle Internet Directory is unavailable, the password change events are archived securely and the encrypted passwords are stored in the Microsoft Active Directory. The Oracle Password Filter for Microsoft Active Directory attempts to synchronize these entries until it reaches the specified maximum number of retries.

Password Synchronization Delayed Until Microsoft Active Directory Users are Synchronized with Oracle Identity Management

The Oracle Password Filter for Microsoft Active Directory is notified immediately when a new user is created in Microsoft Active Directory. However, Oracle Directory Integration Platform will not synchronize entries until the next scheduled synchronization interval. For this reason, passwords for new user entries are stored in encrypted format in Microsoft Active Directory until the next synchronization. The Oracle Password Filter for Microsoft Active Directory then attempts to synchronize these entries until it reaches the specified maximum number of retries.

Password Bootstrapping

Because the original clear text form of a password is not retrievable by the Oracle Password Filter for Microsoft Active Directory, you cannot perform initial bootstrapping to synchronize passwords from Microsoft Active Directory to Oracle Internet Directory. However, you can instruct users to change their passwords or force a password change for all users in Microsoft Active Directory by changing the password expiration policy.

How Do I Deploy the Oracle Password Filter for Microsoft Active Directory?

The general procedures for installing and configuring the Oracle Password Filter for Microsoft Active Directory are as follows;

1. Enable synchronization between Oracle Internet Directory and Microsoft Active Directory by following the instructions described in [Chapter 19, "Integrating with Microsoft Active Directory"](#).
2. Configure and test Oracle Internet Directory in SSL server authentication mode by following the instructions in ["Configuring and Testing Oracle Internet Directory with SSL Server-Side Authentication"](#) on page 20-4.
3. Import the Oracle Internet Directory trusted server certificate into the Microsoft Active Directory domain controller by following the instructions in ["Importing a Trusted Certificate into a Microsoft Active Directory Domain Controller"](#) on page 20-4.
4. Verify that Oracle Internet Directory and Microsoft Active Directory can communicate with SSL server authentication by following the instructions in ["Testing SSL Communication Between Oracle Internet Directory and Microsoft Active Directory"](#) on page 20-5.

5. Install the Oracle Password Filter for Microsoft Active Directory by following the instructions in ["Installing the Oracle Password Filter for Microsoft Active Directory"](#) on page 20-8.
6. Configure the Oracle Password Filter for Microsoft Active Directory by following the instructions in ["Reconfiguring the Oracle Password Filter for Microsoft Active Directory"](#) on page 20-16.

Configuring and Testing Oracle Internet Directory with SSL Server-Side Authentication

The Oracle Password Filter communicates password changes from Microsoft Active Directory to Oracle Internet Directory using the Secure Socket Layer (SSL) protocol, which provides data encryption and message integrity for a TCP/IP connection. More specifically, to synchronize password changes between Oracle Internet Directory and Microsoft Active Directory, you must use SSL server authentication mode, which allows a client to confirm a server's identity. When combined with digital certificates, SSL also provides both server authentication and client authentication. Server authentication with SSL requires that you install a digital certificate on the server side of the communications link. When an SSL transaction is initiated by a client, the server sends its digital certificate to the client. The client examines the certificate to validate that the server has properly identified itself, including verifying that the certificate was issued by a trusted Certificate Authority (CA). In the case of Oracle Internet Directory and Microsoft Active Directory integration, Oracle Internet Directory is the server and Microsoft Active Directory is the client. The Oracle Password Filter for Microsoft Active Directory uses SSL to protect the password during transmission between the Microsoft Active Directory domain controller and the Oracle Internet Directory server.

Note: The certificate you use with the Oracle Password Filter for Microsoft Active Directory can be generated by any X.509-compliant certificate authority capable of accepting PKCS#10 standard certificate requests and producing certificates compliant with the X.509, Version 3, ISO standard and with RFC 2459.

To configure and test Oracle Internet Directory with SSL server-side authentication, refer to *Oracle Internet Directory Administrator's Guide*.

Importing a Trusted Certificate into a Microsoft Active Directory Domain Controller

Server-authenticated SSL communication between a Microsoft Active Directory domain controller and Oracle Internet Directory will fail if the domain controller does not recognize the Oracle Internet Directory SSL certificate as valid. In order for a domain controller to accept an Oracle Internet Directory SSL certificate, you must use the Microsoft Management Console to import the certificate authority's trusted certificate into the domain controller.

To use the Microsoft Management Console to import the certificate authority's trusted certificate into the domain controller:

1. Select **Run** from the Windows **Start** menu. The Run dialog box displays. In the Run dialog box, type **mmc**, and then click **OK**. The Microsoft Management Console window displays.

2. Select **Add/Remove Snap-in** from the **File** menu. The Add/Remove Snap-in dialog box displays.
3. In the Add/Remove Snap-in dialog box, click **Add**. The Add Standalone Snap-in dialog box displays.
4. In the Add Standalone Snap-in dialog box, select **Certificates**, and then click **Add**. The Certificates snap-in dialog box displays, prompting you to select an option for which the snap-in will manage certificates.
5. In the Certificates snap-in dialog box, select **Computer name**, and then click **Next**. The Select Computer dialog box displays.
6. In the Select Computer dialog box, select **Local Computer**, and then click **Finish**.
7. Click **Close** in the Add Standalone Snap-in dialog box, and then click **OK** in the Add/Remove Snap-in dialog box. The new console displays *Certificates (Local Computer)* in the console tree.
8. In the console tree, expand **Certificates (Local Computer)**, and then click **Trusted Root Certification Authority**.
9. Point to **All Tasks** on the **Action** menu, and then select **Import**. The Welcome page of the Certificate Import Wizard displays. Click **Next** to display the File to Import page.
10. On the **File to Import** page, enter the path and file name of the certificate authority's trusted root certificate, or click **Browse** to search for a file, and then click **Next**. The Certificate Store page displays.
11. On the Certificate Store page, select **Place all certificates in the following store**. If Trusted Root Certification Authorities is not already selected as the certificate store, click **Browse** and select it. Click **Next**. The Completing the Certificate Import page displays.
12. On the Completing the Certificate Import page, click **Finish**. A dialog box displays indicating that the import was successful. Click **OK**.
13. Click **Save** from the **File** menu. The Save As dialog box displays. Enter a name for the new console, and then click **Save**.
14. Close **Microsoft Management Console**.

Note: For help on importing a trusted certificate with Microsoft Management Console, refer to your Windows product documentation or visit Microsoft Help and Support at <http://support.microsoft.com>.

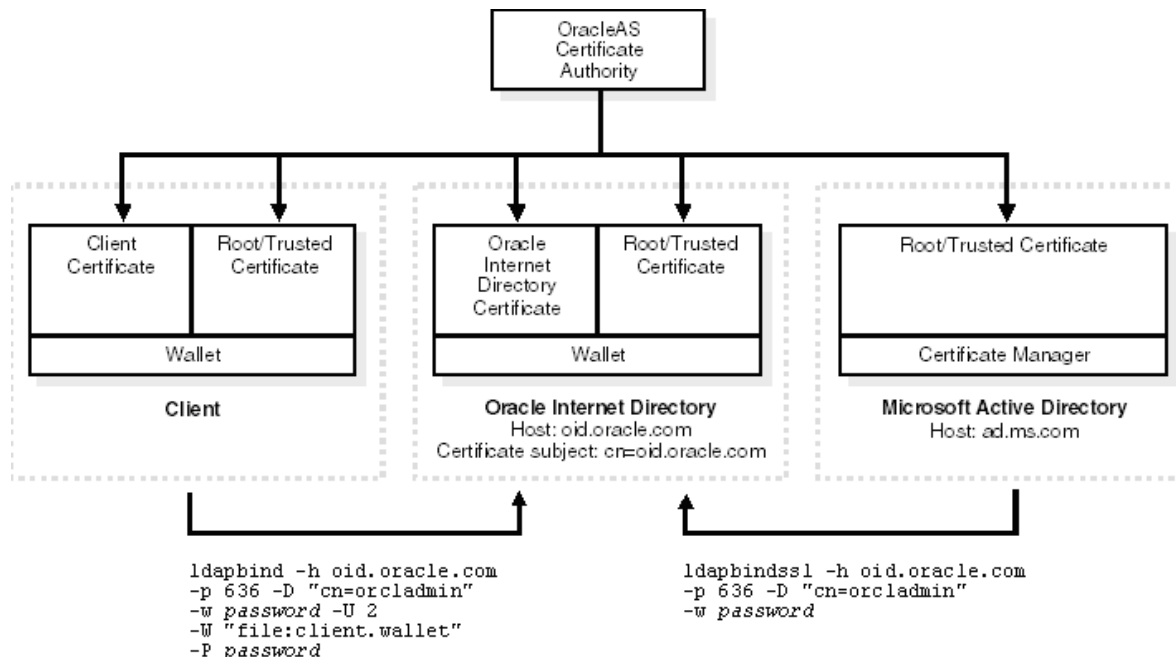
Testing SSL Communication Between Oracle Internet Directory and Microsoft Active Directory

The Oracle Password Filter for Microsoft Active Directory installs a command named `ldapbindssl` on the domain controller that you can use to test SSL communication between Oracle Internet Directory and Microsoft Active Directory. The syntax for the `ldapbindssl` is as follows:

```
ldapbindssl -h oid_hostname -p ssl_port -D account -w password
```

Figure 20–1 conceptually illustrates how to use the `ldapbindssl` and `ldapbind` commands to test SSL communication between Oracle Internet Directory and Microsoft Active Directory.

Figure 20–1 Testing SSL Communication Between Oracle Internet Directory and Microsoft Active Directory



`-w password -w password`

To test SSL connectivity from Microsoft Active Directory to Oracle Internet Directory:

1. Open a command prompt window on the domain controller and navigate to the folder where you installed the Oracle Password Filter for Microsoft Active Directory.
2. Enter the `ldapbindssl` command to test SSL communication with Oracle Internet Directory. For example, the following command attempts to bind to an Oracle Internet Directory host named `oraas.mycompany.com` on SSL port 636:

```
ldapbindssl -h oraas.mycompany.com -p 636 -D cn=orcladmin -w password
```

If the `ldapbindssl` command is successful, the following response is returned:

```
bind successful
```

If the `ldapbindssl` command is not successful, the following response is returned:

```
Cannot connect to the LDAP server
```

If you cannot connect from Microsoft Active Directory to Oracle Internet Directory in SSL mode, verify that you successfully imported a trusted certificate into your Microsoft Active Directory domain controller, as described in ["Importing a Trusted Certificate into a Microsoft Active Directory Domain Controller"](#) on page 20-4.

3. Close the command prompt window.

Installing and Reconfiguring the Oracle Password Filter for Microsoft Active Directory

This section describes how to install and reconfigure the Oracle Password Filter for Microsoft Active Directory. It contains these topics:

- [Installing the Oracle Password Filter for Microsoft Active Directory](#)
- [Reconfiguring the Oracle Password Filter for Microsoft Active Directory](#)

Before you install or reconfigure the Oracle Password Filter for Microsoft Active Directory, be sure to collect the necessary configuration parameters for Microsoft Active Directory and for Oracle Internet Directory. [Table 20–1](#) lists the configuration parameters you will need for Microsoft Active Directory and [Table 20–2](#) lists the configuration parameters you will need for Oracle Internet Directory.

Table 20–1 Oracle Password Filter Configuration Parameters for Microsoft Active Directory

Parameter	Description
Domain	The Microsoft Active Directory domain for this domain controller. This value is typically the DNS domain name, in the form <i>mycompany.com</i> .
Base DN	The container in the Microsoft Active Directory DIT where the Oracle Password Filter searches for entries with changed passwords. If password propagation fails, the DNS of the failed password will be stored in an entry named <code>organizationalUnit</code> within the specified container. For this reason, the specified container should be capable of holding <code>organizationalUnit</code> objects. This value is typically in the form <i>dc=mycompany,dc=com</i> .
Port	The Microsoft Active Directory LDAP port (usually 389).
Host	The IP address (NOT the host name) of the Microsoft Active Directory domain controller.
Microsoft Active Directory User	A user name with read privileges on the entire Microsoft Active Directory DIT and privileges to create an organizational unit and subtree entries under the Microsoft Active Directory base DN. Note that you must enter a user name and not the DN of an administrative user. This value is usually in the form <i>administrator@machine_name</i> .
Microsoft Active Directory User Password	The specified Microsoft Active Directory user's password.
Log File Path	A directory where log files will be written, such as <i>E:\ADPasswordFilter\Log</i> .

Table 20–2 Oracle Password Filter Configuration Parameters for Oracle Internet Directory

Parameter	Description
Base DN	The container in the Oracle Internet Directory DIT where the Oracle Password Filter searches for entries synchronized from Microsoft Active Directory. For example: <i>o=Microsoft Active Directory,c=us</i> .
Host	Specifies the host name where the Oracle Internet Directory LDAP processes are running. For Oracle Internet Directory installations running in a high availability configuration, use the virtual host name of the load balancer.
SSL Port	The Oracle Internet Directory port that is configured for SSL server authentication.

Table 20–2 (Cont.) Oracle Password Filter Configuration Parameters for Oracle Internet Directory

Parameter	Description
Non-SSL Port	The Oracle Internet Directory for unencrypted communication.
Oracle Internet Directory User	The distinguished name of an Oracle Internet Directory user with permissions to update user passwords in the base DN. For example: cn=orcladmin.
Oracle Internet Directory User Password	The specified Oracle Internet Directory user's password.

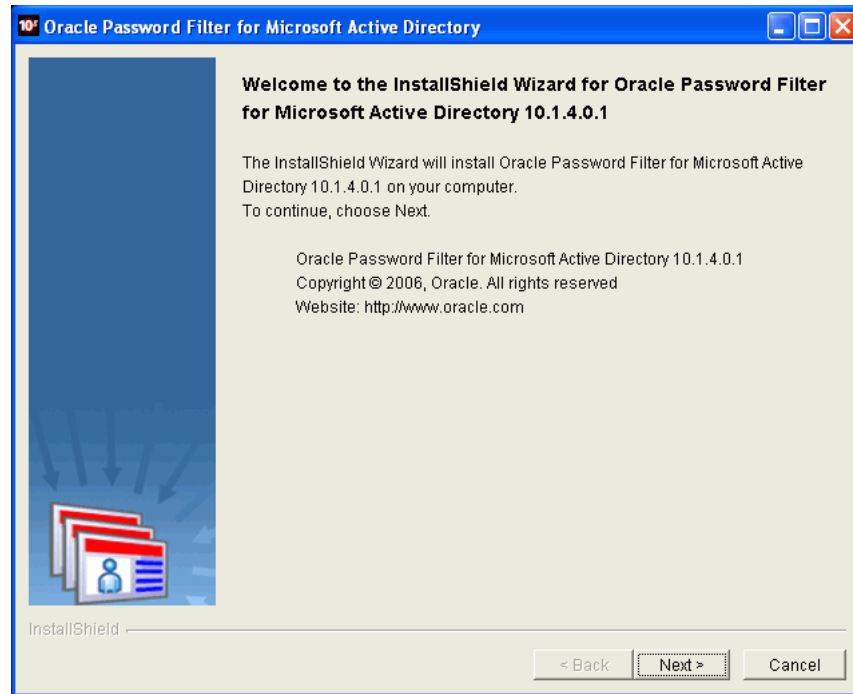
Installing the Oracle Password Filter for Microsoft Active Directory

This section describes how to install the Oracle Password Filter for Microsoft Active Directory on a domain controller.

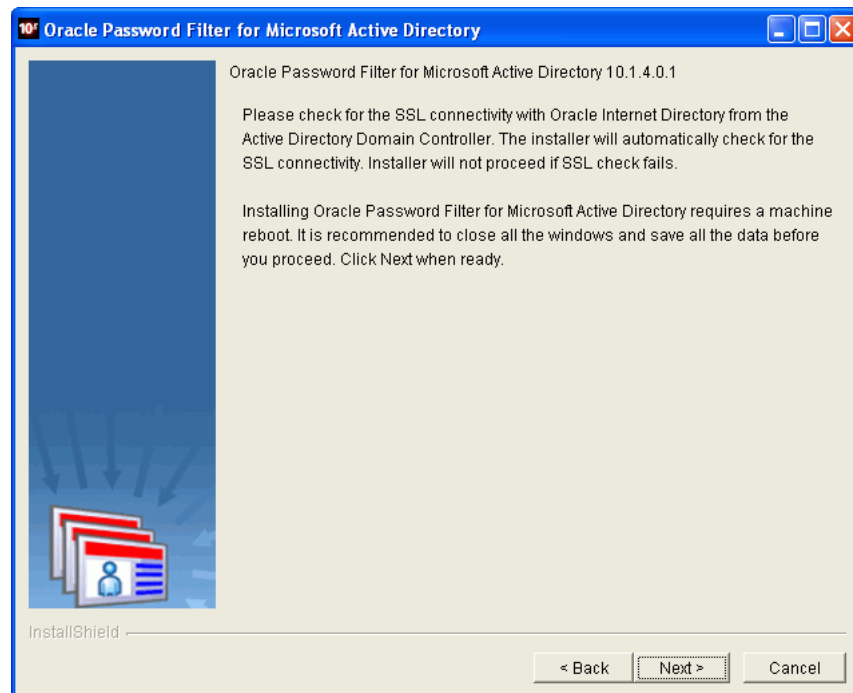
Note: The Microsoft Active Directory and Oracle Internet Directory configuration parameters listed in the following procedure are described in [Table 20–1](#) and [Table 20–2](#).

To install the Oracle Password Filter for Microsoft Active Directory on a domain controller:

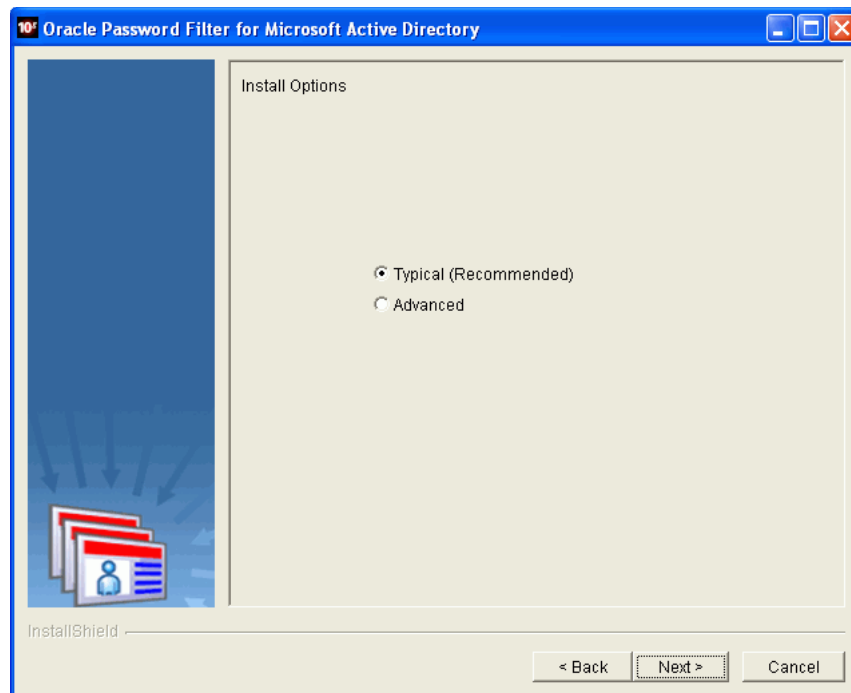
1. Locate the setup.exe file in the utils/adpwdfilter directory on the Oracle Application Server CD-ROM (Disk 1). Run the **setup.exe** command to extract the installation files to a directory on your domain controller.
2. Navigate to the directory where you extracted the installation files and double-click **setup.exe**. The Welcome page of the Oracle Password Filter for Microsoft Active Directory installation program displays, informing you that the program will install the Oracle Password Filter for Microsoft Active Directory.



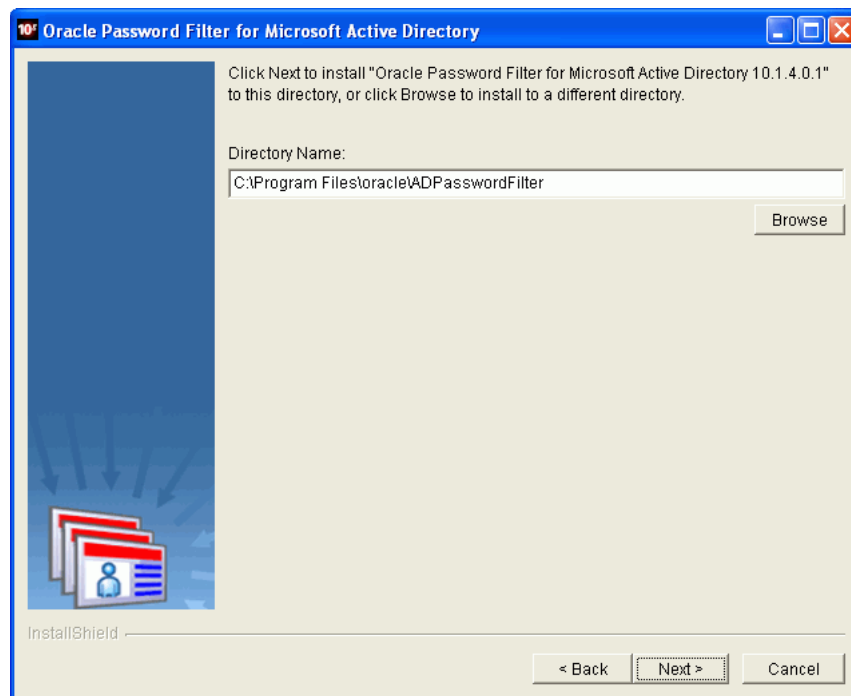
3. On the Welcome page, click **Next**. The Installation Requirements page displays, notifying you that SSL must be enabled between Oracle Internet Directory and Microsoft Active Directory and that installing the Oracle Password Filter for Microsoft Active Directory must restart your computer at the end of the installation process.



4. On the Installation Requirements page, click **Next**. The Installation Options page displays.



5. On the Installation Options page, select **Typical (Recommended)** or **Advanced**. Selecting to perform an advanced installation allows you to specify attributes for Oracle Internet Directory and Microsoft Active Directory later in the installation process (Step 14). Click **Next**. The Installation Location page displays, prompting you for the folder where you want to install Oracle Password Filter for Microsoft Active Directory.



6. On the Installation Location page, accept the default installation directory or enter a different directory. You can also select **Browse** to locate a different directory. Click **Next** after selecting an installation directory. The Microsoft Active Directory Configuration Parameters page displays.

10 Oracle Password Filter for Microsoft Active Directory

Active Directory Configuration Parameters

Active Directory information(Domain Controller)
All fields marked with * are mandatory

Domain*
oracle.com

BaseDN*
DC=oracle,DC=com

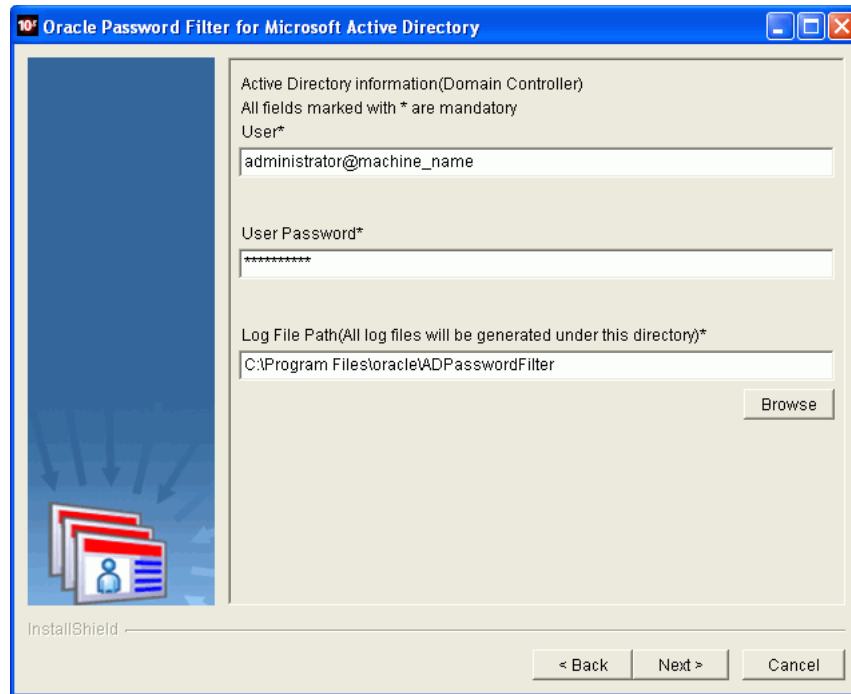
Port*
389

Host*
141.144.73.229

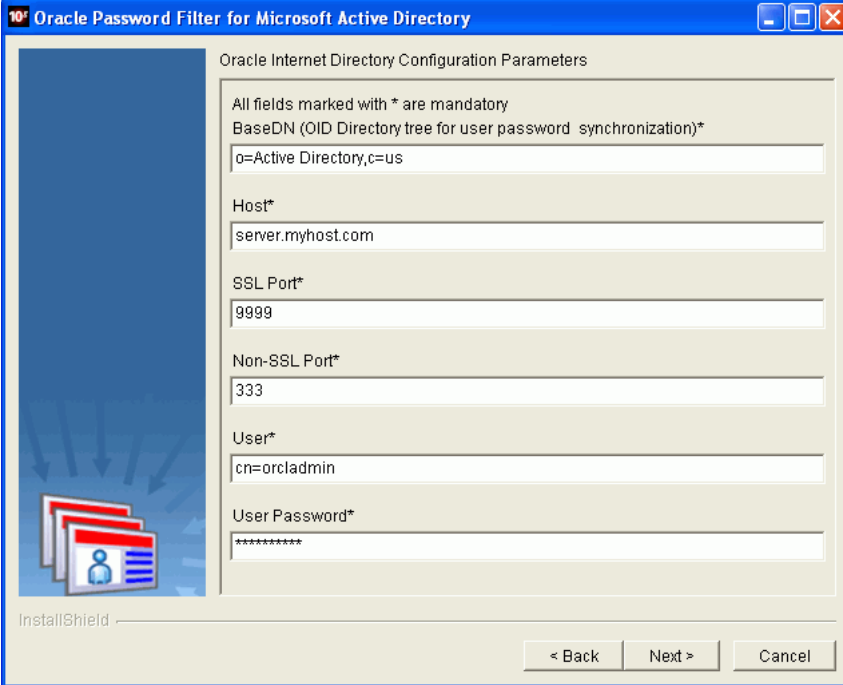
InstallShield

< Back Next > Cancel

7. On the Microsoft Active Directory Configuration Parameters page, enter values for the following parameters:
 - Domain
 - Base DN
 - Port
 - Host
8. Click **Next**. The Microsoft Active Directory Domain Controller Information page displays.



9. On the Microsoft Active Directory Domain Controller Information page, enter values for the following parameters:
 - **User**
 - **User Password**
 - **Log File Path**
10. Click **Next** to continue. The Oracle Internet Directory Configuration Parameters page displays.



Oracle Password Filter for Microsoft Active Directory

Oracle Internet Directory Configuration Parameters

All fields marked with * are mandatory

BaseDN (OID Directory tree for user password synchronization)*

o=Active Directory,c=us

Host*

server.myhost.com

SSL Port*

9999

Non-SSL Port*

333

User*

cn=orcladmin

User Password*

InstallShield

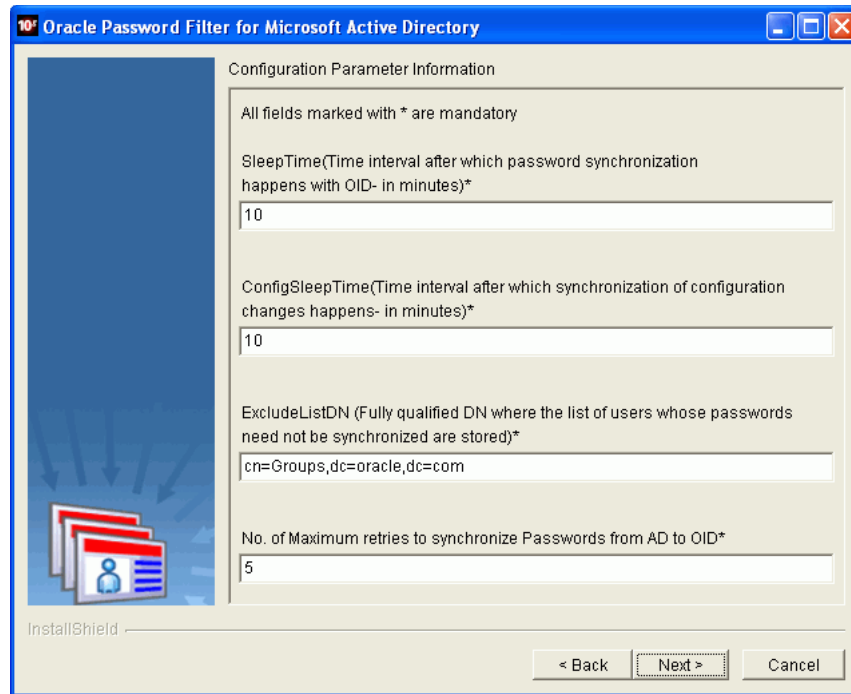
< Back Next > Cancel

11. On the Oracle Internet Directory Configuration Parameters page, enter values for the following parameters:

- Base DN
- Host
- SSL Port
- Non-SSL Port
- User
- User Password

Important: If you have configured both import and export synchronization between Oracle Internet Directory and Microsoft Active Directory, be sure to enter for the User and User Password parameters the same bind DN and password that are specified in the synchronization profile that imports values from Microsoft Active Directory into Oracle Internet Directory. This is necessary to prevent password updates from looping between Oracle Internet Directory and Microsoft Active Directory.

12. Click **Next** to continue. The Oracle Password Filter Configuration Parameters page displays.



10 Oracle Password Filter for Microsoft Active Directory

Configuration Parameter Information

All fields marked with * are mandatory

SleepTime(Time interval after which password synchronization happens with OID- in minutes)*

10

ConfigSleepTime(Time interval after which synchronization of configuration changes happens- in minutes)*

10

ExcludeListDN (Fully qualified DN where the list of users whose passwords need not be synchronized are stored)*

cn=Groups,dc=oracle,dc=com

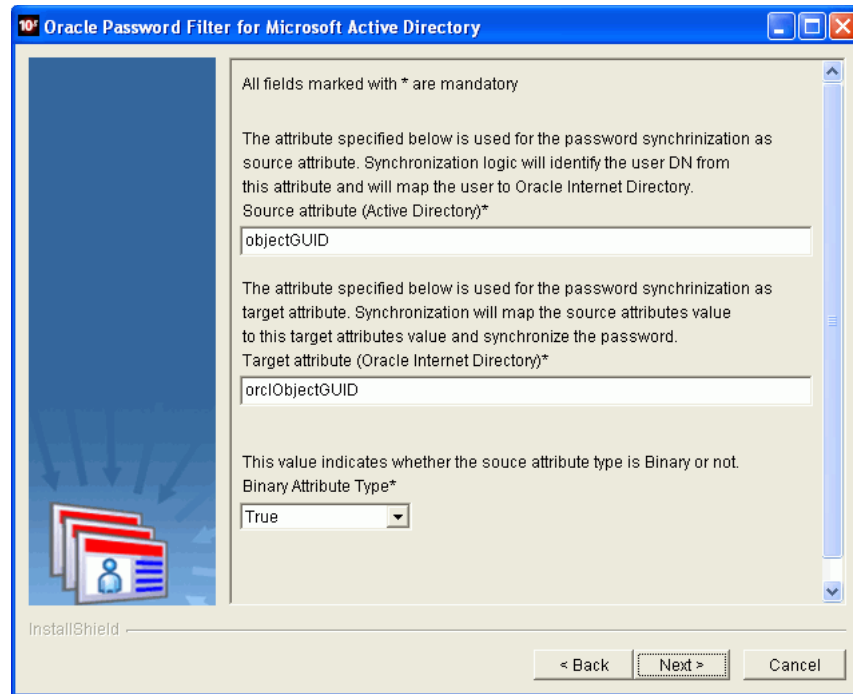
No. of Maximum retries to synchronize Passwords from AD to OID*

5

InstallShield

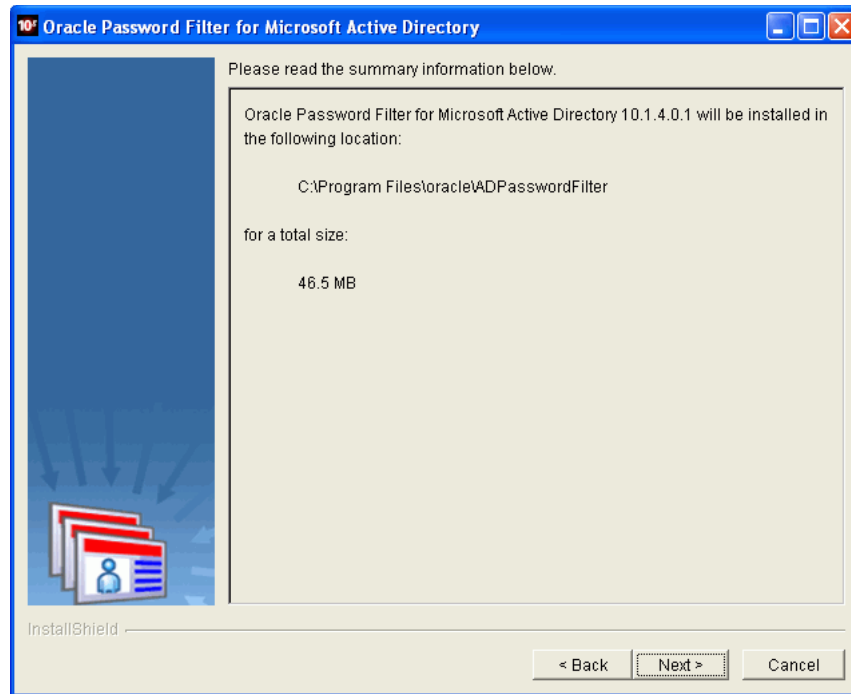
< Back Next > Cancel

13. On the Oracle Password Filter Configuration Parameters page, enter values for the following parameters:
 - **SleepTime:** The number of minutes between attempts to synchronize passwords changes between Oracle Internet Directory and Microsoft Active Directory.
 - **ConfigSleepTime:** The number of minutes between attempts to synchronize configuration changes between Oracle Internet Directory and Microsoft Active Directory.
 - **ExcludeListDN:** A fully qualified DN containing a list of users whose passwords should not be synchronized.
 - **Maximum Retries:** Specifies the maximum number of attempts to synchronize a password.
14. Click **Next** to continue. If you chose Advanced on the Installation Options page, the Specify Attributes page displays.



Perform the following steps for advanced installations:

- a. On the Specify Attributes page displays, enter values in the **Source Attribute (Microsoft Active Directory)** and **Target Attribute (Oracle Internet Directory)** boxes for any attributes that you want to synchronize between the two directories. Also, select a value of `true` or `false` from the **Binary Attribute Type** box to specify whether the source attribute type is binary.
- b. Click **Next** to continue. The Summary page displays and lists the path where the Oracle Password Filter for Microsoft Active Directory will be installed.



15. On the Summary page, click **Next** to install the Oracle Password Filter.
16. If this is the first time you have installed the Oracle Password Filter, select **Yes** to upload schema extensions to Oracle Internet Directory when prompted. Otherwise, select **No**. The Reboot Domain Controller page displays.
17. On the Reboot Domain Controller page, click **Next** to restart the computer.
18. After the computer restarts, log in as an administrator. The remaining configuration tasks for the Oracle Password Filter execute automatically after you log in.

Reconfiguring the Oracle Password Filter for Microsoft Active Directory

In most cases, you should not need to reconfigure the Oracle Password Filter following the installation process. However, you can reconfigure the Oracle Password Filter for Microsoft Active Directory by running the Oracle Password Filter for Microsoft Active Directory installation program.

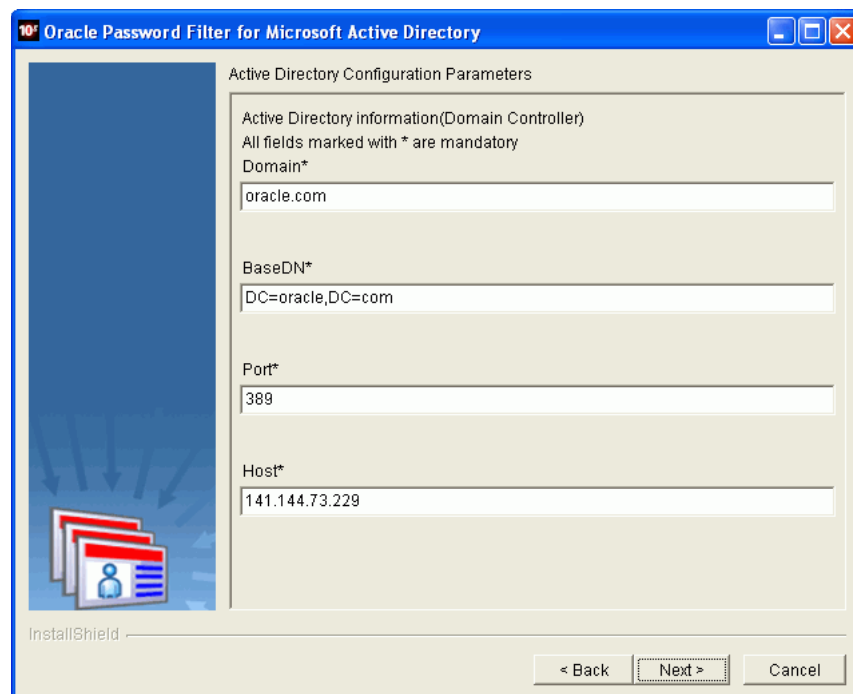
Note: The Microsoft Active Directory and Oracle Internet Directory configuration parameters listed in the following procedure are described in [Table 20–1](#) and [Table 20–2](#).

To reconfigure the Oracle Password Filter for Microsoft Active Directory:

1. Navigate to the directory where you extracted the installation files and double-click **setup.exe**. The Welcome page of the Oracle Password Filter for Microsoft Active Directory configuration program displays, informing you that the installation program will reconfigure the Oracle Password Filter for Microsoft Active Directory.



2. On the Welcome page, click **Next**. The Microsoft Active Directory Configuration Parameters page displays.



3. On the Microsoft Active Directory Configuration Parameters page, modify the following parameters:
 - **Domain**
 - **Base DN**

- **Port**
 - **Host**
4. Click **Next**. The Oracle Internet Directory Configuration Parameters page displays.

Oracle Password Filter for Microsoft Active Directory

Oracle Internet Directory Configuration Parameters

All fields marked with * are mandatory

BaseDN (OID Directory tree for user password synchronization)*

dc=oracle,dc=com

Host*

oraas.oracle.com

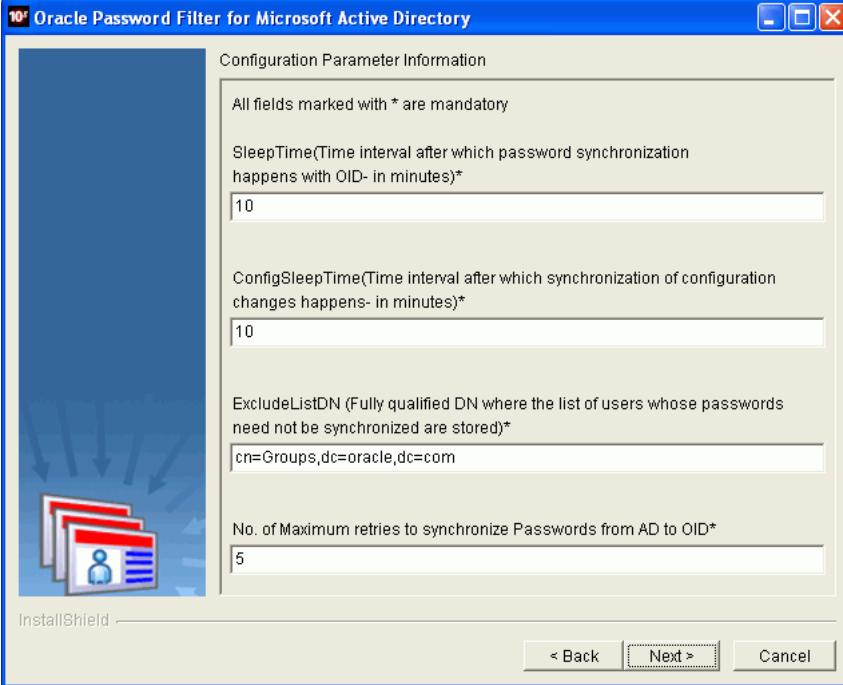
SSL Port*

836

InstallShield

< Back Next > Cancel

5. On the Oracle Internet Directory Configuration Parameters page, modify the following parameters:
 - **Base DN**
 - **Host**
 - **SSL Port**
6. Click **Next** to continue. The Oracle Password Filter Configuration Parameters page displays.



10 Oracle Password Filter for Microsoft Active Directory

Configuration Parameter Information

All fields marked with * are mandatory

SleepTime(Time interval after which password synchronization happens with OID- in minutes)*

10

ConfigSleepTime(Time interval after which synchronization of configuration changes happens- in minutes)*

10

ExcludeListDN (Fully qualified DN where the list of users whose passwords need not be synchronized are stored)*

cn=Groups,dc=oracle,dc=com

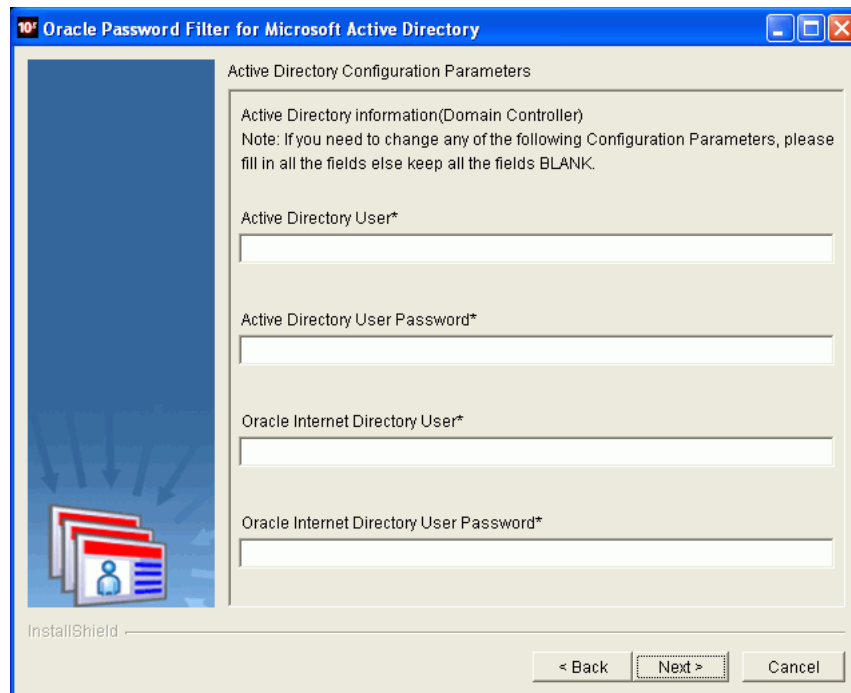
No. of Maximum retries to synchronize Passwords from AD to OID*

5

InstallShield

< Back Next > Cancel

7. On the Oracle Password Filter Configuration Parameters page, modify the following parameters
 - **SleepTime:** The number of minutes between attempts to synchronize passwords changes between Oracle Internet Directory and Microsoft Active Directory.
 - **ConfigSleepTime:** The number of minutes between attempts to synchronize configuration changes between Oracle Internet Directory and Microsoft Active Directory.
 - **ExcludeListDN:** A fully qualified DN containing a list of users whose passwords should not be synchronized.
 - **Maximum Retries:** Specifies the maximum number of attempts to synchronize a password.
8. Click **Next** to continue. The Oracle Password Filter Users page displays.



9. On the Oracle Password Filter Users page, modify the following parameters:

- **Microsoft Active Directory User**
- **Microsoft Active Directory User Password**
- **Oracle Internet Directory User**
- **Oracle Internet Directory User Password**

Important: If you have configured both import and export synchronization between Oracle Internet Directory and Microsoft Active Directory, be sure to enter for the User and User Password parameters the same bind DN and password that are specified in the synchronization profile that imports values from Microsoft Active Directory into Oracle Internet Directory. This is necessary to prevent password updates from looping between Oracle Internet Directory and Microsoft Active Directory.

10. Click **Next** to continue. The Reconfiguration Completed Successfully page displays.
11. On the Reconfiguration Completed Successfully page, click **Finish** to reconfigure the Oracle Password Filter.

Deinstalling the Oracle Password Filter for Microsoft Active Directory

This section describes how to deinstall the Oracle Password Filter for Microsoft Active Directory.

To deinstall the Oracle Password Filter for Microsoft Active Directory:

1. Open in a text editor the **prepAD.ldif** file, which is located in the directory where you installed the Oracle Password Filter for Microsoft Active Directory. Delete the entries and container listed in the prepAD.ldif file from your Microsoft Active Directory installation.
2. Click the Windows **Start** menu and select **Run**. The Run dialog box displays.
3. Enter **regedt32** in the Run dialog box and click **OK**. The Registry Editor window displays.
4. Navigate to the following registry key:
`HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Lsa\orclidmpwf\OIDConfig`
5. Note the container assigned to the `OidSinkNode` entry. The default value assigned to this entry is `cn=Products,cn=OracleContext`.
6. Select **Control Panel** from the Windows **Start** menu. The Control Panel window displays. In the Control Panel window, select **Add or Remove Programs**. The Add or Remove Programs window displays.
7. In the Add or Remove Programs window, select **Oracle Password Filter for Microsoft Active Directory** from the list of currently installed programs, and then click **Change/Remove**. The Welcome page of the Oracle Password Filter for Microsoft Active Directory installation program displays, informing you that the program will remove the Oracle Password Filter for Microsoft Active Directory.



8. On the Welcome page, click **Next**. The Summary page displays and lists the path from where the Oracle Password Filter for Microsoft Active Directory will be removed.



9. On the Summary page, click **Next**. The Restart Required page appears notifying you that removing the Oracle Password Filter for Microsoft Active Directory requires a restart at the end of the deinstallation process.
10. On the Restart Required page, click **Next**. A final page appears informing you that you must restart your computer. Click **Next** to restart your computer.
11. On the computer where you installed Oracle Internet Directory, run the following command to start Oracle Directory Manager:

```
oidadmin
```

12. Navigate to the **cn=PWSync,OidSinkNode** container and delete the following entry and its subentries:

```
CN=Active_Directory_Host, cn=PWSync,OidSinkNode
```

13. Create a new text file named deleteOIDSchema.ldif that contains the following entries:

```
dn: cn=subschemasubentry
changetype: modify
delete: objectclasses
objectclasses: ( 2.16.840.1.113894.8.2.1002 NAME 'adconfig' SUP top STRUCTURAL
MUST ( cn ) MAY ( ADBaseDN $ deleteomain $ ADHost $ ADPort $ Log $
ResourceFilePath ) )

dn: cn=subschemasubentry
changetype: modify
delete: objectclasses
objectclasses: ( 2.16.840.1.113894.8.2.1001 NAME 'oidconfig' SUP top STRUCTURAL
MUST ( cn ) MAY ( OIDBaseDN $ OIDHost $ OIDPort $ passwdattr $ MSDEDSN $
OIDObjectClass $ OIDLog $ ExcludeListDN $ MAX_RETRIES $ OIDSSLType $
OIDWalletLoc $ OidSinkNode $ SleepTime $ stop $ ConfigSleepTime $
OIDConfigSynchKey ) )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1001 NAME 'OIDBaseDN' DESC 'OID Base
Search DN' SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1002 NAME 'OIDHost' DESC 'OID Host'
SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1003 NAME 'OIDPort' DESC 'OID Port'
SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1004 NAME 'passwdattr' DESC 'Pass
Attribute' SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1005 NAME 'MSDEDSN' DESC 'DB DSN'
SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1006 NAME 'OIDObjectClass' DESC 'AD
Object Class' SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1007 NAME 'OIDLog' DESC 'OID Log'
SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1008 NAME 'ExcludeListDN' DESC
'Exclude List' SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1009 NAME 'MAX_RETRIES' DESC 'Max
Retries' SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1010 NAME 'OIDSSLType' DESC 'OID SSL
Type' SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1011 NAME 'OIDWalletLoc' DESC 'OID
Wallet Loc' SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )

dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1012 NAME 'OidSinkNode' DESC 'Config
Sync Node' SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )

dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1013 NAME 'SleepTime' DESC 'Sleep Time
for store thread' SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )

dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1014 NAME 'stop' DESC 'Stop flag for
store thread' SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )

dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1015 NAME 'ConfigSleepTime' DESC 'Sleep
Time for config thread' SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )

dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1016 NAME 'OIDConfigSynchKey' DESC
'Config Sync key' SYNTAX '1.3.6.1.4.1.1466.115.121.1.15' )

dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1017 NAME 'ADBasedN' SYNTAX
'1.3.6.1.4.1.1466.115.121.1.15' )

dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1018 NAME 'ADPort' SYNTAX
'1.3.6.1.4.1.1466.115.121.1.15' )

dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1019 NAME 'ADHost' SYNTAX
'1.3.6.1.4.1.1466.115.121.1.15' )

dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1020 NAME 'ADDomain' SYNTAX
'1.3.6.1.4.1.1466.115.121.1.15' )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1021 NAME 'Log' SYNTAX
'1.3.6.1.4.1.1466.115.121.1.15' )
```

```
dn: cn=subschemasubentry
changetype: modify
delete: attributetypes
attributetypes: ( 2.16.840.1.113894.8.1.1022 NAME 'ResourceFilePath' SYNTAX
'1.3.6.1.4.1.1466.115.121.1.15' )
```

14. Use an `ldapmodify` command to load the `deleteOIDSchema.ldif` file:

```
$ORACLE_HOME/bin/ldapmodify -h OID host -p OID port
-D "DN of privileged OID user" -w password -f deleteOIDSchema.ldif
```

Integrating with Sun Java System Directory

This chapter outlines the procedures for integrating Oracle Identity Management with Sun Java System Directory, formerly known as SunONE iPlanet, in a production environment. It contains these topics:

- [Verifying Synchronization Requirements for Sun Java System Directory](#)
- [Configuring Basic Synchronization with Sun Java System Directory](#)
- [Configuring Advanced Integration with Sun Java System Directory](#)

Note: This chapter assumes familiarity with the chapter on Oracle Internet Directory concepts and architecture in *Oracle Internet Directory Administrator's Guide*. It also assumes familiarity with the earlier chapters in this book, especially:

- [Chapter 1, "Introduction to Oracle Identity Management Integration"](#)
- [Chapter 4, "Managing the Oracle Directory Integration Platform"](#)
- [Chapter 5, "Oracle Directory Synchronization Service"](#)
- [Chapter 17, "Third-Party Directory Integration Concepts and Considerations"](#)

If you are configuring a demonstration of integration with Sun Java System Directory, then see the Oracle By Example series for Oracle Identity Management Release 10g (10.1.4.2), available on Oracle Technology Network at <http://www.oracle.com/technology/>

Verifying Synchronization Requirements for Sun Java System Directory

Before configuring basic or advanced synchronization with Sun Java System Directory, ensure that your environment meets the necessary synchronization requirements by following the instructions in "[Verifying Synchronization Requirements](#)" on page 18-1. Before synchronizing with Sun Java System directory, you must also perform the following steps:

- When creating a user account in Sun Java System Directory with sufficient privileges to perform import and export operations, be sure to assign sufficient permissions to read the tombstone
- Enable change logging on Sun Java System Directory
- Enable the Retro Change Log plug-in

Configuring Basic Synchronization with Sun Java System Directory

You use the express configuration command to quickly establish synchronization between Oracle Internet Directory and Sun Java System Directory. Express configuration uses default settings to automatically perform all required configurations, and also creates two synchronization profiles, one for import and one for export. To use express configuration to synchronize with Sun Java System Directory, follow the instructions in ["Creating Synchronization Profiles with Express Configuration"](#) on page 18-2.

Configuring Advanced Integration with Sun Java System Directory

When you install Oracle Directory Integration Platform, sample import and export synchronization profiles are automatically created for each of the supported third-party directories. The sample synchronization profiles created for Sun Java System Directory are:

- `iPlanetImport`—The profile for importing changes from Sun Java System Directory to Oracle Internet Directory
- `iPlanetExport`—The profile for exporting changes from Oracle Internet Directory to Sun Java System Directory

You can also use the express configuration option of the Directory Integration Assistant (`dipassistant`) to create additional synchronization profiles, as described in ["Configuring Basic Synchronization with Sun Java System Directory"](#) on page 21-2.

The import and export synchronization profiles created during the install process or with express configuration are only intended as a starting point for you to use when deploying your integration of Oracle Internet Directory and a Sun Java System Directory. Because the default synchronization profiles are created using predefined assumptions, you must further customize them for your environment by performing the following steps in the order listed:

- [Step 1: Planning Your Integration](#)
- [Step 2: Configuring the Realm](#)
- [Step 3: Customizing the ACLs](#)
- [Step 4: Customizing Attribute Mappings](#)
- [Step 5: Customizing the Sun Java System Directory Connector to Synchronize Deletions](#)
- [Step 6: Synchronizing Passwords](#)
- [Step 7: Synchronizing in SSL Mode](#)
- [Step 8: Configuring the Sun Java System Directory External Authentication Plug-in](#)
- [Step 9: Performing Post-Configuration and Administrative Tasks](#)

Step 1: Planning Your Integration

Plan your integration by reading [Chapter 17, "Third-Party Directory Integration Concepts and Considerations"](#), particularly ["Sun Java System Directory Integration Concepts"](#) on page 17-27. Be sure to create a new profile by copying the existing Sun Java System directory template profile by following the instructions in ["Creating a Profile"](#) on page 7-1.

Step 2: Configuring the Realm

Configure the realm by following the instructions in ["Configuring the Realm"](#) on page 18-6.

Step 3: Customizing the ACLs

Customize ACLs as described in ["Customizing Access Control Lists"](#) on page 18-7.

Step 4: Customizing Attribute Mappings

When integrating with Sun Java System Directory, the following attribute-level mapping is mandatory for all objects:

```
Targetdn:1: :person:orclsourceobjectdn: : orclSUNOneobject:
```

Example 21–1 Attribute-Level Mapping for the User Object in Sun Java System Directory

```
Cn:1: :person: cn: :person:
sn:1: :person: sn: :person:
```

Example 21–2 Attribute-Level Mapping for the Group Object in Sun Java System Directory

```
Cn:1: :groupofname: cn:groupofuniquenames
```

In the preceding examples, Cn and sn from Sun Java System Directory are mapped to cn and sn in Oracle Internet Directory.

Customize the attribute mappings by following the instructions in ["Customizing Mapping Rules"](#) on page 18-9.

Step 5: Customizing the Sun Java System Directory Connector to Synchronize Deletions

If you want to synchronize deletions, and the mapping rules have mandatory attributes, then be sure that the tombstone is configured correctly.

To verify that the tombstone is configured in Sun Java System Directory, execute the following command:

```
$ORACLE_HOME/bin/ldapsearch -h connected_directory_host
-p connected_directory_port -D connected_directory_account
-w connected_directory_password -b source_domain -s sub "objectclass=nstombstone"
```

This returns information on all deleted entries.

See Also: Sun Java System Directory documentation for details about configuring tombstones

Note: Tombstones are automatically configured for Sun Java System Directory if replication is enabled.

Step 6: Synchronizing Passwords

Oracle Internet Directory and Sun Java System Directory support the same set of password hashing techniques. To synchronize passwords between Oracle Internet Directory and Sun Java System Directory, ensure that SSL server authentication mode

is configured for both directories and that the following mapping rule exists in the mapping file:

```
Userpassword: : :person:userpassword: :person
```

Step 7: Synchronizing in SSL Mode

Configure Sun Java System Directory for synchronization in SSL mode by following the instructions in ["Configuring the Third-Party Directory Connector for Synchronization in SSL Mode"](#) on page 18-10.

Step 8: Configuring the Sun Java System Directory External Authentication Plug-in

Configure the Sun Java System Directory external authentication plug-in by following the instructions in [on page 18-12"Configuring External Authentication Plug-ins"](#).

Step 9: Performing Post-Configuration and Administrative Tasks

Read [Chapter 23, "Managing Integration with a Third-Party Directory"](#) for information on post-configuration and ongoing administration tasks.

Integrating with Novell eDirectory or OpenLDAP

This chapter outlines the procedures for integrating Oracle Identity Management with Novell eDirectory or OpenLDAP in a production environment. It contains these topics:

- [Verifying Synchronization Requirements for Novell eDirectory or OpenLDAP](#)
- [Configuring Basic Synchronization with Novell eDirectory or OpenLDAP](#)
- [Configuring Advanced Integration with Novell eDirectory or OpenLDAP](#)

Notes: This chapter assumes familiarity with the chapter on Oracle Internet Directory concepts and architecture in *Oracle Internet Directory Administrator's Guide*. It also assumes familiarity with the earlier chapters in this book, especially:

- [Chapter 1, "Introduction to Oracle Identity Management Integration"](#)
- [Chapter 4, "Managing the Oracle Directory Integration Platform"](#)
- [Chapter 5, "Oracle Directory Synchronization Service"](#)
- [Chapter 17, "Third-Party Directory Integration Concepts and Considerations"](#)

Synchronization is supported between Oracle Application Server 10g (10.1.4.0.1) or later and Novell eDirectory 8.6.2 or later or OpenLDAP 2.2.

Verifying Synchronization Requirements for Novell eDirectory or OpenLDAP

Before configuring basic or advanced synchronization with Novell eDirectory or OpenLDAP, ensure that your environment meets the necessary synchronization requirements by following the instructions in "[Verifying Synchronization Requirements](#)" on page 18-1.

Note: To reconcile correctly, additions and deletions must be performed from only one of the synchronized directories. In other words, you can perform additions and deletions from Oracle Internet Directory or eDirectory/OpenLDAP, but not both. However, modifications can be performed from either directory.

Configuring Basic Synchronization with Novell eDirectory or OpenLDAP

You use the express configuration command to quickly establish synchronization between Oracle Internet Directory and Novell eDirectory or OpenLDAP. Express configuration uses default settings to automatically perform all required configurations, and also creates two synchronization profiles, one for import and one for export. To use express configuration to synchronize with Novell eDirectory or OpenLDAP, follow the instructions in ["Creating Synchronization Profiles with Express Configuration"](#) on page 18-2.

Configuring Advanced Integration with Novell eDirectory or OpenLDAP

When you install Oracle Directory Integration Platform, sample import and export synchronization profiles are automatically created for each of the supported third-party directories. The sample synchronization profiles created for Novell eDirectory are:

- `Novell eDirectoryImp`—The profile for importing changes from Novell eDirectory to Oracle Internet Directory
- `Novell eDirectoryExp`—The profile for exporting changes from Oracle Internet Directory to Novell eDirectory

The sample synchronization profiles created for OpenLDAP are:

- `OpenLDAPImport`—The profile for importing changes from OpenLDAP to Oracle Internet Directory
- `OpenLDAPExport`—The profile for exporting changes from Oracle Internet Directory to OpenLDAP

You can also use the express configuration option of the Directory Integration Assistant (`dipassistant`) to create additional synchronization profiles, as described in ["Configuring Basic Synchronization with Novell eDirectory or OpenLDAP"](#) on page 22-2. The import and export synchronization profiles created during the install process or with express configuration are only intended as a starting point for you to use when deploying your integration of Oracle Internet Directory and Novell eDirectory or OpenLDAP. Because the default synchronization profiles are created using predefined assumptions, you must further customize them for your environment by performing the following steps in the order listed:

- [Step 1: Planning Your Integration](#)
- [Step 2: Configuring the Realm](#)
- [Step 3: Customizing the Search Filter to Retrieve Information from Novell eDirectory or OpenLDAP](#)
- [Step 4: Customizing the ACLs](#)
- [Step 5: Customizing Attribute Mappings](#)
- [Step 6: Customizing the Novell eDirectory or OpenLDAP Connector to Synchronize Deletions](#)
- [Step 7: Specifying Synchronization Parameters for the Additional Config Information Attribute](#)
- [Step 8: Configuring the OpenLDAP Connector to Synchronize Passwords](#)
- [Step 9: Synchronizing in SSL Mode](#)

- [Step 10: Configuring the Novell eDirectory or OpenLDAP External Authentication Plug-in](#)
- [Step 11: Performing Post-Configuration and Administrative Tasks](#)

Step 1: Planning Your Integration

Plan your integration by reading [Chapter 17, "Third-Party Directory Integration Concepts and Considerations"](#), particularly ["Novell eDirectory and OpenLDAP Integration Concepts"](#) on page 17-28. Be sure to create a new profile by copying the existing eDirectory or OpenLDAP template profile by following the instructions in ["Creating a Profile"](#) on page 7-1.

Step 2: Configuring the Realm

Configure the realm by following the instructions in ["Configuring the Realm"](#) on page 18-6.

Step 3: Customizing the Search Filter to Retrieve Information from Novell eDirectory or OpenLDAP

By default, the Novell eDirectory or OpenLDAP Connector retrieves changes to all objects in the container based on the `modifytimestamp` attribute. If you are interested in retrieving changes to specific types of objects, such as changes to users and groups, then you should configure an LDAP search filter. This filter screens out changes that are not required when the Novell eDirectory or OpenLDAP Connector queries Novell eDirectory or OpenLDAP. The filter is stored in the connected directory matching filter attribute (`orclodipcondirmatchingfilter`) in the synchronization profile.

The Novell eDirectory and OpenLDAP sample import profiles are configured to retrieve changes to users, groups, and container objects from Novell eDirectory and OpenLDAP, respectively. Computers are not retrieved. The value of the `searchfilter` attribute is set as follows:

```
searchfilter=(&(!(modifiersname=connected_dir_account))
(|(objectclass=domain)(objectclass=organizationalunit)
(objectclass=organization)(objectclass=person)(objectclass=groupofnames)))
```

You use the Directory Integration Assistant (`dipassistant`) to update the `searchfilter` attribute if you want to synchronize entries other than users or groups. For example, the following command updates the `searchfilter` attribute to synchronize only users and groups:

```
dipassistant mp -h host -p port -D binddn -profile profilename
odip.profile.condirfilter=searchfilter=
(|(objectclass=groupofnames)(objectclass=person))
```

Note: All attributes specified in the `searchfilter` attribute should be configured as indexed attributes in Novell eDirectory or OpenLDAP.

See Also: The appendix on the LDAP filter definition in *Oracle Internet Directory Administrator's Guide* for instructions on configuring an LDAP search filter

Step 4: Customizing the ACLs

Customize ACLs as described in ["Customizing Access Control Lists"](#) on page 18-7.

Step 5: Customizing Attribute Mappings

When integrating with Novell eDirectory, the following attribute-level mapping is mandatory for all objects:

```
GUID:1 : :orclNDSObjectGUID: :orclndsObject:bin2b64(guid)
Modifytimestamp:1 : :orclsourcemodifytimestamp: :orclndsobject:
Createtimestamp:1 : :orclsourcecreatetimestamp: :orclndsobject:
Targetdn:1 : :orclsourceobjectdn: :orclndsobject:
```

When integrating with OpenLDAP, the following attribute-level mapping is mandatory for all objects:

```
entryuuid:1 : :orclOpenLdapEntryUUID: :orclOpenLdapObject
Modifytimestamp:1 : :orclsourcemodifytimestamp: :orclOpenLdapObject
Createtimestamp:1 : :orclsourcecreatetimestamp: :orclOpenLdapObject
Targetdn:1 : :orclsourceobjectdn: :orclOpenLdapObject:
```

Example 22-1 Attribute-Level Mapping for the User Object in Novell eDirectory or OpenLDAP

```
Cn:1 : :person: cn: :person:
sn:1 : :person: sn: :person:
```

Example 22-2 Attribute-Level Mapping for the Group Object in Novell eDirectory or OpenLDAP

```
Cn:1 : :groupofname: cn:groupofuniquenames
```

In the preceding examples, Cn and sn from Novell eDirectory or OpenLDAP are mapped to cn and sn in Oracle Internet Directory.

Customize the attribute mappings by following the instructions in ["Customizing Mapping Rules"](#) on page 18-9.

Step 6: Customizing the Novell eDirectory or OpenLDAP Connector to Synchronize Deletions

Synchronizing deletions from Novell eDirectory or OpenLDAP in Oracle Internet Directory is handled with the reconciliation approach, as described in ["Synchronizing from Novell eDirectory or OpenLDAP to Oracle Internet Directory"](#) on page 17-28. To avoid decreased performance on the server when synchronizing deletions from Novell eDirectory or OpenLDAP in Oracle Internet Directory, you can customize the comparison to search specific subsets of the DIT. You specify the subset search criteria as part of the map file by using the `ReconciliationRules` keyword.

The default reconciliation rules for Novell eDirectory are as follows:

```
inetorgperson:cn:*
groupofnames:cn:*
```

The default reconciliation rules for OpenLDAP are as follows:

```
inetorgperson:cn:*
groupofuniquenames:cn:*
```

The preceding rules specify that the search criteria be applied in the following two steps:

1. Search for all entries in the `inetorgperson` object class. You can also specify different subsets within this rule according to the attribute values.
2. Search for all entries in the `groupofnames` object class in Novell eDirectory or in the `groupofuniqueNames` object class in OpenLDAP.

How Do I Define a Reconciliation Rule?

You define a reconciliation rule with one object class, one attribute, and any number of values. You can use any attribute that is synchronized with Oracle Internet Directory to define a reconciliation rule. However, you must observe the following two requirements:

- The attribute of the specified object class must be defined in the mapping rules
- The corresponding Oracle Internet Directory attribute must be indexed

For example, consider the following reconciliation rule:

```
myobjclass:myattr:val1:val2:val3
```

In the preceding reconciliation rule, the name of the object class is `myobjclass` and the name of the attribute is `myattr`. You can assign values of `val1`, `val2`, or `val3` to the `myattr` attribute. To use the `myattr` attribute, the following mapping rule must be defined:

```
myattr: : : myobjclass:attr: :objclass:
```

The preceding mapping rule defines the `myattr` attribute in the `myobjclass` object class, and `attr` is the corresponding Oracle Internet Directory attribute that should be indexed.

How are Reconciliation Rules Used to Synchronize Deletions?

Defining reconciliation rules generates search filters that query Novell eDirectory or OpenLDAP to determine the number of deleted entries. For example, with the `myobjclass` and `attr` reconciliation rule example in the previous section, the following search filters are generated in Novell eDirectory or OpenLDAP:

- `(&(objectclass= myobjclass)
(createtimestamp<=orclodipreconciliationtimestamp)
(myattr=val1))`
- `(&(objectclass= myobjclass) (createtimestamp<=
orclodipreconciliationtimestamp) (myattr=val2))`
- `(&(objectclass= myobjclass) (createtimestamp<=
orclodipreconciliationtimestamp) (myattr=val3))`

The reconciliation rule and mapping rule also generate corresponding filters in Oracle Internet Directory. For example, the following Oracle Internet Directory filters are generated for the `myobjclass` and `attr` reconciliation rule:

- `(&(objectclass= objclass)
(orclndsobjectguid=*) (orclSourceCreateTimeStamp<=
orclodipreconciliationtimestamp) (attr=val1))`
- `(&(objectclass= objclass)
(orclndsobjectguid=*) (orclSourceCreateTimeStamp<=
orclodipreconciliationtimestamp) (attr=val2))`

- `(&(objectclass= objclass)
(orclndsobjectguid=*)(orclSourceCreateTimeStamp<=
orclodipreconciliationtimestamp) (attr=val3))`

Step 7: Specifying Synchronization Parameters for the Additional Config Information Attribute

The Additional Config Info (`orclodipAgentConfigInfo`) attribute in a synchronization profile stores any additional configuration information needed by a connector to synchronize Oracle Internet Directory with a connected directory. You can use the `SearchDeltaSize` and `SkipErrorToSyncNextChange` parameters with any connected directory, as described in ["Additional Configuration Information"](#) on page 6-3. With Novell eDirectory and OpenLDAP, you can also use the parameters listed in [Table 22–1](#) to specify additional configuration information.

Table 22–1 Novell eDirectory and OpenLDAP Synchronization Parameters for the Additional Config Info Attribute

Parameter	Description
<code>AttributeType</code>	Indicates the type of the <code>UniqueAttribute</code> parameter. You assign to this parameter a value of <code>Binary</code> for Novell eDirectory or <code>nonBinary</code> for OpenLDAP. This parameter is used to obtain the corresponding Oracle Internet Directory attribute for the attribute that is defined in the mapping file.
<code>CheckAllEntries</code>	Determines how deleted entries in Novell eDirectory or OpenLDAP are synchronized with Oracle Internet Directory. If you assign a value of <code>true</code> to this parameter, the Oracle Directory Integration Platform identifies deleted entries by performing a linear comparison between the entries in Oracle Internet Directory and Novell eDirectory or OpenLDAP. If an entry does not exist in Novell eDirectory or OpenLDAP, the entry is deleted from Oracle Internet Directory. If you assign a value of <code>false</code> to this parameter, deleted entries are synchronized according to the difference between the number of entries in the connected directory and the number of entries in Oracle Internet Directory. If the number of deleted entries is 0 or less than 0, then there are no deleted entries to synchronize. However, if the number of deleted entries is greater than 0, then the Oracle Directory Integration Platform compares each entry in Oracle Internet Directory with Novell eDirectory or OpenLDAP to identify the deleted entries to synchronize. The Oracle Directory Integration Platform continues to compare entries until it locates the same number of deleted entries as the difference between the number of entries in the connected directory and the number of entries in Oracle Internet Directory. For better performance, you should assign a value of <code>false</code> to this parameter.
<code>ReduceFilterTimeInSeconds</code>	Specifies the time difference between a computer that is running Oracle Internet Directory and a computer that is running Novell eDirectory. This parameter is necessary because synchronization between Oracle Internet Directory and Novell eDirectory will not function properly if the time on the Novell eDirectory computer is earlier than the time on the Oracle Internet Directory computer. You assign to this parameter a value in seconds that is equal to the time difference between the two computers. The default value is 0.

Table 22–1 (Cont.) Novell eDirectory and OpenLDAP Synchronization Parameters for the Additional Config Info Attribute

Parameter	Description
UniqueAttribute	Identifies the unique attribute in Novell eDirectory or OpenLDAP that can be used to search for an entry. You assign to this parameter a value of GUID for Novell eDirectory or entryuuid for OpenLDAP.

Step 8: Configuring the OpenLDAP Connector to Synchronize Passwords

The Oracle directory integration platform can synchronize password changes from Oracle Internet Directory to Novell eDirectory or OpenLDAP only when the directories are running SSL server-side authentication. You cannot synchronize passwords from Novell eDirectory to Oracle Internet Directory. However, you can synchronize passwords from OpenLDAP to Oracle Internet Directory by performing the following tasks:

- Add a mapping rule that enables password synchronization. For example:

```
userpassword: : : inetorgperson: userpassword: person
```

- Enable the password policy and reversible password encryption in the Oracle directory server. To do this, assign a value of 1 to the `orclPwDPolicyEnable` and `orclPwDEncryptionEnable` attributes in the entry `cn=PwDPolicyEntry, cn=common, cn=products, cn=oraclecontext, DN_of_realm`. You can do this by using either Oracle Directory Manager or `ldapmodify` by uploading an LDIF file containing the following entries:

```
dn:cn=PwDPolicyEntry,cn=common,cn=products,cn=oraclecontext,DN_of_realm.
changetype: modify
replace: orclPwDPolicyEnable
orclPwDPolicyEnable: 1
-
replace: orclPwDEncryptionEnable
orclPwDEncryptionEnable: 1
```

See Also:

- ["Configuring the Third-Party Directory Connector for Synchronization in SSL Mode"](#) on page 18-10
- The section ["Configuring Mapping Rules"](#) on page 6-4 for instructions on adding mapping rules
- The chapter on directory storage of password verifiers in *Oracle Internet Directory Administrator's Guide* for information about enabling reversible encryption

Step 9: Synchronizing in SSL Mode

Configure the Novell eDirectory or OpenLDAP connector for synchronization in SSL mode by following the instructions in ["Configuring the Third-Party Directory Connector for Synchronization in SSL Mode"](#) on page 18-10.

Step 10: Configuring the Novell eDirectory or OpenLDAP External Authentication Plug-in

Configure the Novell eDirectory or OpenLDAP external authentication plug-in by following the instructions in "[Configuring External Authentication Plug-ins](#)" on page 18-12.

Step 11: Performing Post-Configuration and Administrative Tasks

Read [Chapter 23, "Managing Integration with a Third-Party Directory"](#) for information on post-configuration and ongoing administration tasks.

Managing Integration with a Third-Party Directory

This chapter contains information on post-configuration and ongoing administration tasks. It contains these topics:

- [Tasks After Configuring with a Third-Party Directory](#)
- [Typical Management of Integration with a Third-Party Directory](#)

Tasks After Configuring with a Third-Party Directory

Once configuration is complete, do the following:

1. Migrate data from one directory to the other as needed. This is described in ["Bootstrapping Data Between Directories"](#) on page 23-2.
2. Use the Directory Integration Assistant to enable the synchronization profile by entering the following command:

```
$ORACLE_HOME/bin/dipassistant modifyprofile  
[-h host name] [-p port_number] [-D bind_DN]  
-profile profile_name_in_OID odip.profile.status=ENABLE
```

3. Start the Oracle directory integration server using the configuration set that corresponds to that of the profile. See ["Starting, Stopping, and Restarting the Oracle Directory Integration Platform"](#) on page 4-8.

Typical Management of Integration with a Third-Party Directory

Management tasks typically include:

- Managing synchronization profiles and mapping rules:
 - Creating new profiles. You create new profiles if you need to synchronize with an additional domain controller in a multiple domain environment.

You can create new profiles by using existing profiles as templates. To do this, use the `createlike` command of the Directory Integration Assistant (`dipassistant`) utility.
 - Changing configurations (attributes) in the profile.
 - Disabling profiles to allow maintenance and then reenabling them. Disabling profiles stops synchronization related to that profile.
- Managing mapping rules:

- Creating new rules when additional attributes need to be synchronized.
- Changing existing rules when the way attributes are synchronized needs to change.
- Deleting or commenting out rules not required when a particular attribute is not required to be synchronized.
- Managing access control.
- Starting and stopping the Oracle directory server and the Oracle directory integration server.

This section contains these topics:

- [Bootstrapping Data Between Directories](#)
- [Managing a Third-Party Directory External Authentication Plug-in](#)

See Also:

- *Oracle Identity Management User Reference* for instructions on starting and stopping servers and how to use the Directory Integration Assistant (dipassistant) utility
- *Oracle Identity Management Infrastructure Administrator's Guide* for instructions about how to use the Identity Management Grid Control Plug-in to manage integration with a third-party directory

Bootstrapping Data Between Directories

Bootstrapping is sometimes called data migration. To bootstrap data, do the following once the third-party directory connector and plug-in configurations are complete:

1. Identify the data you want to migrate. You can choose to migrate all data in the directory or only a subset of data.
2. Use the following command to disable the import and export synchronization profile:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -host myhost -port myport
-file import.profile -dn bind_DN -passwd password_of_bind_DN
-profile profile_name odip.profile.status=DISABLE
```

3. Bootstrap from one directory to another by using the Directory Integration Assistant (dipassistant) with the `-bootstrap` option. Bootstrapping is described in [Chapter 8, "Bootstrapping a Directory in Oracle Directory Integration Platform"](#).

Once bootstrapping is accomplished, the profile status attributes are appropriately updated in the synchronization profile by the Directory Integration Assistant (dipassistant).

4. If you used LDIF file-based bootstrapping, then initialize the `lastchangekey` value with the Directory Integration Assistant (dipassistant) as follows:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -updlcn
```

This `lastchangekey` attribute should be set to the value of the last change number in the source directory before you started the bootstrap.

5. If two-way synchronization is required, then enable the export profile and make sure the change logging option is enabled for the Oracle directory server. Change logging is controlled by the `-l` option while starting Oracle Internet Directory. By

default, it is set to `TRUE`, meaning that change logging is enabled. If it is set to `FALSE`, then use the OID Control Utility to shut down the Oracle directory server, and then to start the server again with the change log enabled.

Managing a Third-Party Directory External Authentication Plug-in

This section explains how to delete, disable, and re-enable a third-party external authentication plug-in.

Deleting a Third-Party Directory External Authentication Plug-in

To delete a third-party external authentication plug-in, enter the following commands:

```
ldapdelete -h host -p port -D cn=orcladmin -w password
"cn=adwhencompare,cn=plugin,cn=subconfigsubentry"
```

```
ldapdelete -h host -p port -D cn=orcladmin -w password
"cn=adwhenbind,cn=plugin,cn=subconfigsubentry"
```

Disabling a Third-Party External Authentication Plug-in

To disable a third-party external authentication plug-in:

1. Create an LDIF file with the following entries:

```
dn: cn=adwhencompare,cn=plugin,cn=subconfigsubentry
changetype: modify
replace: orclpluginenable
orclpluginenable: 0
```

```
dn: cn=adwhenbind,cn=plugin,cn=subconfigsubentry
changetype: modify
replace: orclpluginenable
orclpluginenable: 0
```

2. Load the LDIF file with the `ldapmodify` command, as follows:

```
ldapmodify -h host -p port -D cn=orcladmin -w password -f fileName
```

Re-enabling a Third-Party External Authentication Plug-in

To re-enable a third-party external authentication plug-in, use these two commands:

1. Create an LDIF file with the following entries:

```
dn: cn=adwhencompare,cn=plugin,cn=subconfigsubentry
changetype: modify
replace: orclpluginenable
orclpluginenable: 1
```

```
dn: cn=adwhenbind,cn=plugin,cn=subconfigsubentry
changetype: modify
replace: orclpluginenable
orclpluginenable: 1
```

2. Load the LDIF file with the `ldapmodify` command, as follows:

```
ldapmodify -h host -p port -D cn=orcladmin -w password -f fileName
```


Part VI

Appendixes

Part VI contains these appendixes:

- [Appendix A, "Elements in the Oracle Directory Integration Server Administration Tool"](#)
- [Appendix B, "Case Study: A Deployment of Oracle Directory Integration Platform"](#)
- [Appendix C, "Troubleshooting the Oracle Directory Integration Platform"](#)

Elements in the Oracle Directory Integration Server Administration Tool

This appendix describes the windows and corresponding fields in the Oracle Directory Integration Server Administration tool. It contains these sections:

- [Windows and Tabs for Connecting to a Directory Server](#)
- [Windows and Tabs in the Oracle Directory Integration Server Administration Tool](#)
- [Tabs and Fields for Registering and Editing a Connector Profile](#)

Windows and Tabs for Connecting to a Directory Server

This section lists and describes the windows and tabs you use to connect to a directory server. It contains these topics:

- [Credentials Tab](#)
- [Directory Server Connection Window](#)
- [Select Directory Server Window](#)
- [Select Distinguished Name \(DN\) Path: All Entries Window](#)
- [Server Process Window](#)
- [SSL Tab](#)

Credentials Tab

[Table A-1](#) describes the fields on the Credentials tab of the Login window.

Table A-1 *Fields in the Credentials Window*

Field Name	Description
User	<p>The default value for the user name is dipadmin. This is the nickname of the user whose entry is cn=dipadmin,cn=odi,cn=oracle internet directory.</p> <p>If you have already set up the user's entry by using LDAP command-line tools, then you can enter that user's entry in one of two ways:</p> <ul style="list-style-type: none">▪ Browse and select that entry by using the button to the right of the User field.▪ Enter the distinguished name (DN) for that user entry by using the correct format, for example: <code>cn=Susie Brown,ou=HR,o=acme,c=us</code> <p>If you do not have the correct privileges, then access to the tool is denied. To use this tool, you must be a member of the following group: cn=dipadmingrp,cn=dipadmin,cn=directory integration platform,cn=products,cn=oraclecontext.</p>

Table A–1 (Cont.) Fields in the Credentials Window

Field Name	Description
Password	<p>If you are logging in as the super user and you specified a password for the super user during installation, in the Password field, enter the password you specified. Otherwise, enter the default password, namely, <code>welcome</code>. After you are logged into Oracle Directory Integration Server Administration and have connected to a directory server, you should change this password to protect the directory.</p> <p>If you are logging in anonymously, leave the Password field empty.</p> <p>If you want to log in as a specific directory user, enter the corresponding password.</p> <p>See Also: The chapter about directory server administration in <i>Oracle Internet Directory Administrator's Guide</i>, for instructions about how to change the password</p>
Server	<p>The first time you log in, the Oracle Directory Integration Server Administration tool displays the name of default Oracle directory server you specified during the Oracle Application Server installation.</p> <p>It obtains the information for the directory server by checking first the value for the <code>oidhost</code> parameter in the <code>ias.properties</code> file in the <code>\$ORACLE_HOME/config</code> directory. If no value is specified there, then it checks the value for the <code>host</code> parameter in the <code>osdadmin.ini</code> file. If no value is specified there, then it displays the value <code>localhost</code> in the Server field.</p> <p>If you are want to connect to a server on a different host:</p> <ol style="list-style-type: none"> 1. Click the button to the right of the Server list. The Select Directory Server Window window displays a list of available servers. 2. Select a server. 3. Click OK. <p>To add a directory server to the list:</p> <ol style="list-style-type: none"> 1. In the Select Directory Servers window, click Add. The Directory Server Connection Window window appears. 2. In the Server field, enter the name of the directory server you want to add. 3. In the Port field, enter the port number for the server you want to add. 4. Click OK. The added directory appears in the list in the Select Directory Server window. <p>To modify a directory server on the list:</p> <ol style="list-style-type: none"> 1. Select the directory server you want to modify. 2. Click Edit. The Directory Server Connection window appears. 3. Modify the Server and Port fields, then click OK. The modifications for that server appear in the list in the Select Directory Server window.
Port	<p>The first time you log in, the Oracle Directory Integration Server Administration tool displays the name of default Oracle directory server port you specified during the Oracle Application Server installation. It obtains this information by checking the value of the <code>oidport</code> parameter in the <code>ias.properties</code> file. If no value is specified there, then it checks the value for the <code>port</code> parameter in the <code>osdadmin.ini</code> file. If no value is specified there, then it displays the value <code>389</code>.</p> <p>To change this port number:</p> <ol style="list-style-type: none"> 1. Click the button to the right of the Server field. 2. In the Select Directory Server window, select the directory server. 3. Click Edit. The Directory Server Connection window appears. 4. In the Directory Server Connection window, in the Port field, enter the new port number, then click OK.

Directory Server Connection Window

Use this window to add a directory server to the list in the [Select Directory Server Window](#) window.

Select Directory Server Window

This window displays a list of all directory servers to which you have connected at any time in the past. You can select a directory server from the list, either to connect to it, delete it, edit it, or to use it as a template for another management connection. To add a server to this list, click **Add**. The [Directory Server Connection Window](#) window appears.

Select Distinguished Name (DN) Path: All Entries Window

Use this window to display the hierarchy of all containers in the directory information tree (DIT).

Click the plus sign (+) next to the top-level entry to expand the tree. Expand the tree by clicking plus signs to see the subordinate entries. When you click a plus sign to expand an entry, that plus sign becomes a minus sign (-).

Note: Although an entry that does not have subordinate entries may appear with a plus sign, when you click that plus sign, it disappears. Entries that have no plus or minus sign next to them are leaf nodes on the tree.

Select the entry you want and click **OK**. That entry appears in the **Server** field on the Login dialog box.

Server Process Window

This window displays configuration settings for the selected process. [Table A-2](#) describes the fields in the Server Process.

Table A-2 Fields in the Server Process Window

Field Name	Description
Instance	The current directory integration server instance.
Configuration Set	The configuration set entry that was used to start the directory integration server.
Host Name	The host name from which the directory integration server started.
Agent Refresh Flag	The number of minutes between server refreshes for any changes in Oracle Directory Integration Platform profiles.
Oracle DIP Instance Status	Indicates whether an instance of the Oracle directory integration platform server should continue running or shut down.
Oracle DIP Profile Execution Group Identifier	The profile group that was used to start the directory integration server.

SSL Tab

[Table A-3](#) describes the fields on the SSL tab of the Login window.

Table A-3 Fields in the SSL Window

Field Name	Description
SSL Location	The location of the user's wallet.
SSL Password	The password to open the user's wallet.

Table A–3 (Cont.) Fields in the SSL Window

Field Name	Description
SSL Authentication	<p>Select the authentication level:</p> <ul style="list-style-type: none"> ■ No SSL Authentication—Neither the client nor the server authenticates itself to the other. No certificates are sent or exchanged. If you selected the SSL Enabled check box on the Credentials tab, and choose this option, then only SSL encryption/decryption will be used. ■ SSL Client and Server Authentication—Two-way authentication. Both client and server send certificates to each other. ■ SSL Server Authentication—One-way authentication. Only the directory server authenticates itself to the client by sending its certificate to the client.

Windows and Tabs in the Oracle Directory Integration Server Administration Tool

This section describes the windows and tabs in the Oracle Directory Integration Server Administration tool. It contains these topics:

- [Add New Connector Group Window](#)
- [Configure Access Control Policy Management Tab](#)
- [Configure Entry Management Tab](#)
- [Configuration Set Window](#)
- [Configuration Set Management Window](#)
- [Connector Group Window](#)
- [Connector Group Management Window](#)
- [Connector Profile Management Window](#)
- [Connected Directory Failover setup for External Authentication Plug-ins Window](#)
- [LDAP Connector Express Setup Window](#)
- [Profile Selector Window](#)
- [Rename Connector Group Window](#)
- [Select Distinguished Name \(DN\) Path: All Containers Window](#)
- [Select Distinguished Name \(DN\) Path: Tree View Window](#)

Add New Connector Group Window

Use this window to enter the name of a new connector profile group. Note that connector names cannot include spaces.

Configure Access Control Policy Management Tab

Use this tab to determine whether the navigator pane displays all ACPs automatically or only as the result of a search. If you have a large number of ACPs, then you may want to display them only as the result of a search.

Configure Entry Management Tab

Use this tab to specify:

- The number of entries the Oracle Directory Integration Server Administration tool displays in a search result
- The duration of searches

You can make these configurations in this tool, directory server, or both.

If you make the configuration in both this tool and the directory server, and the two configurations do not match, then Oracle Internet Directory resolves the conflict as follows:

- If the value you set in this tool is greater than that in the directory server, then the configuration of the server prevails. For example, if you set this tool to search for 2 minutes, and the directory server for 3 minutes, then the actual search duration will be 3 minutes.
- If the value you set in this tool is less than that in the directory server, then the configuration of this tool prevails. For example, if you set this tool to search for 2 minutes, and the server for 3 minutes, then the actual search duration is 2 minutes.

Configuration Set Window

[Table A-4](#) describes the fields in the Configuration Set window.

Table A-4 Fields in the Configuration Set Window

Field Name	Description
LDAP Search Time Limit	The maximum LDAP search time limit
Refresh Interval	The interval in minutes when the Oracle directory integration server searches Oracle Internet Directory for any integration profile modifications. If the mapping rules for an integration profile are modified during a synchronization iteration, they will be updated by the Oracle directory integration server during the next iteration.
Debug Level	Specify the logging level for debugging.
File Size Limit (Trace)	The maximum size of trace files.
LDAP Search Count Limit	The maximum number of LDAP searches to perform.
SSL Mode	Select the authentication level: <ul style="list-style-type: none"> ■ No SSL Authentication—Neither the client nor the server authenticates itself to the other. No certificates are sent or exchanged. If you selected the SSL Enabled check box on the Credentials tab, and choose this option, then only SSL encryption/decryption will be used. ■ SSL Client and Server Authentication—Two-way authentication. Both client and server send certificates to each other. ■ SSL Server Authentication—One-way authentication. Only the directory server authenticates itself to the client by sending its certificate to the client.
Commit Size	The maximum number of changes that are synchronized in a synchronization cycle.
Wallet Location	The location of the user's SSL wallet.
File Size Limit (Audit)	The maximum size of audit files.

Configuration Set Management Window

This window displays a list of configuration sets. To display a configuration set's parameters, select the configuration set entry in the navigator pane. The parameters appear in the [Configuration Set Window](#) window. You can create a new configuration set by clicking the **Add Configuration Set** button. This displays the New Configuration Set window, which contains the same fields that are listed in the [Configuration Set Window](#) window.

Connector Group Window

This window displays information about the connector profiles associated with a connector profile group. If this window is empty, then no connector profiles are associated with this connector profile group. The columns of the Connector Group window are:

- **Connector Name:** The RDN component of the DN for this connector profile.
- **Synchronization Mode:** Specifies whether the profile is used for importing or exporting. An import operation brings changes from a connected directory into Oracle Internet Directory. An export operation brings changes from Oracle Internet Directory into a connected directory.
- **Connector Status:** Specifies whether the profile is enabled or disabled.

You can also use the Connector Group window to:

- Associate a connector profile with a connector profile group by clicking **Associate Profile**. This displays the [Profile Selector Window](#) window. If a connector profile is already associated with a connector profile group, you must first disassociate the profile before you can associate it with a different connector profile group.
- Disassociate a profile from a connector profile group by selecting it and clicking **Disassociate Profile**. This displays a window that prompts you to confirm disassociation of the connector profile from the group.

Connector Group Management Window

Use this window to create or modify connector profile groups can:

- Create a new connector profile group by clicking **Add Connector Group**. This displays the [Connector Group Window](#) page.
- Edit a connector profile group by selecting it, and then clicking **Edit**. This displays the [Connector Group Window](#) page.

Connector Profile Management Window

This window displays all of the Oracle Directory Integration Platform integration profiles in Oracle Internet Directory. Use this window to create or modify a connector profile. You can:

- Create a connector profile by copying an existing one. To do this, select the connector profile you want to copy, then click **Create Like**. The Integration Profile window displays the [General Tab](#) window.
- Create a connector profile without copying an existing one. To do this, click **Create New**. The Integration Profile window displays the [General Tab](#) window.
- Edit a connector profile by selecting it, and then click **Edit**. This displays the [General Tab](#) window.

- Delete a connector profile by selecting it, and then click **Delete**. This displays a window that prompts you to confirm deletion of the connector profile.

Connected Directory Failover setup for External Authentication Plug-ins Window

Table A–5 describes the fields in the Connected Directory Failover setup for External Authentication Plug-ins window.

Table A–5 Fields in the Connected Directory Failover setup for External Authentication Plug-ins Window

Field Name	Description
Failover Host	The failover host name where the directory server is running.
Failover Port	The failover port where the directory server is running.
SSL Mode	Determines whether the connection to the failover host is in SSL mode; can be set to Non-SSL or SSL-Only.
Wallet Location	Location of the SSL wallet. Required if communication to the failover host is in SSL mode.
Wallet Password	Password of the SSL wallet. Required if communication to the failover host is in SSL Mode.

LDAP Connector Express Setup Window

Table A–6 describes the fields in the LDAP Connector Express Setup window.

Table A–6 Fields in the LDAP Connector Express Setup Window

Field Name	Description
Connected Directory Type	The type of connected directory. You can select one of the following options: <ul style="list-style-type: none"> ■ Microsoft Active Directory ■ Novell eDirectory ■ OpenLDAP ■ Sun Java System Directory
Create Like	Create a connector profile by copying an existing one.
Connector Name	The connector name.
Connected Directory Host	The host where the connected directory is running.
Connected Directory Port	The port where the connected directory is running.
Connected Directory SSL Enabled	Specify whether the connection to the target directory is in SSL mode.
Connected DirectoryUser	The user name of the connected directory user.
Connected Directory User Password	The password of the connected directory user.
Synchronization Mode	The direction of the synchronization. You can select Target -> OID to synchronize from the target directory to Oracle Internet Directory or you can select OID -> Target to synchronize from Oracle Internet Directory to the target directory.
Connector Group	The connector profile group with which to associate the connector profile.

Table A–6 (Cont.) Fields in the LDAP Connector Express Setup Window

Field Name	Description
Synchronization Domains	The domains with which the profile will synchronize. Click the Browse button to select a domain with the Select Distinguished Name (DN) Path: All Entries Window window. You can select multiple domains in this window.
Enable Connector Profile	Enable or disable the connector profile.
Configure External Authentication plug-ins	Use an external plug-in to handle authentication.

Note: When using Connector Express to create an export or import profile, the default synchronization mode is Target->OID. This can cause you to inadvertently configure an import profile when you intended to configure an export profile. Even though Export Profile field is the first field on this page, and the Synchronization Mode field is a later selection on this page, you must select the synchronization mode before selecting an export profile.

If you select the export profile before the synchronization mode, mapping rules are created for importing.

Profile Selector Window

This window allows you to select a connector profile to associate with a connector profile group. Only profiles that are not already associated with any connector groups are displayed. The columns of the Profile Selector window are:

- Connector Name: The RDN component of the DN for this connector profile.
- Synchronization Mode: Specifies whether the profile is used for importing or exporting. An import operation brings changes from a connected directory into Oracle Internet Directory. An export operation brings changes from Oracle Internet Directory into a connected directory.
- Profile Status: Specifies whether the profile is enabled or disabled.

Rename Connector Group Window

Use this window to rename a connector group. Note that connector names cannot include spaces.

Select Distinguished Name (DN) Path: All Containers Window

Use this window to display the hierarchy of all containers in the directory information tree (DIT).

Click the plus sign (+) next to the top-level entry to expand the tree. Expand the tree by clicking plus signs to see the subordinate entries. When you click a plus sign to expand an entry, that plus sign becomes a minus sign (-).

Note: Although an entry that does not have subordinate entries may appear with a plus sign, when you click that plus sign, it disappears. Entries that have no plus or minus sign next to them are leaf nodes on the tree.

Select the entry you want and click **OK**. That entry appears in the **Synchronization Domains** field in the LDAP Connector Express Setup window.

Select Distinguished Name (DN) Path: Tree View Window

Use this window to display the hierarchy of all entries in the directory information tree (DIT).

Click the plus sign (+) next to the top-level entry to expand the tree. Expand the tree by clicking plus signs to see the subordinate entries. When you click a plus sign to expand an entry, that plus sign becomes a minus sign (-).

Note: Although an entry that does not have subordinate entries may appear with a plus sign, when you click that plus sign, it disappears. Entries that have no plus or minus sign next to them are leaf nodes on the tree.

Select the entry you want and click **OK**. That entry appears in the **Root of the Search** field in the Search window.

Tabs and Fields for Registering and Editing a Connector Profile

This section lists and describes the tabs and fields in the Integration Profile window, which you use when registering and editing a connector profile. It contains these topics:

- [Attribute Rule Window](#)
- [Domain Rule Window](#)
- [Edit Source Attribute Window](#)
- [Filtering Tab](#)
- [General Tab](#)
- [Mapping Tab](#)
- [Others Tab](#)
- [Select Source Attributes Window](#)
- [Status Tab](#)

Attribute Rule Window

This window allows you to create mapping rules for attributes of the objects that are being managed. [Table A-7](#) describes the fields in the Attribute Rule window.

Table A-7 *Fields in the Attribute Rule Window*

Field Name	Description
Source Object Class	The object class in the source directory. Do not enter a value into this field when synchronizing with a non-LDAP source.

Table A–7 (Cont.) Fields in the Attribute Rule Window

Field Name	Description
Source Attributes	<p>The source directory attributes to which you want to apply the mapping rule. When synchronizing with LDAP sources, the Oracle directory integration server automatically retrieves the source attributes from the source directory's schema. Use the following buttons to manage non-LDAP source attributes:</p> <ul style="list-style-type: none"> ■ Add—Adds a source attribute rule with the Select Source Attributes Window. ■ Delete—Displays a window that prompts you to confirm deletion of a source attribute. ■ Edit—Edits a source attribute rule with the Edit Source Attribute Window.
Destination Object Class	The destination object type or class. Use the destination object class for LDAP targets.
Destination Attribute	The destination attribute name to which you want to apply the mapping rule.
Destination Attribute Type	The type of the attribute in the destination directory.
Attribute Mapping Rule	The transformation rule that derives the destination attribute value from the source attribute value.

Domain Rule Window

This window allows you to create mapping rules for the domain or container from which objects are synchronized into Oracle Internet Directory. [Table A–8](#) describes the fields in the Domain Rule window.

Table A–8 Fields in the Domain Rule Window

Field Name	Description
Source Domain	The name of the source container from which the objects are synchronized. Enter a value of NONLDAP if you are synchronizing with a non-LDAP source.
Destination Domain	The name of the destination container into which the objects are synchronized. Enter a value of NONLDAP if you are synchronizing with a non-LDAP source.
Domain Mapping Rule	The specific mapping rule that determines how entries from the source container are mapped to the destination container.

Edit Source Attribute Window

Use this window to edit the name and type of a source attribute. You do not need to enter a value into the Source Attribute field when synchronizing with LDAP sources because the Oracle directory integration server automatically retrieves the source attribute name from the source directory's schema. However, you can enter a value into the Source Attribute field when synchronizing with a non-LDAP source.

Filtering Tab

[Table A–9](#) describes the fields on the Filtering tab.

Table A–9 Fields on the Filtering Tab

Field Name	Description
Connected Directory Matching Filter	Specify the attribute that uniquely identifies an entry in the connected directory or specify an ldap search filter for the connected directory in the format <code>searchfilter=ldap_search_filter</code> .
OID Matching Filter	Specify the attribute that uniquely identifies records in Oracle Internet Directory. This attribute is used as a key to synchronize Oracle Internet Directory with the connected directory. This field is optional.

General Tab

Table A–10 describes the fields on the General tab.

Table A–10 Fields on the General Tab

Field Name	Description
Connector Name	Specify the name of the connector. The name you enter is used as the RDN component of the DN for this connector profile. For example, specifying a profile name <code>MSAccess</code> creates a connector profile named <code>orclodipagentname=MSAccess,cn=subscriber profile, cn=changelog subscriber, cn=oracle internet directory</code> . This field is mandatory. There is no default.
Connected Directory Host	The host where the connected directory is running.
Connected Directory Port	The port where the connected directory is running.
Synchronization Mode	Specify whether this is an import or an export operation. An import operation pulls changes from a connected target directory into Oracle Internet Directory. An export operation pushes changes from Oracle Internet Directory into a connected target directory. This field is mandatory. The default is <code>IMPORT</code> .
Connector Status	Specify whether the profile is enabled or disabled. This field is mandatory. The default is <code>ENABLE</code> .
Connected Directory Account	Specify the account to be used by the connector agent for accessing the connected directory. For example, if the connected directory is a database, then the account might be <code>Scott</code> . If the connected directory is another LDAP-compliant directory, then the account might be <code>cn=Directory Manager</code> . This field is optional. There is no default.
Connected Directory Account Password	Specify the password the connector/agent is to use when accessing the connected directory. This field is optional. There is no default.
Interface Type	The format used by the import or export file. Options are <code>DB</code> , <code>LDAP</code> , <code>LDIF</code> , and <code>TAGGED</code> . This field is optional. The default is <code>LDAP</code> .
Profile Version	Version of Oracle Directory Integration Platform with which this profile was created.

Table A–10 (Cont.) Fields on the General Tab

Field Name	Description
Connected Directory Type	<p>The type of connected directory. You can select one of the following options:</p> <ul style="list-style-type: none"> ■ Microsoft Active Directory ■ Novell eDirectory ■ OpenLDAP ■ Sun Java System Directory

Mapping Tab

[Table A–11](#) describes the sections on the Mapping tab.

Table A–11 Sections on the Mapping Tab

Field Name	Description
Domain Rules	<p>This section contains the mapping rules for the domain or container from which objects are synchronized into Oracle Internet Directory. There is no default. Use the following buttons to manage domain rules:</p> <ul style="list-style-type: none"> ■ Add Domain Rule—Adds a domain rule with the Domain Rule Window window. ■ Delete Domain Rule—Displays a window that prompts you to confirm deletion of the domain rule. ■ Edit Domain Rule—Edits a domain rule with the Domain Rule Window window.
Attribute Rules	<p>This section allows you to manage the mapping rules for attributes of the objects that are being managed. Use the following buttons to manage attribute rules:</p> <ul style="list-style-type: none"> ■ Add Attribute Rule—Adds an attribute rule with the Attribute Rule Window window. ■ Delete Attribute Rule—Displays a window that prompts you to confirm deletion of the attribute rule. ■ Edit Attribute Rule—Edits an attribute rule with the Attribute Rule Window window. ■ Validate—Validates the attribute mapping rules and syntax. Also verifies the name and type of the attributes and their relationships to object classes in the source and destination directories. ■ Save to File—Displays a dialog box that you can use to save the mapping attributes to a file.

Others Tab

[Table A–1](#) describes the fields on the Others tab.

Table A–12 Fields on the Others Tab

Field Name	Description
Search Delta Size	Determines how many incremental changes are processed during each iteration in a synchronization cycle.
Continue after error	Determine how the Oracle directory integration server handles an error when processing a change during synchronization.

Table A–12 (Cont.) Fields on the Others Tab

Field Name	Description
Scheduling Interval	Specify the number of seconds between synchronization attempts between a connected directory and Oracle Internet Directory. This field is mandatory. The default is 60.
Maximum Number of Retries	Specify the maximum number of times the directory integration server is to attempt synchronization before it disables synchronization. This field is mandatory. The default is 5. The first retry takes place 1 minute after the first failure. The second retry happens 2 minutes after the second failure, and subsequently the retry takes place <i>n</i> minutes after the <i>n</i> -th failure.
Debug Level	Specify the logging level for debugging.

Select Source Attributes Window

Use this window to select a source attribute. To edit an attribute, select it and click [Edit Source Attribute Window](#).

Status Tab

[Table A–13](#) describes the fields on the Status tab.

Table A–13 Fields on the Status Tab

Field Name	Description
Last Execution Time	The most recent absolute time that the agent was executed. The default is the time at which the connector is created. Modifying this field will be misleading.
Last Successful Execution Time	The most recent absolute time that the agent succeeded. The default is the time at which the connector is created. Modifying this field will be misleading.
Synchronization Status	Synchronization success or failure.
Synchronization Errors	The last error message. You cannot modify this field. There is no default.
OID Last Applied Change Number (Import operations only)	For export operations, specify the identifier of the last change from Oracle Internet Directory that has been applied to the connected directory. The default is 0. The field can be consciously modified by the end user whenever appropriate. The profile should be in the disabled mode. If the number is increased, then any change log entries numbered between the original value and the new value will not be applied.
Bootstrap Status	Determines whether bootstrapping has been performed between Oracle Internet Directory and the connected directory.

Case Study: A Deployment of Oracle Directory Integration Platform

This appendix describes a deployment in which Oracle Directory Integration Platform integrates various applications in the MyCompany enterprise.

This section contains these topics:

- [Components in the MyCompany Enterprise](#)
- [Requirements of the MyCompany Enterprise](#)
- [Overall Deployment in the MyCompany Enterprise](#)
- [User Creation and Provisioning in the MyCompany Enterprise](#)
- [Modification of User Properties in the MyCompany Enterprise](#)
- [Deletion of Users in the MyCompany Enterprise](#)

Components in the MyCompany Enterprise

This hypothetical enterprise has the following components:

- Oracle Human Resources, in which all employees and contractors are managed
- Sun Java System Directory, which is being used by certain applications
- OracleAS Portal, which is used as the intranet portal for all employees
- Oracle Content Management Software Development Kit, which is used as a document repository for all corporate documents

Requirements of the MyCompany Enterprise

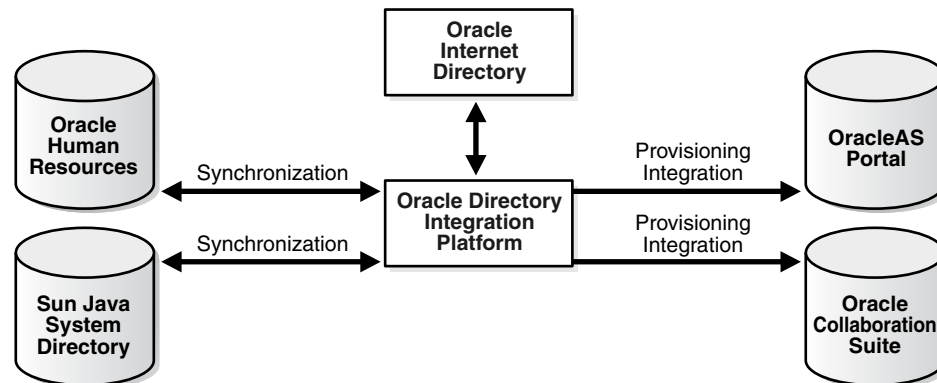
The MyCompany enterprise requires that:

- All employees and contractors are created in Oracle Human Resources. Once created, all applications in the enterprise must share this information through Oracle Internet Directory.
- All applications in the enterprise, including single sign-on services, can honor any employee created in Oracle Human Resource.
- All applications that are affected by changes to user properties are notified when changes occur.
- A user's access rights are revoked when the user is terminated in Oracle Human Resources.

Overall Deployment in the MyCompany Enterprise

Figure B–1 illustrates the various components and their relationships to each other.

Figure B–1 Example of Oracle Directory Integration Platform in the MyCompany Deployment



In the example in Figure B–1:

- Oracle Internet Directory is the central user repository for all enterprise applications.
- Oracle Human Resources is the basis for all user-related information. It is synchronized with Oracle Internet Directory by using the Oracle Directory Synchronization Service.
- Sun Java System Directory, which is already deployed in the enterprise, is synchronized with Oracle Internet Directory by using the Oracle Directory Synchronization Service.
- OracleAS Portal is notified of changes in Oracle Internet Directory by using the Oracle Directory Integration Platform Service.
- Oracle Content Management Software Development Kit is notified of changes in Oracle Internet Directory by using the Oracle Directory Integration Platform Service.

User Creation and Provisioning in the MyCompany Enterprise

In this example, the MyCompany enterprise requires that all users be created in Oracle Human Resources. Oracle Directory Integration Platform must propagate new user records to all other repositories in the enterprise.

Figure B–2 illustrates how Oracle Directory Integration Platform performs this task.

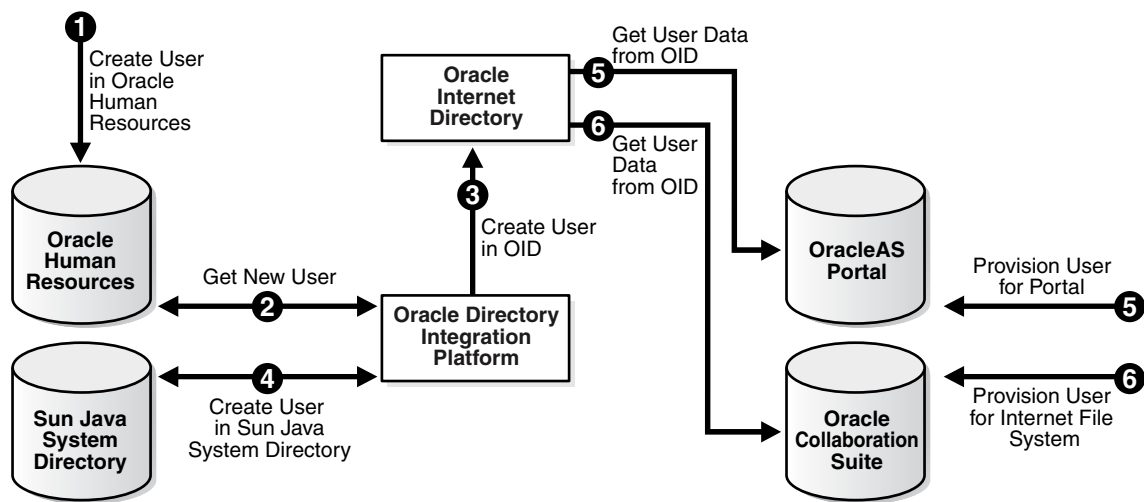
Figure B–2 User Creation and Provisioning

Figure B–2 shows the creation of a new user in Oracle Human Resources, which, in turn, causes an entry for that user to be created in Oracle Internet Directory and Sun Java System Directory. It also shows the process of provisioning the user to access two applications in the enterprise: OracleAS Portal and Oracle Content Management Software Development Kit. User creation and provisioning occur in the following manner:

1. The Oracle Human Resources administrator creates the user in the Oracle Human Resources database.
2. Oracle Directory Integration Platform, through the Oracle Directory Synchronization Service, detects the new-user creation.
3. Oracle Directory Integration Platform, through the Oracle Directory Synchronization Service creates the entry for the user in Oracle Internet Directory.
4. Oracle Directory Integration Platform, through the Oracle Directory Synchronization Service, creates an entry in the Sun Java System Directory.
5. Because the user entry is available in Oracle Internet Directory, the OracleAS Portal administrator can now provision the user to use the services of OracleAS Portal. During this task, the OracleAS Portal software automatically retrieves the user information from Oracle Internet Directory.
6. The Oracle Content Management Software Development Kit administrator also provisions the user to use Oracle Content Management Software Development Kit services by using a similar process.

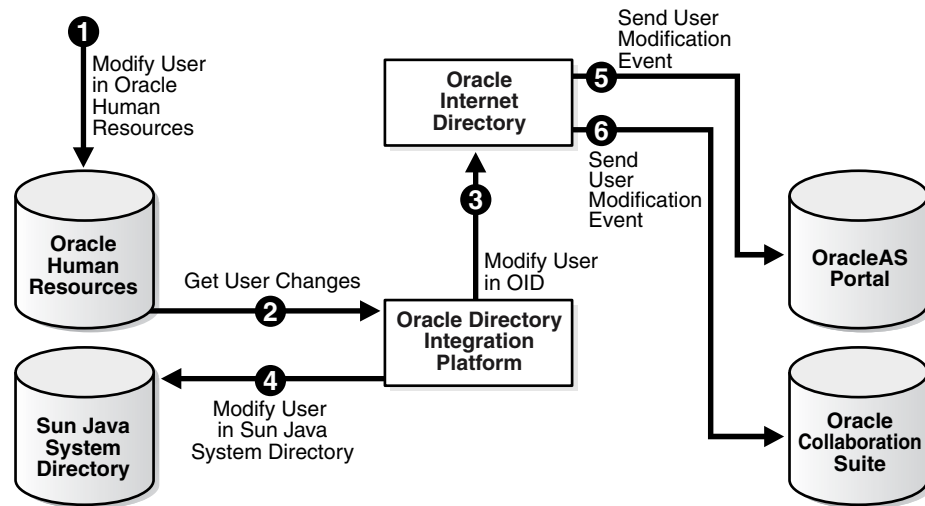
Note that Oracle Directory Integration Platform does not directly notify OracleAS Portal or Oracle Content Management Software Development Kit about new users. This is because not all users created in Oracle Human Resources need access to all services. In this case, the deployment must explicitly provision the users to use these services, as in Steps 5 and 6.

Modification of User Properties in the MyCompany Enterprise

In this example, the MyCompany enterprise requires that any modification to user properties be communicated to all components interested in such changes. Figure B–3

illustrates the actions that Oracle Directory Integration Platform takes to meet this requirement.

Figure B–3 Modification of User Properties



The process is as follows:

1. The user is first modified in Oracle Human Resources.
2. Oracle Directory Integration Platform retrieves these changes through the Oracle Directory Synchronization Service.
3. Oracle Directory Integration Platform makes the corresponding user modification in Oracle Internet Directory.
4. The Oracle Directory Synchronization Service modifies the user in the Sun Java System Directory.
5. Oracle Directory Integration Platform, through the Oracle Directory Integration Platform Service, notifies OracleAS Portal about the change in user properties.
6. Oracle Directory Integration Platform, through the Oracle Directory Integration Platform Service, notifies Oracle Content Management Software Development Kit about the same change in user properties.

Deletion of Users in the MyCompany Enterprise

In this example, the MyCompany enterprise requires that a user being deleted or terminated in Oracle Human Resources be automatically denied access to all enterprise resources that are based on the directory service.

Figure B–4 shows the flow of events during the deletion of users.

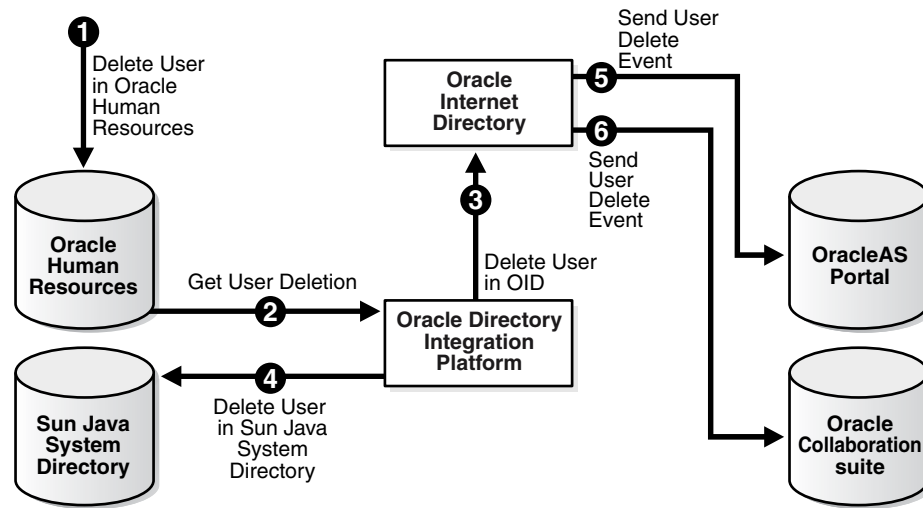
Figure B–4 Deletion of Users from the Corporate Human Resources

Figure B–4 shows the process by which Oracle Directory Integration Platform communicates the deletion of users to all systems in the enterprise. The process is as follows:

1. The user is first deleted in Oracle Human Resources.
2. Oracle Directory Integration Platform retrieves these changes through the Oracle Directory Synchronization Service.
3. Oracle Directory Integration Platform, through the Oracle Directory Synchronization Service, makes the corresponding user deletion in Oracle Internet Directory.
4. Oracle Directory Integration Platform, through the Oracle Directory Synchronization Service, deletes the users in the Sun Java System Directory.
5. Oracle Directory Integration Platform, through the Oracle Directory Integration Platform Service, notifies OracleAS Portal about the deletion of the user.
6. Oracle Directory Integration Platform, through the Oracle Directory Integration Platform Service, notifies Oracle Content Management Software Development Kit about the deletion of the user.

Once all of the steps are completed, a deleted user in Oracle Human Resources cannot access OracleAS Portal or Oracle Content Management Software Development Kit.

Troubleshooting the Oracle Directory Integration Platform

This appendix describes common problems that you might encounter when using the Oracle Directory Integration Platform and explains how to solve them. It contains these topics:

- [Troubleshooting Oracle Directory Integration Platform Problems](#)
- [Problems and Solutions](#)
- [Troubleshooting Provisioning](#)
- [Troubleshooting Synchronization](#)
- [Troubleshooting Integration with Microsoft Active Directory](#)
- [Need More Help?](#)

See Also:

- *Oracle by Example for Oracle Identity Management*, available from the Oracle Technology Network at <http://www.oracle.com/technology/index.html>
- *Oracle Identity Management User Reference*

Troubleshooting Oracle Directory Integration Platform Problems

This section includes general approaches for diagnosing problems with the Oracle directory integration server. It contains these topics:

- [Diagnosing the Oracle Directory Integration Platform in an Infrastructure Installation](#)
- [Diagnosing the Oracle Directory Integration Platform in an Oracle Directory Integration Platform Installation](#)
- [Troubleshooting Utilities](#)

Diagnosing the Oracle Directory Integration Platform in an Infrastructure Installation

After you start the Oracle directory integration server, you can verify that it is running by following these steps:

1. On UNIX/Linux, use the following command to verify that the `odisrv` process is running:

```
ps -ef | grep odisrv
```

For Windows operating systems, obtain the value of the process ID (PID) for the `odisrv` process from `$ORACLE_HOME/ldap/log/oidmon.log`. Then, start Task Manager and click the **Processes** tab to verify that the process is running.

2. If the Oracle directory integration server is not running, then examine the `$ORACLE_HOME/ldap/log/oidmon.log` file to determine the reason why the server did not start.
3. If the log file shows any database related errors:
 - a. Verify that a value is set for `ORACLE_SID`.
 - b. Verify that the connection string assigned to `ORACLE_SID` is specified in the `$ORACLE_HOME/network/admin/tnsnames.ora` file.
4. Ensure that the log file lists valid values for the server instance number and the `configset` number arguments. If the values are set correctly, then examine the file `$ORACLE_HOME/ldap/log/odisrv_nn.log` where `nn` is the number of the started instance. If the `odisrv_xx.log` file indicates a registration error, then re-register the Oracle directory integration platform by using the `odisrvreg` utility.
5. If you do not find any errors in the previous step, then examine the file `$ORACLE_HOME/ldap/log/odisrv_jvm_yyy.log`, where `yyy` is the process identifier of the `odisrv` process that should have started. Look for the file with the latest timestamp.

Diagnosing the Oracle Directory Integration Platform in an Oracle Directory Integration Platform Installation

After you start the Oracle directory integration server, you can verify that it is running by following these steps:

1. On UNIX/Linux, use the following command to verify that the `odisrv` process is running:

```
ps -ef | grep odisrv
```

For Windows operating systems, obtain the value of the process ID (PID) for the `odisrv` process from the `$ORACLE_HOME/ldap/log/odisrv_nn.log` file, where `nn` is the number of the started instance. Then, start Task Manager and click the **Processes** tab to verify that the process is running.

2. If the Oracle directory integration server is not running, examine the `odisrv_xx.log` file. If the file contains a registration error, then re-register the Oracle directory integration server by using the `odisrvreg` utility.
3. If you do not find any errors in the previous step, then examine the file `$ORACLE_HOME/ldap/log/odisrv_jvm_yyy.log`, where `yyy` is the process identifier of the `odisrv` process that should have started. Look for the file with the latest timestamp.

Troubleshooting Utilities

This section discusses the `oditest` and DIP Tester utilities that you can use to troubleshoot synchronization problems.

The `oditest` Utility

Troubleshooting synchronization can be complex if there are numerous profiles running or if the synchronization interval for a particular profile is set to occur too

infrequently. In such cases, the behavior of any connector can be tested using the `oditest` utility as follows:

1. If numerous profiles are running, then use the Directory Integration Assistant (`dipassistant`) to selectively disable the profile you want to troubleshoot. If a single profile is running, then stop the directory integration server.
2. Go to `$ORACLE_HOME/bin` and run the `oditest` utility using the following syntax:

```
oditest sync | prov profile_name host=host_of_Oracle_Internet_Directory \
port=port_for_Oracle_Internet_Directory binddn=bind_DN \
bindpass=password_for_the_bind_DN sslauth=0 debug=63
```

The following example shows how to run the `oditest` utility with a Sun Java System Directory synchronization profile:

```
oditest sync IplanetImport host=my-oidhost port=3060 binddn=cn=orcladmin
bindpass=welcome1 sslauth=0 debug=63
```

See Also: ["Finding Log Files"](#) on page 4-14 for information on how to review the audit log and trace files

The DIP Tester Utility

The DIP Tester utility is a standalone, platform independent Java application that aids in the configuration, testing, and debugging of Oracle Internet Directory implementations that synchronize with Oracle Directory Integration Platform connectors. The utility uses the Directory Integration Assistant (`dipassistant`) to modify profiles and also uses standard LDAP tools (`ldapadd`, `ldapmodify`, `ldapdelete`, and `ldapsearch`) for many behind-the-scenes operations. The DIP Tester utility has been tested on Oracle Internet Directory Release 10g (9.0.4) through Oracle Application Server 10g (10.1.4.0.1) for Solaris, Linux, and Windows platforms. You can download DIP Tester from Oracle Technology Network at <http://www.oracle.com/technology/index.html>. The download includes graphical user interface (GUI) and command-line versions of the DIP Tester utility. Both versions are installed automatically with a single installation script.

As you follow the troubleshooting procedure in this section, you can use DIP Tester to:

- Make changes to a directory integration profile
- View log files
- Create test entries
- Get or set the last applied change key
- Dump entire profile contents
- Reload the map file
- Start and stop the directory integration server
- Capture errors in trace files for uploading to Oracle Support
- Perform initial bootstrapping of users

Note: When the Oracle directory integration server performs a synchronization, it reads the last applied change key and caches the value. At the next synchronization interval, the Oracle directory integration server updates Oracle Internet Directory with the last execution time and the cached value of the last applied change key.

Before you manually change the last applied change key in a synchronization profile, be sure to stop the Oracle directory integration server. Otherwise at the next interval, your change will be overwritten by the cached value. In fact, you should always stop the Oracle directory integration server before changing any values in a synchronization profile.

The DIP Tester utility is installed in the `$ORACLE_HOME/bin` directory.

See Also: The README.txt and DIP Tester User's Guide, located in the directory where you installed the DIP Tester utility

Problems and Solutions

This section describes common problems and solutions for Oracle Directory Integration Platform. It contains these topics:

- [Oracle Directory Integration Server Errors](#)
- [Provisioning Errors and Problems](#)
- [Synchronization Errors and Problems](#)
- [Windows Native Authentication Errors and Problems](#)
- [Novell eDirectory and OpenLDAP Synchronization Errors and Problems](#)
- [Oracle Password Filter for Microsoft Active Directory Errors and Problems](#)

Note: The Oracle directory integration platform stores error messages in the appropriate file, as described in "[Location and Naming of Files](#)" on page 6-15.

Oracle Directory Integration Server Errors

This section provides solutions for errors and problems you may encounter with the Oracle directory integration server.

Problem

PASSWORD POLICY ERROR :9000: GSL_PWDEXPIRED_EXCP.

Solution

Beginning with Oracle Internet Directory 10g (9.0.4), the default password expiration time, which is assigned to the `pwdmaxage` attribute, is set to 60 days. To fix this problem, perform the following steps:

1. Use the `oidpasswd` utility to unlock the `cn=orcladmin` super user account as follows:

```
oidpasswd connect=asdb unlock_su_acct=true
OID DB user password:
```


OID super user account unlocked successfully.

This unlocks only the super user account, `cn=orcladmin`. Do not confuse this account with the `cd=orcladmin` account within the default realm `cn=orcladmin, cn=users, dc=xxxxx, dc=yyyyy`. They are two separate accounts.

2. Start an Oracle Internet Directory 10g (10.1.4.2) release of Oracle Directory Manager and navigate to Password Policy Management. You will see two entries: `cn=PwdPolicyEntry` and the password policy for your realm—for example, `password_policy_entry, dc=acme, dc=com`.

Change the `pwdmaxage` attribute in each password policy to an appropriate value:

- 5184000 = 60 days (default)
- 7776000 = 90 days
- 10368000 = 120 days
- 15552000 = 180 days
- 31536000 = 1 year

Note: It is important to change this value in both places.

3. Start Oracle Directory Manager and navigate to the realm-specific `orcladmin` account. Find the `userpassword` attribute and assign a new value. You should then be able to start any Oracle component that uses OracleAS Single Sign-On, and log in as `orcladmin`.
4. Rerun the `odisrvreg` utility to reset the randomly generated password for Oracle Directory Integration Platform:

```
odisrvreg -D cn=orcladmin -w password -p 3060
Already Registered...Updating DIS password...
DIS registration successful.
```

Provisioning Errors and Problems

This section provides solutions for provisioning errors and problems.

Problem

Unable to get the Entry from its GUID. Fatal Error...

Solution

The Oracle directory integration server is attempting to retrieve an entry that has been deleted, but not yet purged. Update the tombstone purge configuration settings in the Garbage Collection Management node of Oracle Directory Manager.

Problem

LDAP connection failure.

Solution

Oracle Directory Integration Platform failed to connect to the directory server. Check the connection to the directory server.

See Also: The chapter about directory server administration in *Oracle Internet Directory Administrator's Guide* for information about directory server connections

Problem

LDAP authentication failure.

Solution

The provisioning profile is not able to connect to the LDAP server as administrator. Verify Oracle directory integration server entry in the directory. Re-register the Oracle directory integration server by using the `odisrvreg` utility.

See Also: ["Manually Registering the Oracle Directory Integration Platform"](#) on page 4-14

Problem

Initialization failure.

Solution

Problem connecting to the directory server using JNDI. Examine the trace files (*profile_name.trc*) and audit files (*profile_name.aud*) in the `$ORACLE_HOME/ldap/odi/log` directory.

Problem

Database connection failure.

Solution

Problem connecting to the database with the given account information; either the database is not running or there is an authentication problem. Examine the trace files (*profile_name.trc*) and audit files (*profile_name.aud*) in the `$ORACLE_HOME/ldap/odi/log` directory.

Problem

Exception while calling an SQL operation.

Solution

Problem in executing the package. Verify the package usability. Examine the trace files (*profile_name.trc*) and audit files (*profile_name.aud*) in the `$ORACLE_HOME/ldap/odi/log` directory.

Problem

Provisioning Profiles Not Getting Executed by the DIP Provisioning Server.

Solution

Provisioning profiles only run when the Oracle directory integration platform is started with configuration set 0. Ensure that the Oracle directory integration server has been started with the argument `configset=0`.

Problem

Unable to Connect to the Application Database.

Solution

The application database connection requirements in a provisioning profile may be incorrect. Use `sqlplus` to verify connectivity requirements.

Problem

User/Group Modify And Delete Events Not being consumed by the application.

Solution

The Oracle Directory Integration Platform Service first queries an application database about the existence of a user or group. If the application database responds with a negative value, then the user or group does not exist, and the event is not propagated to the application. Examine the trace files (*profile_name.trc*) and audit files (*profile_name.aud*) in the `$ORACLE_HOME/ldap/odi/log` directory to determine whether the user or group exists in the application database.

Problem

Subscription to binary attributes results in the event propagation error.

Solution

Binary attributes propagation is not supported. Remove the binary attribute assignments from the event subscription in the provisioning profile.

Problem

Insufficient Access Rights to do "proxy" as the Application DN.

Solution

The Oracle Directory Integration Platform server group has not been granted browse privilege by the application DN. Use the `ldapmodify` command to load the following ACIs, which grant browse privileges from the application DN to the Oracle Directory Integration Platform group:

```
orclaci: access to attr=(*) by group="cn=odisgroup,cn=odi,cn=oracle internet
directory" (read,write,search,compare)
orclaci: access to entry by group="cn=odisgroup,cn=odi,cn=oracle internet
directory" (browse,proxy)
```

Problem

Insufficient access rights to use an application DN as a proxy.

Solution

The Oracle Directory Integration Platform server group has not been granted proxy privileges by the application DN. Use the `ldapmodify` command to load the following ACI, which grants proxy privileges from the application DN to the Oracle Directory Integration Platform group:

```
orclaci: access to entry by group=" cn=odisgroup, cn=odi,cn=oracle internet
directory" (browse,proxy)
```

Synchronization Errors and Problems

This section provides solutions for synchronization errors and problems.

See Also: Oracle*MetaLink* Note: 276481.1—Troubleshooting OID DIP Synchronization Issues available on Oracle*MetaLink* at <http://metalink.oracle.com/>

Problem

LDAP: error code 50 - Insufficient Access Rights; remaining name 'CN=Users,dc=mycompany,dc=com'

Solution

The record target is not in a default container. Find the `DST CHANGE RECORD`. Check the ACIs for the target container. If they are blank, then use DIP Tester to apply a known set of ACIs to the new container.

Problem

LDAP: error code 50 - Insufficient Access Rights; ACTIVECHGIMP MAPPING IMPORT OPERATION FAILURE; Agent execution successful, Mapping/import operation failure

Solution

By default the `cn=Users, default realm` contains the proper ACIs. However, this error can occur when trying to synchronize into a different container within the default realm. Open the trace file, locate the change record that is causing the error, and then check the ACIs for the record's parent container. Apply the same ACIs to the target container.

Problem

Trace File Error: Not able to construct DN Output ChangeRecord ChangeRecord : Changetype: 1 ChangeKey: cn=users, dc=us,dc=oracle,dc=com Exception javax.naming.ContextNotEmptyException: [LDAP: error code 66 - Not Allowed On Non-leaf]; remaining name 'cn=users,dc=us,dc=oracle,dc=com' Missing mandatory attribute(s).

Solution

Problem with the mapping file. Follow the instructions in Oracle*MetaLink* Note: 261342.1—Understanding DIP Mapping available on Oracle*MetaLink* at <http://metalink.oracle.com/>.

Problem

Trace File Error: IPlanetImport:Error in Mapping
Engine.java.lang.NullPointerException java.lang.NullPointerException at oracle.ldap.odip.engine.Connector.setValues(Connector.java:101).

Solution 1

The mapping file has not been loaded. In the Oracle Directory Integration Server Administration tool, verify that the Mapping tab contains the values from your mapping file. If your values are not available, then use the DIP Tester utility to reload the mapping file.

Solution 2

The `orclcondirlastappliedchgnum` attribute is null or has no value. This may occur if bootstrapping failed or if you manually populated Oracle Internet Directory and did not assign a value to the `orclcondirlastappliedchgnum` attribute. Verify

that the `orclcondirlastappliedchgnum` attribute has a value. If not, then use the `DIP Tester` utility to set the `orclcondirlastappliedchgnum` attribute.

Problem

Trace File Error: Command exec successful IPlanetImport:Error in Mapping Enginejava.lang.NullPointerException java.lang.NullPointerException at oracle.ldap.odip.engine.Connector.setValues(Connector.java:101) at oracle.ldap.odip.gsi.LDAPReader.initialise(LDAPReader.java:169) Updated Attributes orclodipLastExecutionTime: 20040601143204.

Solution

Missing LDAP port on connected directory URL attribute value (hostname:port). Specify the LDAP port in the connected directory URL attribute.

Problem

Trace File Error: LDAP URL : (xxxxxx.com:389<login credentials to 3rd party ldap server> LDAP Connection success ActiveChgImp:Error in Mapping EngineODIException: DIP_GEN_INITIALIZATION_EXCEPTION ODIException: DIP_GEN_INITIALIZATION_EXCEPTION at oracle.ldap.odip.util.DirUtils.getLastChgNum(DirUtils.java:48) at oracle.ldap.odip.gsi.LDAPReader.initAvailableChgKey(LDAPReader.java:719) at oracle.ldap.odip.gsi.LDAPReader.initialise(LDAPReader.java:212) at oracle.ldap.odip.engine.AgentThread.mapInitialise(AgentThread.java:327) at oracle.ldap.odip.engine.AgentThread.execMapping(AgentThread.java:253) at oracle.ldap.odip.engine.AgentThread.run(AgentThread.java:149) ActiveChgImp:about to Update exec status Error in proxy connection : java.lang.NullPointerException.

Solution

Permissions and ownership of the files in `$ORACLE_HOME/ldap/odi/conf` should be owned by the Oracle installer ID. Use the `ldapmodify` utility to fix the following two entries:

```
dn: orclODIPAgentName=profile_name,cn=subscriber profile,
   cn=changelog subscriber, cn=oracle internet directory
changetype: modify
replace: orclaci
orclaci: access to attr = (*) by group="cn=odisgroup,cn=odi,cn=oracle
   internet directory" (read,write,search,compare)
orclaci: access to entry by group="cn=odisgroup,cn=odi,cn=oracle
   internet directory" (browse,proxy)

dn: orclodipAgentName=ActiveChgImp,cn=subscriber profile,cn=changelog
subscriber,cn=oracle internet directory
orclodipagentconfiginfo:: W010VEVSRkFDRURFVEFJTfNdC1BhY2thZ2U6IGdzaQpSZWFkZXI
6IEFjdGl2ZUNoZ1JlYWRLcgo=
```

Note: The preceding entry is a binary object representing an import profile for the ActiveChange Reader. If you are fixing a Sun Java System Directory export profile, then you must dump the `orclodipagentconfiginfo` attribute for the corresponding profile from an existing profile or another node.

See Also: The following for information about LDAP error code 49 and Error 9000: GSL_PWDEXPIRED_EXCP:

- "Oracle Directory Integration Server Errors" on page C-4
- OracleMetaLink Note: 265397.1—Password Policy Expires, available on OracleMetaLink at <http://metalink.oracle.com/>

Problem

The Mapping tab in the Oracle Directory Integration Server Administration tool shows a file name instead of the mapping rules.

Solution

The absolute path was not included when the mapping file was loaded. Reload the mapping file using full absolute path. You can reload the mapping file using the Directory Integration Assistant (dipassistant) or the DIP Tester utility.

Problem

LDAP: error code 50 - Insufficient Access Rights.

Solution

The odi agent `orclODIPAgentName=IPlanetImport,cn=subscriber profile,cn= changelog subscriber,cn=oracle internet directory` does not have full read/write access to the synchronized entries in Oracle Internet Directory. Because the `cn=oracleDASCreateUser,cn=groups,cn=oraclecontext,identity_management_realm` group will already have the required ACLs defined, this entry should be a member of this group. In this case, <subscriber DN> is set to `identity_management_realm`. You must add the `orclODIPAgentName=IPlanetImport,cn=subscriber profile,cn=changelog subscriber,cn=oracle internet directory user` entry to the `cn=oracleDASCreateUser,cn=groups,cn=oraclecontext,identity_management_realm` group, so that it will have the required ACL access to perform the updates: In Oracle Directory Manager, navigate through: Entry Management -> `dc=com,identity_management_realm,cn=oraclecontext-> cn=groups-> cn=oracleDASCreateUser`. From here, against the attribute 'uniquemember' add: `orclODIPAgentName=IPlanetImport,cn=subscriber profile,cn=changelog subscriber,cn=oracle internet directory`.

Problem

Add and change operations are successful, but delete operations fail without being recorded in the trace file.

Solution 1

Tombstones are not enabled in Sun Java System Directory. Verify that tombstones are enabled as described in OracleMetaLink Note: 219835.1, available on OracleMetaLink at <http://metalink.oracle.com/>.

Solution 2

In Microsoft Active Directory, the account used for the profile is not a member of the DIR SYNCH ADMIN group. This only occurs if you are not using a Microsoft Active Directory administrator account. Install the appropriate patch from Microsoft.

Problem

Data synchronization problems encountered after configuring Oracle Directory Integration import or export connectors to third-party LDAP directories.

Solution

Determine the cause by running the `oditest` utility. Run the `oditest` utility as described in ["The oditest Utility"](#) on page C-2.

Problem

The Oracle Internet Directory profile in Oracle Directory Manager shows "synchronization successful" yet no changes show up in the directory.

Solution

The synchronization interval is set to occur too infrequently to be of use during testing. By default, the synchronization interval is set to occur every 60 seconds. However, you can increase the synchronization interval for better performance. For example, you can increase your synchronization interval to a value such as 300 seconds (5 minutes) or 600 seconds (10 minutes). Follow these steps to decrease your synchronization interval:

CAUTION: Decreasing the synchronization interval may significantly impact the performance of your connected directory server. Before changing the synchronization interval, try debugging your connector with the `oditest` utility. If you do change the synchronization interval, be sure to reset it to its original value after you are finished with your testing procedures.

1. In the Oracle Directory Integration Server Administration tool, in the navigator pane, navigate to the Integration Server and modify the Scheduling Interval attribute in the profiles to 20 seconds.
2. Use the `odisrv` command to stop the Oracle directory integration server, and restart it with the parameter `debug=63`.
3. Add a test entry in your connected directory.
4. In Oracle Internet Directory, change to the `$ORACLE_HOME/ldap/odi/log` directory and use the `cat` command to display the `ActiveChgImp.trc` file. When the Oracle directory integration server wakes up and processes the record from the connected directory change log, you will see the details listed in the `IplanetImport.trc` or `ActiveChgImp.trc` file.
5. Examine the trace files for possible clues as to what is actually taking place: You should see the handshake/login to the connected directory server, then the change being captured and reformatted according to the mapping rules, and finally the change being attempted in Oracle Internet Directory. If there are handshake or mapping problems they will appear in this file.

A common mistake is to set the Connect Directory Account DN to Administrator. This field must contain the entire distinguished name of the Microsoft Active Directory administrator, for example:

```
cn=Administrator,cn=Users,dc=myoracle,dc=com
```

The first domain component is the value of the third field of the Windows Login page: User Name, Password, Log on to.

The following `ldapsearch` commands may be helpful in identifying problems with the configuration.

To check the default identity management realm:

```
ldapsearch -h host -p port -D cn=orcladmin -w password -b "cn=common,cn=products,
cn=oraclecontext" -L -s
base "objectclass=*" orcldefaultsubscriber
```

To dump the Oracle directory integration server configuration set:

```
ldapsearch -h host -p port -D cn=orcladmin -w password -b cn=instance1,cn=odisrv,
cn=subregistrysubentry
-s base -v "objectclass=*"
```

To check profiles:

```
ldapsearch -h host -p port -D cn=orcladmin -w password -b
"orclODIPAgentName=profile,cn=subscriber profile,cn=changelog Subscriber,cn=oracle
internet directory" -s sub objectclass=*
```

To check the agent credentials:

```
ldapsearch -p port -D cn=orcladmin -w password -b "orclODIPAgentName=profile,
cn=subscriber profile,cn=changelog subscriber,cn=oracle internet directory"
-s sub "objectclass=*"
```

This command returns the password in clear text only if you run it using `orcladmin` credentials.

Problem

Bootstrap Error: `DIP_GEN_AUTHENTICATION_FAILURE` when trying to Synchronize Microsoft Active Directory with Oracle Internet Directory

Solution

Invalid credentials. Check the synchronization profile and ensure that it contains the proper credentials to log in to the Microsoft Active Directory server.

Windows Native Authentication Errors and Problems

This section provides solutions for errors and problems you may encounter when integrating Oracle Identity Management with Windows Native Authentication.

Problem

Internal Server error. Please contact your administrator.

Solution

Windows Native Authentication is misconfigured on the middle-tier computer. To fix this problem, perform the following steps:

1. Check the `opmn.log` file for errors.
2. Check the `ssoServer.log` file for errors.
3. Make sure that the keytab file is located in the `$ORACLE_HOME/j2ee/OC4J_SECURITY/config` directory and that the principal name configured in the `jazn-data.xml` file is correct.

4. Make sure that the single sign-on middle tier computer is properly configured to access the Key Distribution Center. See ["Set Up a Kerberos Service Account for the OracleAS Single Sign-On Server"](#) on page 19-9.

Problem

Could not authenticate to KDC.

Solution

This error message may be invoked if the realm name in `krb5.conf` is incorrectly configured. Check the values `default_realm` and `domain_realm` in `/etc/krb5/krb5.conf`. Note that the realm name is case-sensitive.

Problem

Your browser does not support the Windows Kerberos authentication or is not configured properly.

Solution

The user's Web browser is not supported or is misconfigured. Follow the instructions in ["Task 2: Configure Internet Explorer for Windows Native Authentication"](#) on page 19-11.

Problem

"Access forbidden" or "HTTP error code 403" or "Windows Native Authentication Failed. Please contact your administrator."

Solution

These error messages have the same cause: the user entry cannot be found in Oracle Internet Directory. A local administrator working at a Windows desktop may be trying to access a single sign-on partner application whose entry may not have been synchronized with Oracle Internet Directory. Determine whether the user entry exists in the directory and if the Kerberos principal attributes for the user are properly synchronized from Microsoft Active Directory.

Problem

The Windows login dialog box (with user name, password, and domain fields in it) comes up when accessing the partner application.

Solution

The single sign-on server was not able to authenticate the Kerberos token because the corresponding user entry could not be found in Oracle Internet Directory. Add the user entry to the directory.

Problem

Single sign-on server fails to start. Log file contains an exception bearing the message "Credential not found."

Solution

The parameter `kerberos-servicename` may not be configured correctly. To fix this problem, perform the following steps:

1. Make sure that `kerberos-servicename` is configured correctly in the files `orion-application.xml` and `jazn-data.xml`. In `orion-application.xml`, the format for

this parameter is `HTTP@sso.mycompany.com`. In the `jazn-data.xml`, the format is `HTTP/sso.mycompany.com`.

2. Check the `ssoServer.log` file for errors.
3. Make sure that the keytab file is located in the `$ORACLE_HOME/j2ee/OC4J_SECURITY/config` directory and that the principal name configured in `jazn-data.xml` is correct.
4. Make sure that the single sign-on middle tier computer is configured to access the Kerberos domain controller. See ["Set Up a Kerberos Service Account for the OracleAS Single Sign-On Server"](#) on page 19-9.

Problem

The following exception is raised when running the OracleAS Single Sign-On Configuring Assistant:

```
Repository Access API throws exception :
oracle.ias.repository.schema.SchemaException: Unable to establish secure
connection to Oracle Internet Directory Server
ldap://server.mycompany.com:636/ Base Exception :
javax.naming.CommunicationException: server.mycompany.com:636 [Root
exception is java.lang.UnsatisfiedLinkError: no njssl10 in java.library.path]
    at
    oracle.ias.repository.directory.DirectoryReader.connectSsl(DirectoryReader.java:
98)
    at
    oracle.ias.repository.directory.DirectoryReader.connect(DirectoryReader.java:106
)
        at oracle.ias.repository.IASSchema.getDBPassword(IASSchema.java:440)
        at
    oracle.ias.repository.SchemaManager.getDBPassword(SchemaManager.java:310)
    at oracle.security.sso.IMWNAConfig.getSSOHost(IMWNAConfig.java:903)
    at oracle.security.sso.IMWNAConfig.parseArgs(IMWNAConfig.java:168)
    at oracle.security.sso.IMWNAConfig.init(IMWNAConfig.java:194)
    at oracle.security.sso.IMWNAConfig.work(IMWNAConfig.java:60)
    at
    oracle.security.sso.SSOConfigAssistant.wnaConfig(SSOConfigAssistant.java:243)
    at
    oracle.security.sso.SSOConfigAssistant.main(SSOConfigAssistant.java:218)
```

Solution

This exception occurs when the Windows version of the OracleAS Single Sign-On Configuring Assistant is run on UNIX and Linux platforms. Run the UNIX/Linux version of the OracleAS Single Sign-On Configuring Assistant by following the instructions in ["Run the OracleAS Single Sign-On Configuration Assistant on each Oracle Application Server Single Sign-On Host"](#) on page 19-10.

Problem

With Windows Native Authentication, Internet Explorer is sending NT Lan Manager (NTLM) authentication instead of Kerberos credentials.

Solution

This issue is caused by an improperly configured Microsoft Active Directory installation. Refer to your Microsoft Active Directory documentation or contact Microsoft for information on how to resolve this issue.

Problem

Individual users cannot log in from specific computers using Windows Native Authentication.

Solution

If the users can log in using another computer, then there is a configuration problem with Windows or Internet Explorer on the original computer. Refer to the Microsoft Developer Network at <http://msdn.microsoft.com> or contact Microsoft for information on how to resolve this issue.

Novell eDirectory and OpenLDAP Synchronization Errors and Problems

This section provides solutions to synchronization errors and problems that can occur with Novell eDirectory and OpenLDAP.

Problem

After configuring import synchronization, entries are not synchronizing from Novell eDirectory or OpenLDAP to Oracle Internet Directory, even though the profile's synchronization status is successful and the trace file does not show any exceptions.

Possible causes and their solutions:

Cause Incorrect value assigned to the `modifiersname` parameter of the `odip.profile.condirfilter` property in the import profile.

Solution Copy the connection DN from the Novell eDirectory or OpenLDAP export profile to the `modifiersname` parameter of the `odip.profile.condirfilter` property in the import profile.

Cause The entries that the Oracle directory integration server are attempting to synchronize are created using the same DN that is assigned to the `modifiersname` parameter of the `odip.profile.condirfilter` property in the import profile.

Solution Change the DN that is assigned to the `modifiersname` parameter of the `odip.profile.condirfilter` property in the import profile to a DN that does not create the entries in Novell eDirectory or OpenLDAP.

Cause There is a time difference between the computer that is running Oracle Internet Directory and the computer that is running Novell eDirectory or OpenLDAP.

Solution Assign to the `ReduceFilterTimeInSeconds` parameter of the `odip.profile.configfile` property in the import profile a value in seconds that is equal to the time difference between the two computers.

Problem

Communications exception.

Solution

One of the directory servers is not running. Use the `ldapbind` utility to determine which server is not running, and then restart it.

Problem

Unsupported exception thrown during reconciliation.

Solution

One or more of the Oracle Internet Directory attributes that are specified in the Novell eDirectory or OpenLDAP reconciliation rules are not indexed. Index the corresponding attributes in Oracle Internet Directory.

Problem

Deleted entries are not synchronizing from Novell eDirectory or OpenLDAP to Oracle Internet Directory, even though the profile's reconciliation status is successful.

Possible causes and their solutions:

Cause The deleted entries are not specified in the Novell eDirectory or OpenLDAP reconciliation rules.

Solution Modify the Novell eDirectory or OpenLDAP reconciliation rules to include the deleted entries.

Cause There are more entries in Novell eDirectory or OpenLDAP for a particular reconciliation rule than there are in Oracle Internet Directory.

Solution Examine the `$ORACLE_HOME/ldap/odi/log/profile_name.trc` file for the following message:

No. of entries are less in destination directory compared to source directory.

The preceding message is usually generated when the entire Novell eDirectory or OpenLDAP DIT needs to be synchronized with Oracle Internet Directory. To resolve this problem, assign a value of `true` to the `CheckAllEntries` parameter of the `odip.profile.configfile` property.

Caution: Assigning a value of `true` to the `CheckAllEntries` parameter of the `odip.profile.configfile` property will result in decreased performance.

Oracle Password Filter for Microsoft Active Directory Errors and Problems

This section provides solutions to errors and problems that can occur with the Oracle Password Filter for Microsoft Active Directory.

Problem

Unable to find log file path.

Cause

Invalid log file path.

Solution

Specify a valid log file path by following the instructions in ["Reconfiguring the Oracle Password Filter for Microsoft Active Directory"](#) on page 20-16.

Problem

Cannot connect to Oracle Internet Directory in non-SSL mode.

Cause

Invalid Oracle Internet Directory configuration settings.

Solution

Correct the Oracle Internet Directory configuring settings by following the instructions in ["Reconfiguring the Oracle Password Filter for Microsoft Active Directory"](#) on page 20-16.

Problem

Cannot connect to Oracle Internet Directory in SSL mode.

Cause

The Oracle Internet Directory certificate authority's trusted certificate has not been imported into the Microsoft Active Directory domain controller.

Solution

Import the trusted certificate into Microsoft Active Directory by following the instructions in ["Importing a Trusted Certificate into a Microsoft Active Directory Domain Controller"](#) on page 20-4.

Problem

Cannot connect to Microsoft Active Directory.

Cause

Invalid Microsoft Active Directory configuration settings.

Solution

Correct the Microsoft Active Directory configuration settings by following the instructions in ["Reconfiguring the Oracle Password Filter for Microsoft Active Directory"](#) on page 20-16.

Problem

Cannot upload the prepAD.ldif file.

Cause

The specified Microsoft Active Directory base DN container cannot store `organizationalUnit` objects.

Solution

Specify a base DN for Microsoft Active Directory that can store `organizationalUnit` objects by following the instructions in ["Reconfiguring the Oracle Password Filter for Microsoft Active Directory"](#) on page 20-16.

Problem

Password updates are looping between Oracle Internet Directory and Microsoft Active Directory.

Cause

The Oracle Password Filter is not configured to use the same bind DN and password that are specified in the synchronization profile that imports values from Microsoft Active Directory into Oracle Internet Directory.

Solution

Configure the Oracle Password Filter to use the same bind DN and password that are specified in the synchronization profile that imports values from Microsoft Active Directory into Oracle Internet Directory by following the instructions in ["Reconfiguring the Oracle Password Filter for Microsoft Active Directory"](#) on page 20-16.

Problem

Some passwords are not synchronizing between Oracle Internet Directory and Microsoft Active Directory.

Cause

Oracle Internet Directory and Microsoft Active Directory specify conflicting password policies.

Solution

Set the Oracle Internet Directory password policies to the same policies that are set in Microsoft Active Directory or remove the password policies from Oracle Internet Directory.

Problem

Passwords are not synchronizing for some users.

Cause

You performed an advanced installation of the Oracle Password Filter and specified different values for the attributes that you want to synchronize between Oracle Internet Directory and Microsoft Active Directory.

Solution

Specify the same values for the attributes that you want to synchronize between Oracle Internet Directory and Microsoft Active Directory by following the instructions in ["Reconfiguring the Oracle Password Filter for Microsoft Active Directory"](#) on page 20-16.

Problem

User data synchronizes, but password synchronization is delayed.

Cause

Different time intervals are specified for user data synchronization and password synchronization.

Solution

Verify that the value assigned to the Oracle Password Filter's `SleepTime` parameter is the same as the default scheduling interval for the synchronization profile. You can use the Oracle Directory Integration Server Administration tool or the Directory Integration Assistant (`dipassistant`) to view and change the default scheduling interval for synchronization profiles. To change the value assigned to the `SleepTime` parameter, follow the instructions in ["Reconfiguring the Oracle Password Filter for Microsoft Active Directory"](#) on page 20-16.

See Also: [Chapter 3, "Oracle Directory Integration Platform Administration Tools"](#) for more information on the Oracle Directory Integration Server Administration tool or the Directory Integration Assistant (dipassistant)

Troubleshooting Provisioning

This section describes how to troubleshoot provisioning problems in the Oracle Internet Directory Provisioning Console. It contains these topics:

- [Viewing Diagnostic Settings](#)
- [Provisioning-Integration Applications Not Visible in the Provisioning Console](#)
- [Unable to Create Users](#)
- [Using Provisioning Status to Identify Problems](#)
- [Users Cannot Log In After Account Creation](#)
- [Monitoring Provisioning Execution Status with the Oracle Enterprise Manager 10g Application Server Control Console](#)
- [Checklist for Troubleshooting Provisioning](#)

Viewing Diagnostic Settings

You can use the Oracle Delegated Administration Services diagnostic settings to debug provisioning problems in the Oracle Internet Directory Provisioning Console without having to examine the log files. For more information about viewing and configuring diagnostic settings, see the chapter on managing users and groups with the Oracle Internet Directory Self-Service Console in the *Oracle Identity Management Guide to Delegated Administration*.

Provisioning-Integration Applications Not Visible in the Provisioning Console

After you install a new provisioning-integrated application in Oracle Internet Directory, the application does not appear in the Provisioning Console until you reload the application cache. You must also reload the application cache whenever a provisioning-integrated application is enabled or disabled in Oracle Internet Directory. To reload the application cache, follow the procedures described in "[Reloading the Application Cache](#)" on page 14-5.

Unable to Create Users

The Oracle Provisioning Service uses plug-ins to create new users. This section contains these topics, which describe how to troubleshoot the Oracle Provisioning Service plug-ins to resolve user creation problems:

- [Troubleshooting Data Entry Plug-ins](#)
- [Troubleshooting Provisioning Plug-ins](#)

Troubleshooting Data Entry Plug-ins

Provisioning-integrated applications can invoke the Pre-Data Entry and Post-Data Entry plug-ins to enhance provisioning intelligence and implement business policies. This section describes how to troubleshoot problems with both plug-ins.

Identifying Problems with the Pre-Data Entry Plug-In When you follow the instructions described in "[Creating Users with the Provisioning Console](#)" on page 14-2, the Provisioning Console invokes the Pre-Data Entry plug-in after you click **Next** in the General Provisioning window. The primary purpose of this plug-in is to determine whether a user should be provisioned in the applications selected in the General Provisioning window. If a user has provisioning permission for an application, then the Pre-Data Entry plug-in populates fields in the next window, the Application Provisioning window, according to the application's provisioning policies.

In the event of a problem with the Pre-Data Entry plug-in, an error containing an exception message and stack trace will display in the General Provisioning window. You can find the user attributes that were passed to the plug-in by locating the following line in the stack trace:

```
*****preplugin base user prop set for <Application Name> ...
```

You can locate the error in the log files by searching for the following:

```
oracle.idm.provisioning.plugin.PluginException
```

Identifying Problems with the Post-Data Entry Plug-In When you follow the instructions described in "[Creating Users with the Provisioning Console](#)" on page 14-2, the Provisioning Console invokes the Post-Data Entry plug-in after you click **Next** in the Application Attributes window. The Post-Data Entry plug-in validates data entered by users for common and application-specific attributes. The validation for the plug-in must be successful in order for provisioning to continue.

In the event of a problem with the Post-Data Entry plug-in, an error will display in the Application Attributes window. The exception stack trace will be located after the following line:

```
UserPlugInMgmt::postPlugInProcess(): apptype <Application Type> appname  
<Application Name> error when executing plugin logics
```

Troubleshooting Provisioning Plug-ins

Provisioning-integrated applications can be provisioned either through a PL/SQL plug-in or the Data Access Java plug-in. The PL/SQL plug-in is invoked by the Oracle directory integration platform while the Data Access Java plug-in is invoked directly by Oracle Delegated Administration Services.

When you follow the instructions described in "[Creating Users with the Provisioning Console](#)" on page 14-2, user creation may be successful even though provisioning for a specific application may fail. You will know when provisioning has failed if you receive a warning status along with a provisioning error message after you click **Submit** in the Review window. For details about the failure, search the log files for "Data Access plug-in execution failure." The lines following this statement list details of why provisioning failed.

Using Provisioning Status to Identify Problems

You can use the provisioning status of a user entry to help identify provisioning problems.

To view a user entry's provisioning status:

1. In the Provisioning Console, select the **Directory** tab, then select **Users**. The Search for Users window appears.
2. In the **Search for User** field, enter the first few characters of the user's first name, last name, e-mail address, or user ID. For example, if you are searching for Anne

Smith, you could enter Ann or Smi. To generate a list of all users in the directory, leave this field blank.

3. Click **Go** to display the search results.
4. Select the user whose entry you want to view, then click **View** to display the View User window.

This window is described in *Oracle Identity Management Guide to Delegated Administration*

5. In the **View User** window, examine the entries in the **Provisioning Status** table. If the Provisioning Status column for an application contains a value of `PROVISIONING_FAILURE`, then the Provisioning Status Description column will contain one of the following values to describe the reason for the failure:

- `PROVISIONING_REQUIRED`
- `PENDING_UPGRADE`
- `PROVISIONING_NOT_REQUIRED`
- `PROVISIONING_FAILURE`

See Also: ["Understanding User Provisioning Statuses"](#) on page 12-10 for more information on user provisioning statuses

Users Cannot Log In After Account Creation

To resolve typical problems that prevent users from logging in after account creation:

1. Examine the user provisioning statuses to identify the applications in which the user was not successfully provisioned by following the instructions described in ["Using Provisioning Status to Identify Problems"](#) on page C-20.
2. Identify the application provisioning approach for applications in which the user was not successfully provisioned:
 - For user accounts created with the Oracle Internet Directory Provisioning Console, examine the following Oracle Delegated Administration Services log file:

```
$ORACLE_HOME/opmn/logs/OC4J~OC4J_SECURITY~default_island~1
```

- For user accounts created with the PL/SQL plug-in or the Data Access Java plug-in, examine the following trace and audit files:

```
$ORACLE_HOME/ldap/odi/log/applicationType_realmName_E.trc
$ORACLE_HOME/ldap/odi/log/applicationType_realmName_E.aud
```

Monitoring Provisioning Execution Status with the Oracle Enterprise Manager 10g Application Server Control Console

You can use the Oracle Enterprise Manager 10g Application Server Control Console to monitor the provisioning execution status of provisioning integration profiles.

1. On the main Application Server Control Console page, select the name of the Oracle Application Server instance you want to manage in the Standalone Instances section. The Oracle Application Server home page opens for the selected instance.
2. In the **System Components** table, select **OID** in the Name column. The Oracle Internet Directory page opens. The status should be green if the required packages

are installed properly. This does not indicate whether or not the Oracle directory integration server is running or not.

3. To check the status of the servers, select **Directory Integration** to display the Directory Integration Platform Status page. This page displays the various running instances of Oracle directory integration servers—including those for both provisioning and synchronization. The main data displayed for provisioning integration profiles in this window are:
 - Name of the subscribed application
 - Name of the organization for which the subscription was made
 - Status of the profile (ENABLED or DISABLED)
 - Change key in Oracle Internet Directory up to which the events have been propagated to the application that is represented by the profile
 - Last execution time
 - Last successful execution time of the profile.
 - Errors, if any

Note: The Directory Integration Platform Status page does not display the various event subscriptions for this profile.

You can also get detailed output about provisioning integration status by running the `oidprovtool` utility with the operation argument `status`. The `oidprovtool` utility is located in the `$ORACLE_HOME/bin` directory.

See Also: The chapter about Oracle Directory Integration Platform tools in the *Oracle Identity Management User Reference* for information on how to use the `oidprovtool` utility

Checklist for Troubleshooting Provisioning

When troubleshooting provisioning, use the following as a checklist:

- On UNIX/Linux, use the following command to verify that the Oracle directory integration server process (`odisrv`) is running:

```
ps -ef | grep odisrv
```

For Windows operating systems, obtain the value of process ID (PID) for the `odisrv` process from the `$ORACLE_HOME/ldap/log/oidmon.log` file. Then, start Task Manager and click the **Processes** tab to verify that the process is running.

- Check whether there is also a Oracle directory integration server instance running.

If OracleAS Portal, Oracle Collaboration Suite, or another component needs provisioning, then there is probably a Oracle directory integration server provisioning process running as instance 1 on configuration set 0. In this case, you should start your Oracle directory integration server as instance 2 with either the default `configset=1` argument or use your custom created configuration set number.

Check `$ORACLE_HOME/ldap/log/odisrv0x.log`. When the provisioning integration service is running, it logs to the `odisrv01.log` file. The directory synchronization service then logs to the `odisrv02.log` file.

- Verify that the profile is enabled by using the Oracle Directory Integration Server Administration tool or the DIP Tester utility.
- Verify that trace files are being generated. The trace file can be found at `$ORACLE_HOME/ldap/odi/log/profile_name.trc`.

If no trace file is generated, then check the `odisrv0x.log` for possible problems in the startup of the Oracle directory integration server, as described earlier in this list.

- Verify that correct syntax is used to start the Oracle directory integration server. For example:

```
oidctl connect=asdb server=odisrv instance=2 configset=1 flags="host=myhost
port=3060" start
```

- For debugging, verify that the value of the debug flag is set to 63 when starting the Oracle directory integration server, as follows:

```
oidctl connect=asdb server=odisrv instance=2 configset=1 flags="host=myhost
port=3060 debug=63" start
```

- Edit the profile and set the debug level to 63 by using the Oracle Directory Integration Server Administration tool or the DIP Tester utility.
- Validate all required parameters in the profile.

See Also:

- Oracle*MetaLink* Note: 261342.1—Understanding DIP Mapping Files available on Oracle*MetaLink* at <http://metalink.oracle.com/>
- "Configuring Mapping Rules" on page 6-4
- Verify that you are using the Oracle Internet Directory 10g (10.1.4.2) release of the Oracle Directory Integration Server Administration tool or Oracle Directory Manager to update the profile. Previous releases of these utilities display different information on the Profile tab pages and should not be used.
- If you are using the PL/SQL plug-in, use `sqlplus` to verify that you can connect to the provisioning-integrated application.

See Also: Oracle*MetaLink* Note: 265397.1—Password Policy Expires available on Oracle*MetaLink* at <http://metalink.oracle.com/>

Troubleshooting Synchronization

This section describes how to troubleshoot synchronization with Oracle Directory Integration Platform. It contains these topics:

- [Oracle Directory Integration Platform Synchronization Process Flow](#)
- [Checklist for Troubleshooting Synchronization](#)
- [Understanding Trace Files](#)

Oracle Directory Integration Platform Synchronization Process Flow

When debugging synchronization issues between Oracle Internet Directory and a connected directory, it helps to understand the synchronization process flow of the Oracle directory integration server.

Oracle Directory Integration Platform Synchronization Process Flow for an Import Profile

The Oracle directory integration server reads all import profiles at startup. For each profile that is set to `ENABLE`, the Oracle directory integration server performs the following tasks during the synchronization process:

1. Connects to a third-party directory.
2. Gets the value of the last change key from the connected directory.
3. Connects to Oracle Internet Directory.
4. Gets the value of the profile's last applied change key from Oracle Internet Directory.
5. For Sun Java System Directory connections, the Oracle directory integration server searches the remote change logs for entries greater than the value of the last applied change key and less than or equal to the value of the last change key. For Microsoft Active Directory connections, the Oracle directory integration server searches for this information in the remote directory's `USNChanged` values. For the Novell eDirectory and OpenLDAP connectors, changes are identified based on the `modifytimestamp` attribute of each entry. For other types of connectors, such as the Oracle Human Resources connector, the Oracle directory integration server performs similar types of searches, although the method by which data is exchanged varies according to the type of connection.
6. Maps the data values from the connected directory to Oracle Internet Directory values.
7. Creates an Oracle Internet Directory change record.
8. Applies the change (add, change, delete) in Oracle Internet Directory.
9. Updates the Oracle Internet Directory import profile with the last execution times and the last applied change key from the connected directory.
10. Enters sleep mode for the number of seconds specified for the synchronization interval.

Oracle Directory Integration Platform Synchronization Process Flow for an Export Profile

The Oracle directory integration server reads all export profiles at startup. For each profile that is set to `ENABLE`, the Oracle directory integration platform performs the following tasks during the synchronization process:

1. Connects to a third-party directory.
2. Connects to Oracle Internet Directory.
3. Gets the value for the last change key from Oracle Internet Directory.
4. Gets the value of the profile's last applied change key from Oracle Internet Directory.
5. The Oracle directory integration server searches the Oracle Internet Directory change logs for entries greater than the value of the last applied change key and less than or equal to the value of the last change key.
6. Maps the data values from Oracle Internet Directory to the connected directory values.
7. Creates a change record.

8. Applies the change (add, change, delete) on the connected directory.
9. Updates the Oracle Internet Directory export profile with the last execution times and the last applied change key from Oracle Internet Directory.
10. Enters sleep mode for the number of seconds specified for the synchronization interval.

Checklist for Troubleshooting Synchronization

When troubleshooting synchronization, use the following as a checklist.

- On UNIX/Linux, use the following command to verify that the Oracle directory integration platform process (odisrv) is running:

```
ps -ef | grep odisrv
```

For Windows operating systems, obtain the value of process ID (PID) for the odisrv process from \$ORACLE_HOME/ldap/log/oidmon.log. Then, launch Task Manager, and click the **Processes** tab to verify that the process is running.

- Check whether there is also a Oracle directory integration server instance running.

If OracleAS Portal, Oracle Collaboration Suite, or another component needs provisioning, then there is probably a Oracle directory integration server provisioning process running as instance 1 on configuration set 0. In this case, you should start your directory integration server as instance 2 with either the default configset=1 argument or using your custom created configuration set number.

Check \$ORACLE_HOME/ldap/log/odisrv0x.log. When the provisioning integration service is running, it logs to the odisrv01.log file. The directory synchronization service then logs to odisrv02.log.

- Verify that the profile is enabled by using the Oracle Directory Integration Server Administration tool or the DIP Tester utility.
- Verify that trace files are being generated. The trace file can be found at \$ORACLE_HOME/ldap/odi/log/profile_name.trc

If no trace file is generated, then check the odisrv0x.log for possible problems in startup of the directory integration server, as described earlier in this list.

- Verify that audit logs are being generated and periodically review them for failures. The audit logs can be found at: \$ORACLE_HOME/ldap/odi/log/profile_name.aud.

- Verify that correct syntax is used to start the Oracle directory integration server. For example:

```
oidctl connect=asdb server=odisrv instance=2 configset=1 flags="host=myhost port=3060" start
```

- For debugging, verify that the value of the debug flag set to 63 when starting the directory integration server, as follows:

```
oidctl connect=asdb server=odisrv instance=2 configset=1 flags="host=myhost port=3060 debug=63" start
```

- Edit the profile and set the debug level to 63 by using the Oracle Directory Integration Server Administration tool or the DIP Tester utility.
- Validate the all required parameters in the profile.

See Also:

- Oracle*MetaLink* Note: 261342.1—Understanding DIP Mapping Files available on Oracle*MetaLink* at <http://metalink.oracle.com/>
- "Configuring Mapping Rules" on page 6-4
- Verify that you are using the Oracle Internet Directory 10g (10.1.4.2) release of the Oracle Directory Integration Server Administration tool or Oracle Directory Manager to update the profile. Previous releases of these utilities display different information on the Profile tab pages and should not be used.
- Verify that the third-party LDAP directory server is running by executing the following command:


```
ldapbind -h ldap_host -p ldap_port -D account -w password
```
- If the Oracle directory integration server does not start, or if it starts and then fails, then check the following:
 - The instance number and configset being used
 - Whether the flags="host=xxx port=xxxx" parameter is used with oidctl
 - The odisrv0x.log to see:
 - * The connector successfully started
 - * The password expired

To re-register the connector, enter the following command:

```
odisrvreg -p port -D cn=orcladmin -w password -h host
```

See Also: Oracle*MetaLink* Note: 265397.1—Password Policy Expires available on Oracle*MetaLink* at <http://metalink.oracle.com/>

Understanding Trace Files

This section explains how to understand an Oracle Directory Integration Platform trace file. The sample trace files in this section were generated with Microsoft Active Directory import connectors. Export connectors generate the same trace files as import connectors except that source and destination LDAP connections and the mapping rules are reversed. The synchronization connectors for Sun Java System Directory, Novell eDirectory, and OpenLDAP generate similar trace files, with the exception of how change numbers are recorded. Oracle Database Connector generates similar trace files, although a JDBC connection is used to obtain the last change number.

To debug problems for a particular synchronization profile, you must set the profile's debug level set to 63. You must also assign a value of 63 to the debug argument of the command that you use to start the Oracle Directory Integration Platform server. See "Starting, Stopping, and Restarting the Oracle Directory Integration Platform" on page 4-8 for more information on how to start, stop, and restart the Oracle Directory Integration Platform.

The following is the beginning of a valid sample trace file for a Microsoft Active Directory connector synchronized modify operation. One of the first statements is an LDAP connection to the remote server, which is necessary to obtain the last change number. The last change number is stored in the HighestCommittedUSN attribute for Active Directory and in the lastchangenumber attribute for Sun Java System

Directory. The last change number in Novell eDirectory and OpenLDAP is the date and time of the last change.

```
-----
Trace Log Started at Wed Sep 29 09:40:18 EDT 2007
-----
Command exec succesful
LDAP URL : (myserver.mycompany.com:389 administrator@mycompany.com
LDAP Connection success
Applied ChangeNum : 428596Available chg num = 428596
```

Next, you should see an LDAP connection to Oracle Internet Directory that queries the synchronization profile to obtain the last applied change number and any defined filters, as follows.

```
Reader Initialised !!
LDAP URL : (myserver.mycompany.com:13060 cn=odisrv+orclhostname=myserver,
cn=registered instances,cn=directory integration platform,cn=products,
cn=oraclecontext
Specifying binary attributes: mpegvideo objectguid objectsid guid usercertificate
orclodipcondirlastappliedchgnum
LDAP Connection success
```

Using the last change number and last applied change number, you can create an LDAP search filter to obtain changes since the last synchronization interval. For example, the following search filter returns the changes between the last change number (428596) and the last applied change number (429095): SearchFiltler (& (USNChanged>=428596) (USNChanged<=429095)).

Changes that fall within the limits of the DomainRules defined in the mapping file are then transformed according to the defined AttributeRules (the mapping file itself is not read directly by the Oracle Directory Integration Platform connector). In a normal trace you should see the following output for each transformed change record:

```
Source ChangeRecord Created
MAPPING: Attributes - Start
MAPPING: Processing Map Rule : x
MAPPING: Processing Map Rule : x
MAPPING: DstChangeRecord after Attribute Mapping : ChangeRecord : -----
Changetype: ADDRMODIFY
ChangeKey: cn=test user,cn=users,dc=oemad-orl,dc=us,dc=oracle,dc=com
Attributes:
Output ChangeRecord ChangeRecord : -----
Changetype: ADDRMODIFY
ChangeKey: cn=test user,cn=adusers,cn=users,dc=vpn,dc=oracle,dc=com
DN : cn=test user,cn=adusers,cn=users,dc=vpn,dc=oracle,dc=com
Searching for entry in Naming context:
Normalized DN : cn=test user,cn=adusers,cn=users,dc=vpn,dc=oracle,dc=com
Changetype is 5
Processing modifyRadd Operation ..
Proceeding with checkNReplace..
Performing checkNReplace..
```

At the end of the iteration, the profile is updated with the last applied change number and execution time. The following is the end portion of a valid sample trace file for a Microsoft Active Directory connector synchronized modify operation:

```
Total # of Mod Items : 2
Modified Entry Successfully : cn=test
user,cn=adusers,cn=users,dc=vpn,dc=oracle,dc=com
Setting Change Success Count : 2
```

```

Setting Change Failure Count : 0
Replacing Attribute orclodipLastSuccessfulExecutionTime in the Profile with value
: 20070531085102
Removed Existing attribute
RePopulated Attribute..
Updated Attributes
orclodipLastExecutionTime: 20070531085102
orclodipConDirLastAppliedChgNum: 429324
orclOdipSynchronizationStatus: Synchronization Successful
orclodipLastSuccessfulExecutionTime: 20070531085102
Ending Mapping execution.

```

The following is the beginning and end portions of a valid sample trace file for a Microsoft Active Directory connector synchronized addition operation:

```

-----
Trace Log Started at Tue Jun 08 11:22:25 EDT 2007
-----

Command exec succesful
LDAP URL : (myserver.mycompany.com:389 administrator@mycompany.com
LDAP Connection success
Applied ChangeNum : 28017Available chg num = 28019
Reader Initialised !!
LDAP URL : (sun1:3060 cn=odisrv+orclhostname=myserver,cn=odi,cn=oracle internet
directory
LDAP Connection success
Writer Initialised!!
MapEngine Initialised!!
Filter Initialised!!
searchF :
CHGLOGFILTER : (&(USNChanged>=28018)(USNChanged<=28022))
Search Time 8
Search Successful till # 28022
Search Changes Done
Changenumber USNChanged: 28022
targetdn distinguishedName: CN=Test User56,CN=Users,DC=US,DC=ORACLE,DC=com
ChangeRecord : -----
Changetype: 4
ChangeKey: CN=Test User56,CN=Users,DC=US,DC=ORACLE,DC=com
Attributes:
Class: null Name: ou Type: null ChgType: 1 Value: [ ]
Class: null Name: objectGUID Type: null ChgType: 2 Value: [[B@d0a5d9]

...

Class: null Name: mail Type: null ChgType: 1 Value: [ ]
Class: null Name: displayname Type: null ChgType: 2 Value: [Test User56]
Class: null Name: cn Type: null ChgType: 2 Value: [Test User56]
Class: null Name: sn Type: null ChgType: 2 Value: [Test User56]
Class: null Name: krbprincipalname Type: null ChgType: 1 Value: [@ ]
Class: null Name: uid Type: null ChgType: 1 Value: [ ]
Class: null Name: orcluserprincipalname Type: null ChgType: 1 Value: [ ]
Class: null Name: orclsamaccountname Type: null ChgType: 2 Value: [$Test User56]
-----
DN : CN=Test User56,cn=users,dc=us,dc=oracle,dc=com
Normalized DN : CN=Test User56,cn=users,dc=us,dc=oracle,dc=com
Processing modifyRadd Operation ..
Entry Not Found. Converting to an ADD op..
Processing Insert Operation ..
Performing createEntry..

```



```
Entry Added Successfully : CN=Test User56,cn=users,dc=us,dc=oracle,dc=com
Updated Attributes
orclodipLastExecutionTime: 20040608112226
orclOdipSynchronizationStatus: Synchronization Successful
orclodipLastSuccessfulExecutionTime: 20040608112226
```

The following is the beginning and end portions of a valid sample trace file for a Microsoft Active Directory connector synchronized deletion operation:

```
-----
Trace Log Started at Wed Aug 18 09:10:05 EDT 2007
-----
Command exec succesful
LDAP URL : (myserver.mycompany.com:389 administrator@mycompany.com
LDAP Connection success
Applied ChangeNum : 31940Available chg num = 31940
Reader Initialised !!
LDAP URL : (sun2.mycompany.com:3060 cn=odisrv+orclhostname=sun2,cn=odi,cn=oracle
internet directory
LDAP Connection success
Writer Initialised!!
MapEngine Initialised!!
Filter Initialised!!
searchF :
CHGLOGFILTER : (&(USNChanged>=31941)(USNChanged<=31941))
Search Time 10
Search Successful till # 31941
Search Changes Done
Changenumbers USNChanged: 31941
Deleted isDeleted: TRUE
Deleted isDeleted: TRUE
ChangeRecord : -----
Changetype: 1
ChangeKey: *
Attributes:
Class: null Name: objectGUID Type: null ChgType: 3 Value: [[B@ece65]

...

Output ChangeRecord ChangeRecord : -----
Changetype: 1
ChangeKey: *
Attributes:
Class: null Name: objectclass Type: null ChgType: 3 Value: [organizationalunit,
orclcontainer, orcladuser, orcluserv2, orcladgroup]
Class: null Name: krbprincipalname Type: null ChgType: 3 Value: [@ ]
Class: null Name: orclsamaccountname Type: null ChgType: 3 Value: [$ ]
Class: null Name: orclobjectguid Type: null ChgType: 3 Value:
[2xR7Nas8UUKtzmPk0jpSFg==]
-----
DN : *
Normalized DN : cn=TUser2007,cn=users,dc=us,dc=oracle,dc=com
Processing Delete Operation ..
Deleted entry Successfully : cn=TUser2007,cn=users,dc=us,dc=oracle,dc=com
Updated Attributes
orclodipLastExecutionTime: 20040818091005
orclOdipSynchronizationStatus: Synchronization Successful
orclodipLastSuccessfulExecutionTime: 20040818091005
```

Troubleshooting Integration with Microsoft Active Directory

This section describes how to troubleshoot integration with Microsoft Active Directory. It contains these topics:

- [Debugging Windows Native Authentication](#)
- [Synchronizing Changes Following a Period when Oracle Internet Directory is Unavailable](#)

Debugging Windows Native Authentication

Once you have configured Windows Native Authentication (see "[Configuring Windows Native Authentication](#)" on page 19-8), you can enable logging for this feature at run time. Open the `opmn.xml` file, located in `$ORACLE_HOME/opmn/conf`, and add the following parameter:

```
-Djazn.debug.log.enable = {true | false}
```

Assigning a value of `true` to the parameter enables debugging while assigning a value of `false` disables it.

The boldface text in the following example show where you should place the parameter in the `opmn.xml` file:

```
<process-type id="OC4J_SECURITY" module-id="OC4J">
  <environment>
    <variable id="DISPLAY" value="sun1.us.oracle.com:0.0"/>
    <variable id="LD_LIBRARY_PATH" value="/private/ora1012/OraHome1/lib"/>
  </environment>
  <module-data>
    <category id="start-parameters">
      <data id="java-options" value="-server -Djazn.debug.log.enable=true
-Djava.security.policy=/private/ora1012/OraHome1/j2ee/OC4J_SECURITY/
config/java2.policy -Djava.awt.headless=true -Xmx512m
-Djava.awt.headless=true"/>
      <data id="oc4j-options" value="-properties"/>
    </category>
    <category id="stop-parameters">
      <data id="java-options" value="-Djava.security.policy=/private/ora1012/
OraHome1/j2ee/OC4J_SECURITY/config/java2.policy -Djava.awt.headless=true"/>
    </category>
  </module-data>
</process-type>
```

The log is written to the file `OC4J~OC4J_SECURITY~default_island~1`, found at `$ORACLE_HOME/opmn/logs`.

See Also: Oracle*MetaLink* Note: 283268.1—Troubleshooting Oracle Application Server Single Sign-On Windows Native Authentication available on Oracle*MetaLink* at <http://metalink.oracle.com/>

Note: When accessing a protected application with Windows Native Authentication, Web browsers automatically return a "401 - Unauthorized" error that is logged by Oracle Enterprise Manager. This is normal behavior and can be safely ignored.

Synchronizing Changes Following a Period when Oracle Internet Directory is Unavailable

When Oracle Internet Directory is unavailable, changes are stored in Microsoft Active Directory. The Oracle Password Filter for Microsoft Active Directory attempts to synchronize these entries after connectivity is restored with Oracle Internet Directory. The `SearchDeltaSize` parameter determines how many incremental changes are processed during each iteration in a synchronization cycle. By default, the `SearchDeltaSize` parameter is assigned a value of 500. Depending on how long Oracle Internet Directory is unavailable, the default `SearchDeltaSize` value of 500 may be too low to catch up all of the unsynchronized changes. To resolve this problem, you must create a catchup profile by copying the existing Microsoft Active Directory import synchronization profile and modifying the value assigned to the `SearchDeltaSize` parameter.

To create a catchup synchronization profile:

1. Stop the Oracle directory integration platform by following the instructions described in ["Starting, Stopping, and Restarting the Oracle Directory Integration Platform"](#) on page 4-8.

2. Use the following command to disable the Microsoft Active Directory import synchronization profile:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -host host -port port
-file import.profile -dn bind_DN -passwd password_of_bind_DN
-profile profile_name odip.profile.status=DISABLE
```

3. Use the following command to create the catchup synchronization profile by copying the Microsoft Active Directory import synchronization profile:

```
$ORACLE_HOME/bin/dipassistant createprofilelike -h host -p port -U ssl_mode -D
bindDN -profile orig_profile_name -newprofile catchup_profile_name
```

4. Use the following command to enable the original Microsoft Active Directory import synchronization profile:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -h host -p port
-file import.profile -dn bind_DN -passwd password_of_bind_DN
-profile profile_name odip.profile.status=ENABLE
```

5. Start the Oracle directory integration platform by following the instructions described in ["Starting, Stopping, and Restarting the Oracle Directory Integration Platform"](#) on page 4-8.

6. Obtain the current value of the `highestCommittedUSN` by searching the new domain controller's root DSE for the current highest `USNChanged` value (attribute value of the `highestCommittedUSN` attribute of the root DSE):

```
ldapsearch -h host -p port -b "" -s base -D user
DN -w password "objectclass=*" highestCommittedUSN
```

7. Experiment with the following `ldapsearch` command until you retrieve more than 100 entries but less than 200. Retrieving more than 200 entries may result in an internal buffer overrun.

```
ldapsearch -v -h adhost -p adport -D administrator@domain -w password
-b cn=users,dc=acme,dc=com -s sub
"(&(objectclass=*)(usnChanged>=delta)(&(usnChanged<=highestCommittedUSN)))" dn
```

For example, the following command performs a search using a default search delta size of 500:

```
ldapsearch -v -h adhost -p adport -D administrator@domain -w password
-b cn=users,dc=acme,dc=com -s sub
" (&(objectclass=*) (usnChanged>=555010) (&(usnChanged<=55510))) " dn
```

8. Create a text file named `profile_config.txt` that contains the following:

```
[INTERFACEDetails]
Package: gsi
Reader: ActiveChgReader
SkipErrorToSyncNextChange: true
SearchDeltaSize: 100000
```

Note: You can also set the `SkipErrorToSyncNextChange` parameter to determine how the Oracle directory integration platform handles an error when processing a change during synchronization. See "[SkipErrorToSyncNextChange Parameter](#)" on page 6-4 for more information.

9. Use the following command to load the `profile_config.txt` file into the catchup synchronization profile:

```
dipassistant modifyprofile -h oidhost -port oidport -dn cn=orcladmin
-passwd password -profile catchup_profile_name
odip.profile.configfile=path/profile_config.txt
```

10. Use the following command to enable the catchup synchronization profile:

```
$ORACLE_HOME/bin/dipassistant modifyprofile -host host -port port
-file import.profile -dn bind_DN -passwd password_of_bind_DN
-profile catchup_profile_name odip.profile.status=ENABLE
```

Note: Be sure to continue running the original Microsoft Active Directory import synchronization profile along with the catchup synchronization profile.

11. Allow the catchup synchronization profile to run for at least 12 hours, and then monitor the `$ORACLE_HOME/ldap/odi/log/catchup_profile_name.aud` file. After all of the backlogged changes are synchronized, use the following command to disable the catchup synchronization profile.

```
$ORACLE_HOME/bin/dipassistant modifyprofile -host host -port port
-file import.profile -dn bind_DN -passwd password_of_bind_DN
-profile catchup_profile_name odip.profile.status=DISABLE
```

Need More Help?

You can find more solutions on Oracle *MetaLink*, <http://metalink.oracle.com>. If you do not find a solution for your problem, log a service request.

See Also: *Oracle Application Server Release Notes*, available on the Oracle Technology Network:
<http://www.oracle.com/technology/documentation/index.html>

Glossary

access control item (ACI)

An attribute that determines who has what type of access to what directory data. It contains a set of rules for structural access items, which pertain to entries, and content access items, which pertain to attributes. Access to both structural and content access items may be granted to one or more users or groups.

access control list (ACL)

The group of access directives that you define. The directives grant levels of access to specific data for specific clients, or groups of clients, or both.

access control policy point

An entry that contains security directives that apply downward to all entries at lower positions in the [directory information tree \(DIT\)](#).

ACI

See [access control item \(ACI\)](#).

ACL

See [access control list \(ACL\)](#).

ACP

See [access control policy point](#).

administrative area

A subtree on a directory server whose entries are under the control (schema, ACL, and collective attributes) of a single administrative authority.

advanced symmetric replication (ASR)

See [Oracle Database Advanced Replication](#)

anonymous authentication

The process by which the directory authenticates a user without requiring a user name and password combination. Each anonymous user then exercises the privileges specified for anonymous users.

API

See [application program interface \(API\)](#).

application program interface (API)

Programs to access the services of a specified application. For example, LDAP-enabled clients access directory information through programmatic calls available in the LDAP API.

ASR

See [Oracle Database Advanced Replication](#).

attribute

An item of information that describes some aspect of an entry. An entry comprises a set of attributes, each of which belongs to an [object class](#). Moreover, each attribute has both a *type*, which describes the kind of information in the attribute, and a *value*, which contains the actual data.

attribute configuration file

In an Oracle Directory Integration Platform environment, a file that specifies attributes in a connected directory.

attribute type

The kind of information an attribute contains, for example, `jobTitle`.

attribute uniqueness

An Oracle Internet Directory feature that ensures that no two specified attributes have the same value. It enables applications synchronizing with the enterprise directory to use attributes as unique keys.

attribute value

The particular occurrence of information appearing in that entry. For example, the value for the `jobTitle` attribute could be `manager`.

authentication

The process of verifying the identity of a user, device, or other entity in a computer system, often as a prerequisite to allowing access to resources in a system.

authorization

Permission given to a user, program, or process to access an object or set of objects.

binding

The process of authenticating to a directory.

central directory

In an Oracle Directory Integration Platform environment, the directory that acts as the central repository. In an Oracle Directory Integration Platform environment, Oracle Internet Directory is the central directory.

certificate

An ITU x.509 v3 standard data structure that securely binds an identity to a public key. A certificate is created when an entity's public key is signed by a trusted identity: a [certificate authority \(CA\)](#). This certificate ensures that the entity's information is correct and that the public key actually belongs to that entity.

certificate authority (CA)

A trusted third party that certifies that other entities—users, databases, administrators, clients, servers—are who they say they are. The certificate authority verifies the user's identity and grants a certificate, signing it with the certificate authority's private key.

certificate chain

An ordered list of certificates containing an end-user or subscriber certificate and its certificate authority certificates.

change logs

A database that records changes made to a directory server.

cipher suite

In SSL, a set of authentication, encryption, and data integrity algorithms used for exchanging messages between network nodes. During an SSL handshake, the two nodes negotiate to see which cipher suite they will use when transmitting messages back and forth.

cluster

A collection of interconnected computers that are used as a single computing resource. Hardware clusters provide high availability and scalability.

cold backup

The procedure to add a new [DSA](#) node to an existing replicating system by using the database copy procedure.

concurrency

The ability to handle multiple requests simultaneously. Threads and processes are examples of concurrency mechanisms.

concurrent clients

The total number of clients that have established a session with Oracle Internet Directory.

concurrent operations

The number of operations that are being run on the directory from all of the concurrent clients. Note that this is not necessarily the same as the concurrent clients, because some of the clients may be keeping their sessions idle.

configset

See [configuration set entry](#).

configuration set entry

A directory entry holding the configuration parameters for a specific instance of the directory server. Multiple configuration set entries can be stored and referenced at run time. The configuration set entries are maintained in the subtree specified by the subConfigsubEntry attribute of the DSE, which itself resides in the associated [directory information base \(DIB\)](#) against which the servers are started.

connect descriptor

A specially formatted description of the destination for a network connection. A connect descriptor contains destination service and network route information.

The destination service is indicated by using its service name for the Oracle Database or its Oracle System Identifier (SID) for Oracle release 8.0 or version 7 databases. The network route provides, at a minimum, the location of the listener through use of a network address.

connected directory

In an Oracle Directory Integration Platform environment, an information repository requiring full synchronization of data between Oracle Internet Directory and itself—for example, an Oracle human Resources database.

consumer

A directory server that is the destination of replication updates. Sometimes called a slave.

contention

Competition for resources.

context prefix

The **DN** of the root of a **naming context**.

cryptography

The practice of encoding and decoding data, resulting in secure messages.

Data Encryption Standard (DES)

A block cipher developed by IBM and the U.S. government in the 1970's as an official standard.

data integrity

The guarantee that the contents of the message received were not altered from the contents of the original message sent.

decryption

The process of converting the contents of an encrypted message (cipher text) back into its original readable format (plain text).

default knowledge reference

A **knowledge reference** that is returned when the base object is not in the directory, and the operation is performed in a naming context not held locally by the server. A default knowledge reference typically sends the user to a server that has more knowledge about the directory partitioning arrangement.

default identity management realm

In a hosted environment, one enterprise—for example, an application service provider—makes Oracle components available to multiple enterprises and stores information for them. In such hosted environments, the enterprise performing the hosting is called the default identity management realm, and the enterprises that are hosted are each associated with their own identity management realm in the DIT.

default realm location

An attribute in the root Oracle Context that identifies the root of the default identity management realm.

delegated administrator

In a hosted environment, one enterprise—for example, an application service provider—makes Oracle components available to multiple other enterprises and stores information for them. In such an environment, a global administrator performs activities that span the entire directory. Other administrators—called delegated administrators—may exercise roles in specific identity management realms, or for specific applications.

DES

See [Data Encryption Standard \(DES\)](#).

DIB

See [directory information base \(DIB\)](#).

directory information base (DIB)

The complete set of all information held in the directory. The DIB consists of entries that are related to each other hierarchically in a [directory information tree \(DIT\)](#).

directory information tree (DIT)

A hierarchical, tree-like structure consisting of the DNs of the entries.

directory integration profile

In an Oracle Directory Integration Platform environment, an entry in Oracle Internet Directory that describes how Oracle Directory Integration Platform communicates with external systems and what is communicated.

directory integration server

In an Oracle Directory Integration Platform environment, the server that drives the synchronization of data between Oracle Internet Directory and a [connected directory](#).

directory naming context

See [naming context](#).

directory provisioning profile

A special kind of [directory integration profile](#) that describes the nature of provisioning-related notifications that Oracle Directory Integration Platform sends to the directory-enabled applications

directory replication group (DRG)

The directory servers participating in a replication agreement.

directory server instance

A discrete invocation of a directory server. Different invocations of a directory server, each started with the same or different configuration set entries and startup flags, are said to be different directory server instances.

directory-specific entry (DSE)

An entry specific to a directory server. Different directory servers may hold the same DIT name, but have different contents—that is, the contents can be specific to the directory holding it. A DSE is an entry with contents specific to the directory server holding it.

directory synchronization profile

A special kind of [directory integration profile](#) that describes how synchronization is carried out between Oracle Internet Directory and an external system.

directory system agent (DSA)

The X.500 term for a directory server.

distinguished name (DN)

The unique name of a directory entry. It comprises all of the individual names of the parent entries back to the root.

DIS

See [directory integration server](#).

DIT

See [directory information tree \(DIT\)](#).

DN

See [distinguished name \(DN\)](#).

DRG

See [directory replication group \(DRG\)](#).

DSA

See [directory system agent \(DSA\)](#).

DSE

See [directory-specific entry \(DSE\)](#).

[DSA](#)-specific entries. Different DSAs may hold the same DIT name, but have different contents. That is, the contents can be specific to the DSA holding it. A DSE is an entry with contents specific to the DSA holding it.

encryption

The process of disguising the contents of a message and rendering it unreadable (ciphertext) to anyone except for the intended recipient.

entry

The building block of a directory, it contains information about an object of interest to directory users.

export agent

In an Oracle Directory Integration Platform environment, an agent that exports data out of Oracle Internet Directory.

export data file

In an Oracle Directory Integration Platform environment, the file that contains data exported by an [export agent](#).

export file

See [export data file](#).

external agent

A directory integration agent that is independent of Oracle directory integration server. Oracle directory integration server does not provide scheduling, mapping, or error handling services for it. An external agent is typically used when a third party metadirectory solution is integrated with the Oracle Directory Integration Platform.

failover

The process of failure recognition and recovery. In an Oracle Application Server Cold Failover Cluster (Infrastructure), an application running on one cluster node is transparently migrated to another cluster node. During this migration, clients accessing the service on the cluster see a momentary outage and may need to reconnect once the failover is complete.

fan-out replication

Also called a point-to-point replication. A type of replication in which a supplier replicates directly to a consumer. That consumer can then replicate to one or more other consumers. The replication can be either full or partial.

filter

A method of qualifying data, usually data that you are seeking. Filters are always expressed as DN's, for example: `cn=susie smith,o=acme,c=us`.

global administrator

In a hosted environment, one enterprise—for example, an application service provider—makes Oracle components available to multiple other enterprises and stores information for them. In such an environment, a global administrator performs activities that span the entire directory.

global unique identifier (GUID)

An identifier generated by the system and inserted into an entry when the entry is added to the directory. In a multimaster replicated environment, the GUID, not the DN, uniquely identifies an entry. The GUID of an entry cannot be modified by a user.

grace login

A login occurring within the specified period before password expiration.

group search base

In the Oracle Internet Directory default DIT, the node in the identity management realm under which all the groups can be found.

guest user

One who is not an anonymous user, and, at the same time, does not have a specific user entry.

GUID

See [global unique identifier \(GUID\)](#).

handshake

A protocol two computers use to initiate a communication session.

hash

A number generated from a string of text with an algorithm. The hash value is substantially smaller than the text itself. Hash numbers are used for security and for faster access to data.

identity management

The process by which the complete security life cycle for network entities is managed in an organization. It typically refers to the management of an organization's application users, where steps in the security life cycle include account creation, suspension, privilege modification, and account deletion. The network entities managed can also include devices, processes, applications, or anything else that needs to interact in a networked environment. Entities managed by an identity management process can also include users outside of the organization, for example customers, trading partners, or Web services.

identity management realm

A collection of identities, all of which are governed by the same administrative policies. In an enterprise, all employees having access to the intranet may belong to one realm, while all external users who access the public applications of the enterprise may belong to another realm. An identity management realm is represented in the directory by a specific entry with a special object class associated with it.

identity management realm-specific Oracle Context

An Oracle Context contained in each identity management realm. It stores the following information:

- User naming policy of the identity management realm—that is, how users are named and located
- Mandatory authentication attributes
- Location of groups in the identity management realm
- Privilege assignments for the identity management realm—for example: who has privileges to add more users to the Realm.
- Application specific data for that Realm including authorizations

import agent

In an Oracle Directory Integration Platform environment, an agent that imports data into Oracle Internet Directory.

import data file

In an Oracle Directory Integration Platform environment, the file containing the data imported by an [import agent](#).

inherit

When an object class has been derived from another class, it also derives, or inherits, many of the characteristics of that other class. Similarly, an attribute subtype inherits the characteristics of its supertype.

instance

See [directory server instance](#).

integrity

The guarantee that the contents of the message received were not altered from the contents of the original message sent.

Internet Engineering Task Force (IETF)

The principal body engaged in the development of new Internet standard specifications. It is an international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet.

Internet Message Access Protocol (IMAP)

A protocol allowing a client to access and manipulate electronic mail messages on a server. It permits manipulation of remote message folders, also called mailboxes, in a way that is functionally equivalent to local mailboxes.

key

A string of bits used widely in cryptography, allowing people to encrypt and decrypt data; a key can be used to perform other mathematical operations as well. Given a cipher, a key determines the mapping of the plaintext to the ciphertext.

key pair

A [public key](#) and its associated [private key](#).

See [public/private key pair](#).

knowledge reference

The access information (name and address) for a remote [DSA](#) and the name of the [DIT](#) subtree that the remote DSA holds. Knowledge references are also called referrals.

latency

The time a client has to wait for a given directory operation to complete. Latency can be defined as wasted time. In networking discussions, latency is defined as the travel time of a packet from source to destination.

LDAP

See [Lightweight Directory Access Protocol \(LDAP\)](#).

LDIF

See [LDAP Data Interchange Format \(LDIF\)](#).

Lightweight Directory Access Protocol (LDAP)

A standard, extensible directory access protocol. It is a common language that LDAP clients and servers use to communicate. The framework of design conventions supporting industry-standard directory products, such as the Oracle Internet Directory.

LDAP Data Interchange Format (LDIF)

The set of standards for formatting an input file for any of the LDAP command-line utilities.

logical host

In an Oracle Application Server Cold Failover Cluster (Infrastructure), one or more disk groups and pairs of host names and IP addresses. It is mapped to a physical host

in the cluster. This physical host impersonates the host name and IP address of the logical host

man-in-the-middle

A security attack characterized by the third-party, surreptitious interception of a message. The third-party, the *man-in-the-middle*, decrypts the message, re-encrypts it (with or without alteration of the original message), and retransmits it to the originally-intended recipient—all without the knowledge of the legitimate sender and receiver. This type of security attack works only in the absence of [authentication](#).

mapping rules file

In an Oracle Directory Integration Platform environment, the file that specifies mappings between Oracle Internet Directory attributes and those in a [connected directory](#).

master definition site (MDS)

In replication, a master definition site is the Oracle Internet Directory database from which the administrator runs the configuration scripts.

master site

In replication, a master site is any site other than the master definition site that participates in LDAP replication.

matching rule

In a search or compare operation, determines equality between the attribute value sought and the attribute value stored. For example, matching rules associated with the `telephoneNumber` attribute could cause "(650) 123-4567" to be matched with either "(650) 123-4567" or "6501234567" or both. When you create an attribute, you associate a matching rule with it.

MD4

A one-way hash function that produces a 128-bit hash, or message digest. If as little as a single bit value in the file is modified, the MD4 checksum for the file will change. Forgery of a file in a way that will cause MD4 to generate the same result as that for the original file is considered extremely difficult.

MD5

An improved version of MD4.

MDS

See [master definition site \(MDS\)](#)

metadirectory

A directory solution that shares information between all enterprise directories, integrating them into one virtual directory. It centralizes administration, thereby reducing administrative costs. It synchronizes data among directories, thereby ensuring that it is consistent and up-to-date across the enterprise.

MTS

See [shared server](#)

multimaster replication

Also called peer-to-peer or *n*-way replication, a type of replication that enables multiple sites, acting as equals, to manage groups of replicated data. In a multimaster replication environment, each node is both a supplier and a consumer node, and the entire directory is replicated on each node.

naming attribute

The attribute used to compose the RDN of a new user entry created through Oracle Delegated Administration Services or Oracle Internet Directory Java APIs. The default value for this is `cn`.

naming context

A subtree that resides entirely on one server. It must be contiguous, that is, it must begin at an entry that serves as the top of the subtree, and extend downward to either leaf entries or [knowledge references](#) (also called referrals) to subordinate naming contexts. It can range in size from a single entry to the entire DIT.

native agent

In an Oracle Directory Integration Platform environment, an agent that runs under the control of the [directory integration server](#). It is in contrast to an [external agent](#).

net service name

A simple name for a service that resolves to a connect descriptor. Users initiate a connect request by passing a user name and password along with a net service name in a connect string for the service to which they wish to connect:

```
CONNECT username/password@net_service_name
```

Depending on your needs, net service names can be stored in a variety of places, including:

- Local configuration file, `tnsnames.ora`, on each client
- Directory server
- Oracle Names server
- External naming service, such as NDS, NIS or CDS

nickname attribute

The attribute used to uniquely identify a user in the entire directory. The default value for this is `uid`. Applications use this to resolve a simple user name to the complete distinguished name. The user nickname attribute cannot have multiple values—that is, a given user cannot have multiple nicknames stored under the same attribute name.

object class

A named group of attributes. When you want to assign attributes to an entry, you do so by assigning to that entry the object classes that hold those attributes.

All objects associated with the same object class share the same attributes.

OEM

See [Oracle Enterprise Manager](#).

OID Control Utility

A command-line tool for issuing run-server and stop-server commands. The commands are interpreted and executed by the [OID Monitor](#) process.

OID Database Password Utility

The utility used to change the password with which Oracle Internet Directory connects to an Oracle database.

OID Monitor

The Oracle Internet Directory component that initiates, monitors, and terminates the Oracle directory server processes. It also controls the replication server if one is installed, and Oracle directory integration server.

one-way function

A function that is easy to compute in one direction but quite difficult to reverse compute, that is, to compute in the opposite direction.

one-way hash function

A [one-way function](#) that takes a variable sized input and creates a fixed size output.

Oracle Call Interface (OCI)

An application programming interface (API) that enables you to create applications that use the native procedures or function calls of a third-generation language to access an Oracle database server and control all phases of SQL statement execution.

Oracle Delegated Administration Services

A set of individual, predefined services—called Oracle Delegated Administration Services units—for performing directory operations on behalf of a user. Oracle Internet Directory Self-Service Console makes it easier to develop and deploy administration solutions for both Oracle and third-party applications that use Oracle Internet Directory.

Oracle Directory Integration Platform

A component of [Oracle Internet Directory](#). It is a framework developed to integrate applications around a central LDAP directory like Oracle Internet Directory.

Oracle Directory Integration Server

In an Oracle Directory Integration Platform environment, a daemon process that monitors Oracle Internet Directory for change events and takes action based on the information present in the [directory integration profile](#).

Oracle Directory Manager

A Java-based tool with a graphical user interface for administering Oracle Internet Directory.

Oracle Enterprise Manager

A separate Oracle product that combines a graphical console, agents, common services, and tools to provide an integrated and comprehensive systems management platform for managing Oracle products.

Oracle Identity Management

An infrastructure enabling deployments to manage centrally and securely all enterprise identities and their access to various applications in the enterprise.

Oracle Internet Directory

A general purpose directory service that enables retrieval of information about dispersed users and network resources. It combines Lightweight Directory Access

Protocol (LDAP) Version 3 with the high performance, scalability, robustness, and availability of Oracle Database.

Oracle Net Services

The foundation of the Oracle family of networking products, allowing services and their client applications to reside on different computers and communicate. The main function of Oracle Net Services is to establish network sessions and transfer data between a client application and a server. Oracle Net Services is located on each computer in the network. Once a network session is established, Oracle Net Services acts as a data courier for the client and the server.

Oracle PKI certificate usages

Defines Oracle application types that a [certificate](#) supports.

Oracle Wallet Manager

A Java-based application that security administrators use to manage public-key security credentials on clients and servers.

Oracle Database Advanced Replication

A feature in the Oracle Database that enables database tables to be kept synchronized across two Oracle databases.

other information repository

In an Oracle Directory Integration Platform environment, in which Oracle Internet Directory serves as the [central directory](#), any information repository except Oracle Internet Directory.

partition

A unique, nonoverlapping directory naming context that is stored on one directory server.

peer-to-peer replication

Also called multimaster replication or *n*-way replication. A type of replication that enables multiple sites, acting as equals, to manage groups of replicated data. In such a replication environment, each node is both a supplier and a consumer node, and the entire directory is replicated on each node.

PKCS #12

A [public-key encryption](#) standard (PKCS). RSA Data Security, Inc. PKCS #12 is an industry standard for storing and transferring personal authentication credentials—typically in a format called a [wallet](#).

plaintext

Message text that has not been encrypted.

point-to-point replication

Also called fan-out replication. A type of replication in which a supplier replicates directly to a consumer. That consumer can then replicate to one or more other consumers. The replication can be either full or partial.

primary node

In an Oracle Application Server Cold Failover Cluster (Infrastructure), the cluster node on which the application runs at any given time.

private key

In public-key cryptography, this key is the secret key. It is primarily used for decryption, and it is also used for encryption with digital signatures.

provisioning agent

An application or process that translates Oracle-specific provisioning events to external or third-party application-specific events.

provisioned applications

Applications in an environment where user and group information is centralized in Oracle Internet Directory. These applications are typically interested in changes to that information in Oracle Internet Directory.

profile

See [directory integration profile](#).

proxy user

A kind of user typically employed in an environment with a middle tier, such as a firewall. In this environment, the end user authenticates to the middle tier. The middle tier then logs into the directory on the end user's behalf. A proxy user has the privilege to switch identities and, once it has logged in to the directory, switches to the end user's identity. It then performs operations on the end user's behalf, using the authorization appropriate to that particular end user.

public key

In public-key cryptography, this key is made public to all; it is primarily used for encryption, but it can be used for verifying signatures.

public-key cryptography

Cryptography based on methods involving a public key and a private key.

public-key encryption

The process in which the sender of a message encrypts the message with the public key of the recipient. Upon delivery, the message is decrypted by the recipient using the recipient's private key.

public/private key pair

A mathematically related set of two numbers where one is called the private key and the other is called the public key. Public keys are typically made widely available, while private keys are available only to their owners. Data encrypted with a public key can only be decrypted with its associated private key and vice versa. Data encrypted with a public key cannot be decrypted with the same public key.

realm search base

An attribute in the root Oracle Context that identifies the entry in the DIT that contains all identity management realms. This attribute is used when mapping a simple realm name to the corresponding entry in the directory.

referral

Information that a directory server provides to a client and which points to other servers the client must contact to find the information it is requesting.

See also [knowledge reference](#).

relational database

A structured collection of data that stores data in tables consisting of one or more rows, each containing the same set of columns. Oracle makes it very easy to link the data in multiple tables. This is what makes Oracle a relational database management system, or RDBMS. It stores data in two or more tables, and enables you to define relationships among the tables. The link is based on one or more fields common to both tables.

replica

Each copy of a naming context that is contained within a single server.

RDN

See [relative distinguished name \(RDN\)](#).

registry entry

An entry containing runtime information associated with invocations of Oracle directory servers, called a [directory server instance](#). Registry entries are stored in the directory itself, and remain there until the corresponding directory server instance stops.

relative distinguished name (RDN)

The local, most granular-level entry name. It has no other qualifying entry names that would serve to uniquely address the entry. In the example, `cn=Smith,o=acme,c=US`, the RDN is `cn=Smith`.

remote master site (RMS)

In a replicated environment, any site, other than the [master definition site \(MDS\)](#), that participates in Oracle Database Advanced Replication.

replication agreement

A special directory entry that represents the replication relationship among the directory servers in a [directory replication group \(DRG\)](#).

response time

The time between the submission of a request and the completion of the response.

root DSE

See [root directory specific entry](#).

root directory specific entry

An entry storing operational information about the directory. The information is stored in a number of attributes.

Root Oracle Context

In the Oracle Identity Management infrastructure, the Root Oracle Context is an entry in Oracle Internet Directory containing a pointer to the default identity management realm in the infrastructure. It also contains information on how to locate an identity management realm given a simple name of the realm.

SASL

See [Simple Authentication and Security Layer \(SASL\)](#).

scalability

The ability of a system to provide throughput in proportion to, and limited only by, available hardware resources.

schema

The collection of attributes, object classes, and their corresponding matching rules.

secondary node

In an Oracle Application Server Cold Failover Cluster (Infrastructure), the cluster node to which an application is moved during a failover.

Secure Hash Algorithm (SHA)

An algorithm that takes a message of less than 264 bits in length and produces a 160-bit message digest. The algorithm is slightly slower than MD5, but the larger message digest makes it more secure against brute-force collision and inversion attacks.

Secure Socket Layer (SSL)

An industry standard protocol designed by Netscape Communications Corporation for securing network connections. SSL provides authentication, encryption, and data integrity using public key infrastructure (PKI).

service time

The time between the initiation of a request and the completion of the response to the request.

session key

A key for symmetric-key cryptosystems that is used for the duration of one message or communication session.

SGA

See [System Global Area \(SGA\)](#).

SHA

See [Secure Hash Algorithm \(SHA\)](#).

shared server

A server that is configured to allow many user processes to share very few server processes, so the number of users that can be supported is increased. With shared server configuration, many user processes connect to a dispatcher. The dispatcher directs multiple incoming network session requests to a common queue. An idle shared server process from a shared pool of server processes picks up a request from the queue. This means a small pool of server processes can server a large amount of clients. Contrast with dedicated server.

sibling

An entry that has the same parent as one or more other entries.

simple authentication

The process by which the client identifies itself to the server by means of a DN and a password which are not encrypted when sent over the network. In the simple authentication option, the server verifies that the DN and password sent by the client match the DN and password stored in the directory.

Simple Authentication and Security Layer (SASL)

A method for adding authentication support to connection-based protocols. To use this specification, a protocol includes a command for identifying and authenticating a user to a server and for optionally negotiating a security layer for subsequent protocol interactions. The command has a required argument identifying a SASL mechanism.

single key-pair wallet

A **PKCS #12**-format **wallet** that contains a single user **certificate** and its associated **private key**. The **public key** is imbedded in the certificate.

slave

See **consumer**.

SLAPD

Standalone LDAP daemon.

smart knowledge reference

A **knowledge reference** that is returned when the knowledge reference entry is in the scope of the search. It points the user to the server that stores the requested information.

specific administrative area

Administrative areas control:

- Subschema administration
- Access control administration
- Collective attribute administration

A *specific* administrative area controls one of these aspects of administration. A specific administrative area is part of an autonomous administrative area.

sponsor node

In replication, the node that is used to provide initial data to a new node.

SSL

See **Secure Socket Layer (SSL)**.

subACLSubentry

A specific type of subentry that contains ACL information.

subclass

An object class derived from another object class. The object class from which it is derived is called its **superclass**.

subentry

A type of entry containing information applicable to a group of entries in a subtree. The information can be of these types:

- Access control policy points
- Schema rules
- Collective attributes

Subentries are located immediately below the root of an administrative area.

subordinate reference

A knowledge reference pointing downward in the DIT to a naming context that starts immediately below an entry.

subschema DN

The list of DIT areas having independent schema definitions.

subSchemaSubentry

A specific type of **subentry** containing schema information.

subtype

An attribute with one or more options, in contrast to that same attribute without the options. For example, a `commonName (cn)` attribute with American English as an option is a subtype of the `commonName (cn)` attribute without that option. Conversely, the `commonName (cn)` attribute without an option is the **supertype** of the same attribute with an option.

super user

A special directory administrator who typically has full access to directory information.

superclass

The object class from which another object class is derived. For example, the object class `person` is the superclass of the object class `organizationalPerson`. The latter, namely, `organizationalPerson`, is a **subclass** of `person` and inherits the attributes contained in `person`.

superior reference

A knowledge reference pointing upward to a DSA that holds a naming context higher in the DIT than all the naming contexts held by the referencing DSA.

supertype

An attribute without options, in contrast to the same attribute with one or more options. For example, the `commonName (cn)` attribute without an option is the supertype of the same attribute with an option. Conversely, a `commonName (cn)` attribute with American English as an option is a **subtype** of the `commonName (cn)` attribute without that option.

supplier

In replication, the server that holds the master copy of the naming context. It supplies updates from the master copy to the **consumer** server.

System Global Area (SGA)

A group of shared memory structures that contains data and control information for one Oracle Database instance. If multiple users are concurrently connected to the same instance, the data in the instance SGA is shared among the users. Consequently, the SGA is sometimes referred to as the shared global area. The combination of the background processes and memory buffers is called an Oracle instance.

system operational attribute

An attribute holding information that pertains to the operation of the directory itself. Some operational information is specified by the directory to control the server, for example, the timestamp for an entry. Other operational information, such as access

information, is defined by administrators and is used by the directory program in its processing.

TLS

See [Transport Layer Security \(TLS\)](#).

think time

The time the user is not engaged in actual use of the processor.

throughput

The number of requests processed by Oracle Internet Directory for each unit of time. This is typically represented as operations per second.

Transport Layer Security (TLS)

A protocol providing communications privacy over the Internet. The protocol enables client/server applications to communicate in a way that prevents eavesdropping, tampering, or message forgery.

trusted certificate

A third-party identity that is qualified with a level of trust. The trust is used when an identity is being validated as the entity it claims to be. Typically, the certificate authorities you trust issue user certificates.

trustpoint

See [trusted certificate](#).

UTF-16

The 16-bit encoding of [Unicode](#). The Latin-1 characters are the first 256 code points in this standard.

Unicode

A type of universal character set, a collection of 64K characters encoded in a 16-bit space. It encodes nearly every character in most existing character set standard, covering most written scripts used in the world. It is owned and defined by Unicode Inc. Unicode is canonical encoding which means its value can be passed to different locales. It does not guarantee a round-trip conversion between it and every Oracle character set without information loss.

UNIX Crypt

The UNIX encryption algorithm.

user search base

In the Oracle Internet Directory default DIT, the node in the identity management realm under which all the users are placed.

UTC (Coordinated Universal Time)

The standard time common to every place in the world. Formerly, and widely called Greenwich Mean Time (GMT) and World Time, UTC nominally reflects the mean solar time along the Earth's prime meridian. UTC is indicated by a z at the end of the value, for example, 200011281010z.

UTF-8

A variable-width, 8-bit encoding of **Unicode** that uses sequences of 1, 2, 3, or 4 bytes for each character. Characters from 0-127 (the 7-bit ASCII characters) are encoded with one byte, characters from 128-2047 require two bytes, characters from 2048-65535 require three bytes, and characters beyond 65535 require four bytes. The Oracle character set name for this is AL32UTF8 (for the Unicode 3.1 standard).

virtual host name

In an Oracle Application Server Cold Failover Cluster (Infrastructure), the host name corresponding to this virtual IP address.

virtual IP address

In an Oracle Application Server Cold Failover Cluster (Infrastructure), each physical node has its own physical IP address and physical host name. To present a single system image to the outside world, the cluster uses a dynamic IP address that can be moved to any physical node in the cluster. This is called the virtual IP address.

wallet

An abstraction used to store and manage security credentials for an individual entity. It implements the storage and retrieval of credentials for use with various cryptographic services. A wallet resource locator (WRL) provides all the necessary information to locate the wallet.

wait time

The time between the submission of the request and initiation of the response.

X.509

A popular format from ISO used to sign public keys.

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