Sun™ Identity Manager 8.0 Administration

Sun Microsystems, Inc.
4150 Network Circle
Santa Clara, CA 95054
U.S.A.

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Preface

This guide describes how to use the Sun Identity Manager software to provide secure user access to your enterprise information systems and applications. It illustrates procedures and scenarios to help you perform regular and periodic administrative tasks with the Identity Manager system.

Who Should Use This Book

This *Identity Manager Administration* guide is intended for use by administrators, software developers, and IT service providers who implement an integrated identity management and web access platform using Sun servers and software.

An understanding of the following technologies will help you apply the information discussed in this book:

- Lightweight Directory Access Protocol (LDAP)
- Java technology
- JavaServer Pages™ (JSP™) technology
- Hypertext Transfer Protocol (HTTP)
- Hypertext Markup Language (HTML)
- Extensible Markup Language (XML)

Before You Read This Book

Identity Manager is a component of Sun Java Enterprise System, a software infrastructure that supports enterprise applications distributed across a network or Internet environment. You should be familiar with the documentation provided with Sun Java Enterprise System, which can be accessed online at http://docs.sun.com/coll/entsys_04q4.

Because Sun Directory Server is used as the data store in an Identity Manager deployment, you should be familiar with the documentation provided with that product. Directory Server documentation can be accessed online at http://docs.sun.com/coll/DirectoryServer_04q2.

Conventions Used in This Book

The tables in this section describe the conventions used in this book.

Typographic Conventions

The following table describes the typographic changes used in this book.

Table 1 Typographic Conventions

Typeface	Meaning	Examples
AaBbCc123 (Monospace)	API and language elements, HTML tags, web site URLs, command names, file names, directory path names, onscreen computer output, sample code.	Edit your .login file. Use ls -a to list all files. % You have mail.
AaBbCc123 (Monospace bold)	What you type, when contrasted with onscreen computer output.	% **su** Password:
AaBbCc123 (Italic)	Book titles, new terms, words to be emphasized. A placeholder in a command or path name to be replaced with a real name or value.	Read Chapter 6 in the *User's Guide*. These are called *class* options. Do *not* save the file. The file is located in the *install-dir*/bin directory.

Symbols

The following table describes the symbol conventions used in this book.

Table 2 Symbol Conventions

Symbol	Description	Example	Meaning
`[ ]`	Contains optional command options.	`ls [-l]`	The `-l` option is not required.
`{ | }`	Contains a set of choices for a required command option.	`-d {y|n}`	The `-d` option requires that you use either the `y` argument or the `n` argument.
-	Joins simultaneous multiple keystrokes.	Control-A	Press the Control key while you press the A key.
+	Joins consecutive multiple keystrokes.	Ctrl+A+N	Press the Control key, release it, and then press the subsequent keys.
>	Indicates menu item selection in a graphical user interface.	File > New > Templates	From the File menu, choose New. From the New submenu, choose Templates.

Related Documentation

The http://docs.sun.com[SM] web site enables you to access Sun technical documentation online. You can browse the archive or search for a specific book title or subject.

Books in This Documentation Set

Sun provides additional documentation and information to help you install, use, and configure Identity Manager.

- *Identity Manager Installation* — Step-by-step instructions and reference information to help you install and configure Identity Manager and associated software.
- *Identity Manager Upgrade* — Step-by-step instructions and reference information to help you upgrade and configure Identity Manager and associated software.
- *Identity Manager Administration* — Procedures, tutorials, and examples that describe how to use Identity Manager to provide secure user access to your enterprise information systems and manage user compliance.
- *Identity Manager Technical Deployment Overview* — Conceptual overview of the Identity Manager product (including object architectures) with an introduction to basic product components.
- *Identity Manager Workflows, Forms, and Views* — Reference and procedural information that describes how to use the Identity Manager workflows, forms, and views — including information about the tools you need to customize these objects.
- *Identity Manager Deployment Tools* — Reference and procedural information that describes how to use different Identity Manager deployment tools; including rules and rules libraries, common tasks and processes, and the SOAP-based Web service interface provided by the Identity Manager server.
- *Identity Manager Resources Reference* — Reference and procedural information that describes how to load and synchronize account information from a resource into Identity Manager.
- *Identity Manager Tuning, Troubleshooting, and Error Messages* — Reference and procedural information that describes Identity Manager error messages and exceptions, and provides instructions for tracing and troubleshooting problems you might encounter as you work.
- *Identity Manager Service Provider Deployment* — Reference and procedural information that describes how to plan and implement the Sun Identity Manager Service Provider feature.

- Identity Manager Help — Online guidance and information that offer complete procedural, reference, and terminology information about Identity Manager. You can access help by clicking the Help link from the Identity Manager menu bar. Guidance (field-specific information) is available on key fields.

Accessing Sun Resources Online

For product downloads, professional services, patches and support, and additional developer information, go to the following:

- Download Center
  http://wwws.sun.com/software/download/
- Professional Services
  http://www.sun.com/service/sunps/sunone/index.html
- Sun Enterprise Services, Solaris Patches, and Support
  http://sunsolve.sun.com/
- Developer Information
  http://developers.sun.com/prodtech/index.html

Contacting Sun Technical Support

If you have technical questions about this product that are not answered in the product documentation, go to http://www.sun.com/service/contacting.

Related Third-Party Web Site References

Sun is not responsible for the availability of third-party web sites mentioned in this document. Sun does not endorse and is not responsible or liable for any content, advertising, products, or other materials that are available on or through such sites or resources. Sun will not be responsible or liable for any actual or alleged damage or loss caused or alleged to be caused by or in connection with use of or reliance on any such content, goods, or services that are available on or through such sites or resources.

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To share your comments, go to http://docs.sun.com and click Send Comments. In the online form, provide the document title and part number. The part number is a seven-digit or nine-digit number that can be found on the title page of the book or at the top of the document.

Chapter 1

Identity Manager Overview

The Sun Identity Manager system allows you to manage and audit access to accounts and resources. By giving you the capabilities and tools to quickly handle periodic and daily user-provisioning and auditing tasks, Identity Manager facilitates exceptional service to internal and external customers.

This chapter gives you an overview provided in the following topics:

The Big Picture

Today's businesses require increased flexibility and capabilities from its IT services. Historically, managing access to business information and systems required direct interaction with a limited number of accounts. Today, managing access means handling not only increased numbers of internal customers, but also partners and customers beyond your enterprise.

The overhead created by this increased need for access can be substantial. As an administrator, you must effectively and securely enable people – both inside and outside your enterprise – to do their jobs. And after you provide initial access, you face continuing detailed challenges, such as forgotten passwords, and changed roles and business relationships.

Additionally, businesses today face strict requirements governing the security and integrity of critical business information. In an environment dictated by compliance-related legislation – such as the Sarbanes-Oxley (SOX) Act, the Health Insurance Portability and Accountability Act (HIPAA), and the Gramm-Leach-Bliley (GLB) Act – the overhead created by monitoring and reporting activities is substantial and costly. You must be able to respond quickly to changes in access control, as well as satisfy the data-gathering and reporting requirements that help keep your business secure.

Identity Manager was developed specifically to help you manage these administrative challenges in a dynamic environment. By using Identity Manager to distribute access management overhead and address the burden of compliance, you facilitate a solution to your primary challenges: How do I define access? And once defined, how do I maintain flexibility and control?

A secure, yet flexible design lets you set up Identity Manager to accommodate the structure of your enterprise and answer these challenges. By mapping Identity Manager objects to the entities that you manage – users and resources – you significantly increase the efficiency of your operations.

In a service provider environment, Identity Manager extends these capabilities to managing extranet users as well.

Goals of the Identity Manager System

The Identity Manager solution enables you to accomplish the following goals:

- Manage account access to a large variety of systems and resources.
- Securely manage dynamic account information for each user's array of accounts.
- Set up delegated rights to create and manage user account data.
- Handle large numbers of enterprise resources, as well as an increasingly large number of extranet customers and partners.
- Securely authorize user access to enterprise information systems. With Identity Manager, you have fully integrated functionality to grant, manage, and revoke access privileges across internal and external organizations.
- Keep data synchronized by *not* keeping data. The Identity Manager solution supports two key principles that superior systems management tools should observe:
  - The product should have minimal impact on the system it is managing, and
  - The product should not introduce more complexity to your enterprise by adding another resource to manage.
- Define audit policies to manage compliance with user access privileges and manage violations through automated remediation actions and email alerts.
- Conduct periodic access reviews and define attestation review and approval procedures that automate the process of certifying user privileges.
- Monitor key information and audit and review statistics through the dashboard.

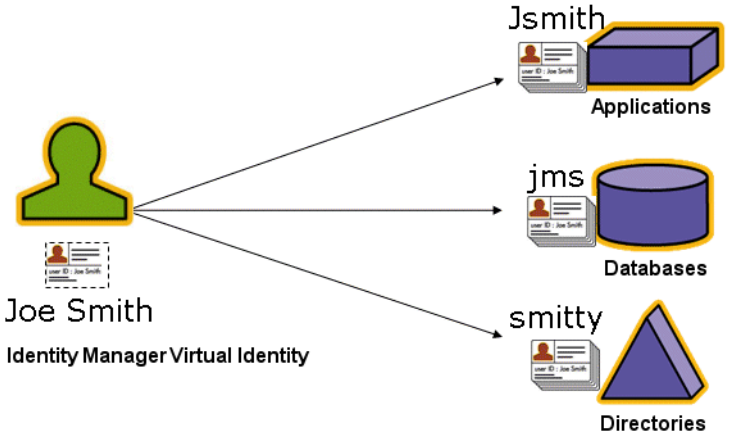
Defining User Access to Resources

Users in your extended enterprise can be anyone with a relationship to your company, including employees, customers, partners, suppliers, or acquisitions. In the Identity Manager system, users are represented by *user accounts*.

Depending on their relationships with your business and other entities, users need access to different things, such as computer systems, data stored in databases, or specific computer applications. In Identity Manager terms, these things are *resources*.

Because users often have one or more identities on each of the resources they access, Identity Manager creates a single, *virtual identity* that maps to disparate resources. This allows you to manage users as a single entity. See Figure 1-1.

Figure 1-1 Identity Manager User Account Resource Relationship



To effectively manage large numbers of users, you need logical ways to group them. In most companies, users are grouped into functional departments or geographical divisions. Each of these departments typically requires access to different resources. In Identity Manager terms, this type of group is called an *organization*.

Another way to group users is by similar characteristics, such as company relationships or job functions. Identity Manager recognizes these groupings as *roles*.

Within the Identity Manager system, you assign roles to user accounts to facilitate efficient enabling and disabling of access to resources. Assigning accounts to organizations enables efficient delegation of administrative responsibilities.

Identity Manager users are also directly or indirectly managed through the application of *policies*, which set up rules and password and user authentication options.

User Types

Identity Manager provides two user types: *Identity Manager Users* and *Service Provider Users*, if you configure your Identity Manager system for a service provider implementation. These types enable you to distinguish users that might have different provisioning requirements based on their relationship with your company, for example extranet users versus intranet users.

A typical scenario for a service provider implementation is a service provider company with internal users and external users (customers) that it wants to manage with Identity Manager. For information about configuring a service provider implementation, see *Identity Manager Service Provider Deployment*.

You specify the Identity Manager user type when you configure a user account. For more information about service provider users, see Chapter 17, "Service Provider Administration."

Delegating Administration

To successfully distribute responsibility for user identity management, you need the right balance of flexibility and control. By granting select Identity Manager users administrator privileges and delegating administrative tasks, you reduce your overhead and increase efficiency by placing responsibility for identity management with those who know user needs best, such as a hiring manager. Users with these extended privileges are called Identity Manager *administrators*.

Delegation only works, however, within a secure model. To maintain an appropriate level of control, Identity Manager lets you assign different levels of *capabilities* to administrators. Capabilities authorize varying levels of access and actions within the system.

The Identity Manager workflow model also includes a method to ensure that certain actions require approval. Using workflow, Identity Manager administrators retain control over tasks and can track their progress. For detailed information about workflow, see *Identity Manager Workflows, Forms, and Views*.

Identity Manager Objects

A clear picture of Identity Manager objects and how they interact is crucial to successful management and deployment of the system. These objects are:

- User Accounts
- Roles
- Resources and Resource Groups
- Organizations and Virtual Organizations
- Directory Junctions
- Capabilities
- Admin Roles
- Policies
- Audit Policies

NOTE When naming Identity Manager objects, do not use the following characters:

' (apostrophe), . (period), | (pipe), [(left bracket),] (right bracket), , (comma), : (colon), $ (dollar sign), " (double quote), \ (backslash), or = (equals sign).

The following characters should also be avoided: _ (underscore), % (percent-sign), ^ (caret), and * (asterisk).

User Accounts

A user is anyone who holds an Identity Manager system account. Identity Manager stores a range of data for each user. Collectively, this information forms a user's Identity Manager identity.

Identity Manager user accounts:

- Provide users access to one or more *resources*, and manage user account data on those resources.
- Are assigned *roles*, which set user access to various resources.
- Are part of an *organization*, which determines how and by whom user accounts are administered.

The user account setup process is dynamic. Depending on the role selection you make during account setup, you may provide more or less resource-specific information to create the account. The number and type of resources associated with the assigned role determine how much information is required at account creation.

Administrators are users with additional privileges to manage user accounts, resources, and other Identity Manager system objects and tasks. Identity Manager administrators manage organizations, and are assigned a range of capabilities to apply to objects in each managed organization.

For more information on user accounts, see Chapter 3, "User and Account Management" on page 65. For more information on administrator accounts, see Chapter 6, "Administration" on page 217.

Roles

A role is an Identity Manager object that allows resource access rights to be grouped and efficiently assigned to users. Roles are organized into four role types:

- Business Roles
- IT Roles
- Applications
- Assets.

Business Roles organize into groups the access rights that people who do similar tasks in an organization need to do their job duties. Typically, Business Roles represent user job functions.

IT Roles, *Applications*, and *Assets* organize resource entitlements (or *access rights*) into groups. To provide users with access to resources, IT Roles, Applications, and Assets are assigned to Business Roles so that users can access the resources they need to do their jobs.

IT Roles, Applications, and Assets can be *required*, *conditional*, or *optional*. A required resource will always be assigned to the user. A conditional resource has conditions that must evaluate to true in order for the resource to be assigned. An optional resource can be requested separately, and, upon approval, assigned to the user.

Because resources can be conditional or optional, users with the same general job description can have the same Business Role, but still have different access rights. This approach allows a Business Role designer to define coarse-grained access to resources in order to achieve regulatory compliance, while still allowing flexibility for the user's manager to fine-tune the user's access rights. With this approach, there is no need to define a new Business Role for each permutation of access needs in the enterprise—a problem known as *role explosion*.

A user can be assigned one or more roles, or no role.

For more information on roles, see "Understanding and Managing Roles" on page 124.

Resources and Resource Groups

Identity Manager stores information about how to connect to a resource or system. Resources to which Identity Manager provides access include:

- Mainframe security managers
- Databases
- Directory services (such as LDAP)
- Applications
- Operating systems
- ERP systems (such as SAP™)

Each Identity Manager resource stores the following kinds of information:

- Resource parameters
- Identity Manager parameters
- Account information (including account attributes and identity template)

There are two ways to assign resources to users. A resource can be assigned to a user directly (this is known as a *individual* or *direct* assignment), or a resource can be assigned to a role, which is then assigned to a user (this is a *role-based* or *indirect* assignment).

- Individual assignment – Individual resources are assigned directly to user accounts.
- Role-based assignment – One or more resources are assigned to a role (an Application, Asset, or IT Role). The Application, Asset, and/or IT Role(s) are then assigned to a Business Role. Finally, one or more Business Roles are assigned to a user account.

A related Identity Manager object, a *resource group*, can be assigned to user accounts in the same way resources are assigned. Resource groups correlate resources so that you can create accounts on resources in a specific order. Also, they simplify the process of assigning multiple resources to user accounts.

For more information about resource groups, see "Resource Groups" on page 185.

Organizations and Virtual Organizations

Organizations are Identity Manager containers used to enable administrative delegation. They define the scope of entities that an Identity Manager administrator controls or manages.

Organizations can also represent direct links into directory-based resources. These are called *virtual organizations*. Virtual organizations allow direct management of resource data without loading information into the Identity Manager repository. By mirroring an existing directory structure and membership through a virtual organization, Identity Manager eliminates duplicate and time-consuming setup tasks.

Organizations that contain other organizations are *parent organizations*. You can create organizations in a flat structure or arrange them in a hierarchy. The hierarchy can represent departments, geographical areas, or other logical divisions by which you manage user accounts.

For more information on organizations, see "Understanding Identity Manager Organizations" on page 228.

Directory Junctions

A *directory junction* is a hierarchically related set of organizations that mirrors a directory resource's actual set of hierarchical containers. A *directory resource* is one that employs a hierarchical namespace through the use of hierarchical containers. Examples of directory resources include LDAP servers and Windows Active Directory resources.

Each organization in a directory junction is a *virtual organization*. The top-most virtual organization in a directory junction is a mirror of the container representing the base context defined in the resource. The remaining virtual organizations in a directory junction are *direct* or *indirect* children of the top virtual organization, and also mirror one of the directory resource containers that are children of the defined resource's base context container.

You can make Identity Manager users members of, and available to, a virtual organization in the same way as an organization.

For more information on directory junctions, see "Understanding Directory Junctions and Virtual Organizations" on page 235.

Capabilities

Each user can be assigned capabilities, or groups of rights, to enable him to perform administrative actions through Identity Manager. Capabilities allow the administrative user to perform certain tasks in the system and act on Identity Manager objects.

Typically, you assign capabilities according to specific job responsibilities, such as password resets or account approvals. By assigning capabilities and rights to individual users, you create a hierarchical administrative structure that provides targeted access and privileges without compromising data protection.

Identity Manager provides a set of default capabilities for common administrative functions. Capabilities meeting your specific needs can also be created and assigned.

For more information on capabilities, see "Understanding and Managing Capabilities" on page 238.

Admin Roles

Identity Manager admin roles enable you to define a unique set of capabilities for each set of organizations that are managed by an administrative user. An admin role is assigned capabilities and controlled organizations, which can then be assigned to an administrative user.

Capabilities and controlled organizations can be assigned directly to an admin role. They also can be assigned indirectly (dynamically) each time the administrative user logs in to Identity Manager. Identity Manager rules control dynamic assignment.

For more information on admin roles, see "Understanding and Managing Admin Roles" on page 243.

Policies

Policies set limitations for Identity Manager users by establishing constraints for account ID, login, and password characteristics. *Identity system account policies* establish user, password, and authentication policy options and constraints. *Resource password and account ID policies* set length rules, character type rules, and allowed words and attribute values. A *dictionary policy* enables Identity Auditor to check passwords against a word database to ensure protection from simple dictionary attacks.

For more information about policies, see "What are Policies?" on page 190.

Audit Policies

Distinct from other system policies, an *audit policy* defines a policy violation for a group of users of a specific resource. Audit policies establish one or more rules by which users are evaluated for compliance violations. These rules depend on conditions based on one or more attributes defined by a resource. When the system scans a user, it uses the criteria defined in the audit policies assigned to that user to determine whether compliance violations have occurred.

For more information about audit policies, see "About Audit Policies" on page 493.

Object Relationships

Table 1-1 provides a quick glance at Identity Manager objects and their relationships.

Table 1-1 Identity Manager Object Relationships (Page 1 of 3)

Identity Manager Object	What is it?	Where does it fit?
User account	An account on Identity Manager and on one or more resources. User data may be loaded into Identity Manager from resources. A special class of users, Identity Manager administrators, have extended privileges	*Role* Generally, each user account is assigned one or more roles. *Organization* User accounts are arranged in a hierarchy as part of an organization. Identity Manager administrators additionally manage organizations. *Resource* Individual resources can be assigned to user accounts. *Capability* Administrators are assigned capabilities for the organizations they manage.
Role	Business Roles organize into groups the access rights that people who do similar tasks in an organization need to do their job duties. Application, and IT Roles group resources into groups so that resources can be assigned to users by way of Business Roles. Role-based resource assignments simplify resource management in large organizations.	*Resource and resource group* Resources and resource groups are assigned to Asset, Application, and IT Roles. *User account* User accounts with similar characteristics are assigned to Business Roles. *Asset, Application, and IT Roles* Asset, Application, and IT Roles are assigned to Business Roles.
Resource	Stores information about a system, application, or other resource on which accounts are managed.	*Role* Resources are assigned to Application and IT Roles, which are in turn assigned to Business Roles. A user account loosely “inherits” resource access from its Business Role assignments. *User account* Resources can be individually assigned to user accounts.

Table 1-1 Identity Manager Object Relationships (Page 2 of 3)

Identity Manager Object	What is it?	Where does it fit?
Resource Group	Ordered group of resources.	*Role* Resource groups are assigned to roles; a user account "inherits" resource access from its Business Role assignments. *User account* Resource groups can be directly assigned to user accounts.
Organization	Defines the scope of entities managed by an administrator; hierarchical.	*Resource* Administrators in a given organization may have access to some or all resources. *Administrator* Organizations are managed (controlled) by users with administrative privileges. Administrators may manage one or more organizations. Administrative privileges in a given organization cascade to its child organizations. *User account* Each user account can be assigned to an Identity Manager organization and one or more directory organizations.
Directory junction	Hierarchically related set of organizations that mirrors a directory resource's actual set of hierarchical containers.	*Organization* Each organization in a directory junction is a virtual organization.
Admin role	Defines a unique set of capabilities for each set of organizations assigned to an administrator.	*Administrator* Admin roles are assigned to administrators. *Capabilities and organizations* Capabilities and organizations are assigned, directly or indirectly (dynamically) to admin roles.
Capability	Defines a group of system rights.	*Administrator* Capabilities are assigned to administrators.

Table 1-1 Identity Manager Object Relationships (Page 3 of 3)

Identity Manager Object	What is it?	Where does it fit?
Policy	Sets password and authentication limits.	*User account* Policies are assigned to user accounts. *Organization* Policies are assigned to or inherited by organizations.
Audit policy	Sets rules by which users are evaluated for compliance violations.	*User account* Audit policies are assigned to user accounts. *Organization* Audit policies are assigned to organizations.

Chapter 2

Getting Started with the Identity Manager UI

Read this chapter to learn about the Identity Manager graphical interfaces and how you can quickly begin using Identity Manager.

Topics covered include:

Identity Manager Administrator Interface

The Identity Manager system includes two primary graphical interfaces through which users perform tasks—the *end-user interface* and the *administrator interface*. The end-user interface (also called the User interface) is discussed later in this chapter on page 54. The Administrator interface is discussed here.

The Identity Manager Administrator interface serves as the primary administrative view of the product. Through this interface, Identity Manager administrators manage users, set up and assign resources, define rights and access levels, and audit compliance in the Identity Manager system.

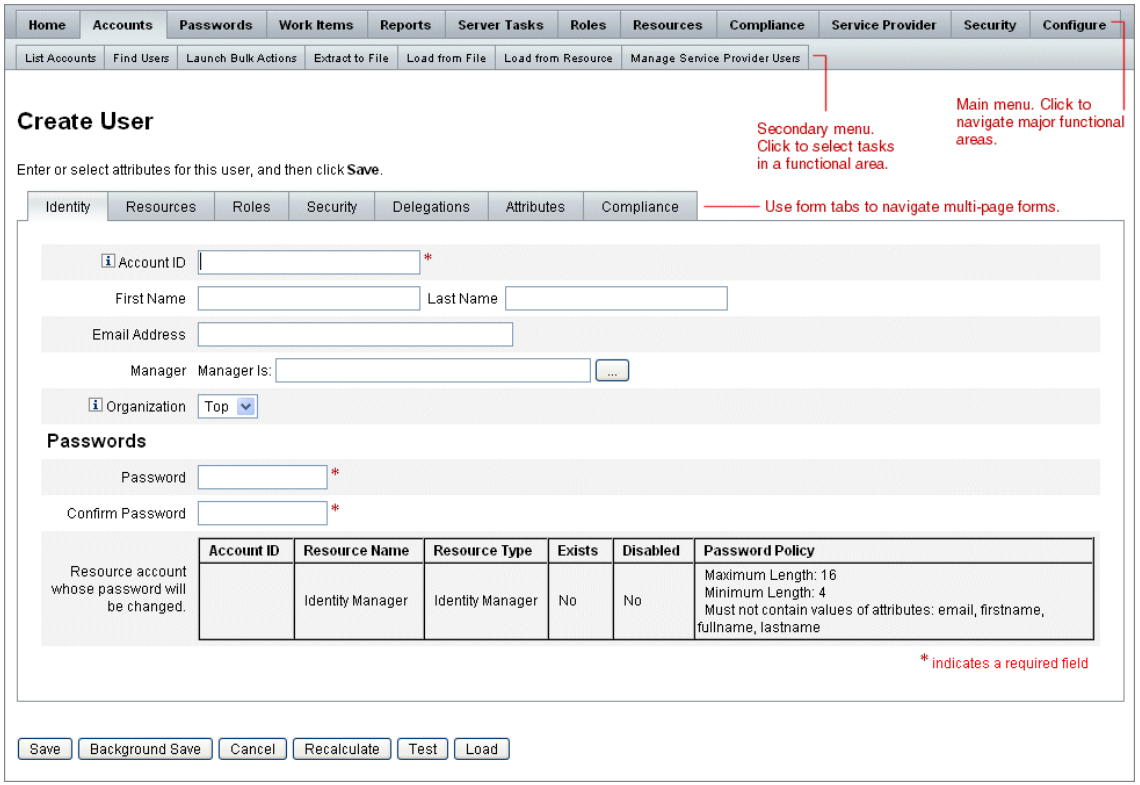
Interface organization is represented by these elements:

- **Navigation bar tabs** — Located at the top of each interface page, these tabs let you navigate major functional areas.
- **Subtabs or menus** — Depending on your specific implementation, you may see secondary tabs or menus below each navigation bar tab. These subtab or menu selections let you access tasks within a functional area.

In some areas, such as Accounts, *tabbed forms* divide longer forms into one or more pages, enabling you to navigate them more easily. This is illustrated in Figure 2-1.

NOTE A quick reference to performing administrative tasks in the UI is available in Appendix C, "User Interface Quick Reference" on page 661.

Figure 2-1 Identity Manager Administrator Interface



Logging in to the Identity Manager Administrator Interface

To open the Administrator interface, follow these steps:

1. Open a Web browser and type the following URL into the address bar:

   `http://<AppServerHost>:<Port>/idm/login.jsp`

2. Enter your user ID and password and click **Log In**.

   The Administrator interface opens if your User ID has assigned capabilities and an assigned controlled organization.

Session Limits and Cookies

If cookies are enabled in the administrator's Web browser, administrators will remain logged on to the Administrator interface up to the time allotted by the configured session limit. If cookies are disabled in the browser, then certain actions will cause the system to prompt the administrator to log in again during the session. These actions are:

- Administrator, role, and organization rename cancellation
- Organization deletion cancellation
- User login module and admin login module creation

To avoid multiple login requests, cookies should be enabled.

Forgotten User ID

Identity Manager allows an administrator to retrieve his or her forgotten user ID. When an administrator clicks **Forgot Your User ID?** from the login page, a lookup page appears and requests identity attribute information associated with the account, such as first and last name, email address, or phone number.

Identity Manager then constructs a query to find a single user matching the entered values. If no match is found, or multiple matches are found, then an error message appears on the Lookup User ID page.

By default, the lookup feature is enabled. It can be disabled, however, by one of the following actions:

- Set `forgotUserIdMode` in login.jsp to a value of false
- Edit the system configuration object and set the attribute `disableForgotUserId` to a value of true for the `admin` attribute and/or the `user` attribute

  For instructions on editing the system configuration object, see page 214.

NOTE If you upgrade from an earlier Identity Manager version to version 8.0, the *Forgot Your User ID?* feature will be *disabled* by default.

To enable this feature, you must modify the following attributes in the System Configuration object (page 214):

```
ui.web.user.disableForgotUserId = false
ui.web.admin.disableForgotUserId = false
```

The set of user attribute names presented are configured through the system configuration attributes `security.authn.lookupUserIdAttributes.<Administrator Interface | User Interface>`. The attributes that can be specified are those defined as queryable attributes in the `IDM Schema Configuration` configuration object.

If recovered, then Identity Manager sends email to the email address of the recovered user by using the User ID Recovery email template.

Identity Manager End-User Interface

The Identity Manager end-user interface (also known as the "Identity Manager User interface") presents a limited view of the Identity Manager system. This view is specifically tailored to users without administrative capabilities.

NOTE For instructions on how to log on to the end-user interface, see "Logging in to the Identity Manager End-User Interface" on page 57.

A user can perform various activities from the User interface, such as changing their password, performing self-provisioning tasks, and managing work items and delegations.

Identity Manager can be configured so that users can request an account by clicking a link on the end-user interface login page. For details, see "Anonymous Enrollment" on page 118.

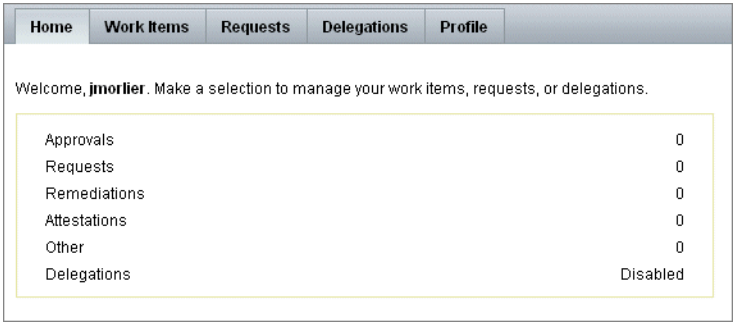
The Five End-User Interface Tabs

The end-user interface is organized into five sections (or tabs): **Home**, **Work Items**, **Requests**, **Delegations**, and **Profile**.

Home

When a user logs in to the Identity Manager User interface, any pending work items and delegations for the user are displayed on the **Home** tab, as illustrated in the following figure:

Figure 2-2 User Interface (Home Tab):



The **Home** tab provides quick access to any pending items. Users can click an item in the list to respond to a work item request or perform other available actions.

Work Items

The **Work Items** tab is further divided into separate **Approvals**, **Attestations**, **Remediations**, and **Other** tabs. In this area of the user interface users can approve or reject any pending work items that the user owns or has the authority to act on.

Requests

The **Requests** tab has two subtabs: **Launch Requests** and **View**.

On the **Launch Requests** tab users have two choices: **Update My Roles** and **Update My Resources**.

- On the Update My Roles page, users can request from a list of available roles that may be appropriate for the user. When the end-user submits a role request, a work item is generated and an approval notification is sent to the designated approvers for that role. End-users can also request that they be removed or *deassigned* from one or more roles.

  See the "Roles and Resources" chapter for information on how to create optional roles that end-users can request access to.

- On the Update My Resources page, users can request from a list of individual resources that may be appropriate for the user. As with role-requests, resource-requests generate work items that require an approval before they can be processed.

The **View** subtab displays status details for requests submitted by the user. From this area users can view the process status and task results for the requests they submit.

Delegations

From the **Delegations** tab, users can delegate work items to other Identity Manager users. For example, a user who is the assigned approver for one or more roles can designate that future approval work items be sent to a colleague for a certain amount of time while the user is away on vacation. Using the Delegations page, users can create and manage delegations without requiring the assistance of an administrator.

Profile

From the **Profile** tab end-users can manage their Identity Manger password and account attribute settings. This tab is divided into the following four subtabs:

- **Change Password** — End-users can change their password on a selected resource or on all resources.
- **Account Attributes** — End-users can change certain attributes, such as the account email address that Identity Manager sends account notifications to.
- **Authentication Questions** — Used to manage authentication questions and answers for the user account.
- **Access Privileges** — Lists the user's currently assigned role and resource assignments.

Logging in to the Identity Manager End-User Interface

To open the end-user interface, follow these steps:

1. Open a Web browser and type the following URL into the address bar:

   `http://<AppServerHost>:<Port>/idm/user/login.jsp`

2. Enter a user ID and password and click **Log In**.

   The end-user interface opens

Forgotten User ID

Identity Manager allows end-users to retrieve their forgotten user IDs. For more information, see "Forgotten User ID" on page 52 in the Logging in to the Identity Manager Administrator Interface section.

Help and Guidance

To successfully complete some tasks, you might need to consult Help and Identity Manager *guidance* (field-level information and instructions). Help and guidance are available from the Identity Manager Administrator and User interfaces.

Identity Manager Help

For task-related help and information, click the **Help** button, which is located at the top of each Administrator and User interface page, as depicted in Figure 2-3.

Figure 2-3 Help button in the Identity Manager interface

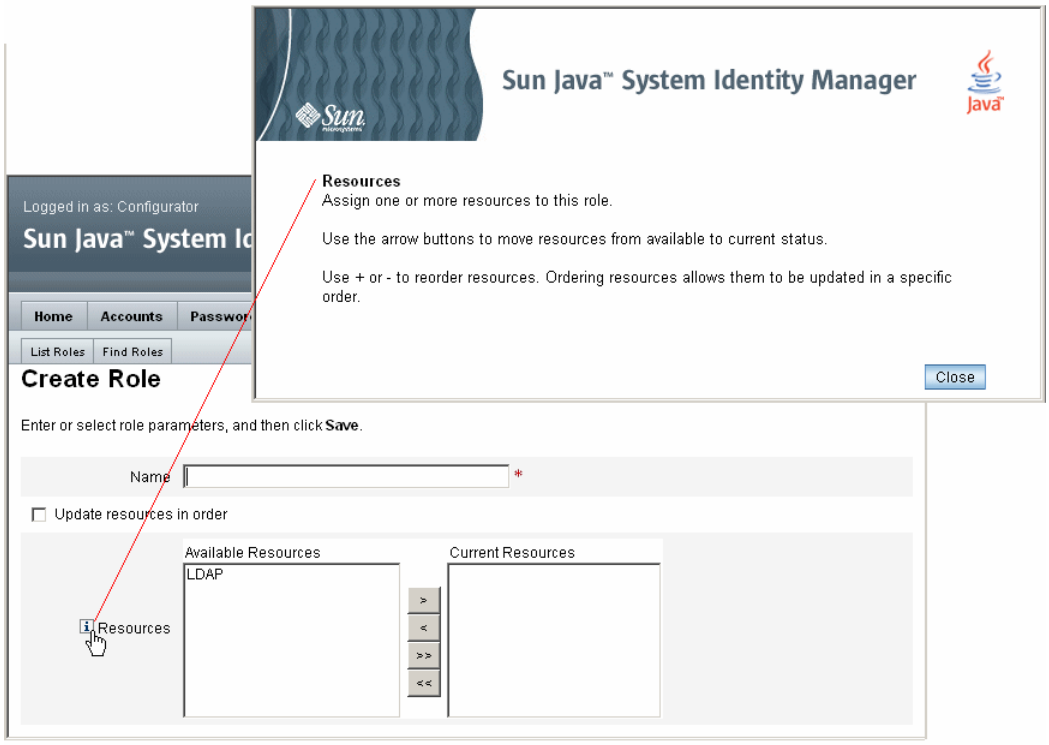
At the bottom of each Help window is a Contents link that guides you to other Help topics and the Identity Manager terms glossary.

Identity Manager Guidance

Identity Manager guidance is brief, targeted help that appears next to many page fields. Its goal is to help you enter information or make selections as you move through a page to perform a task.

A symbol marked with the letter “i” displays next to fields with guidance. Click the symbol to open a window and display its associated information.

Figure 2-4 Identity Manager Guidance



The Identity Manager Debug Page

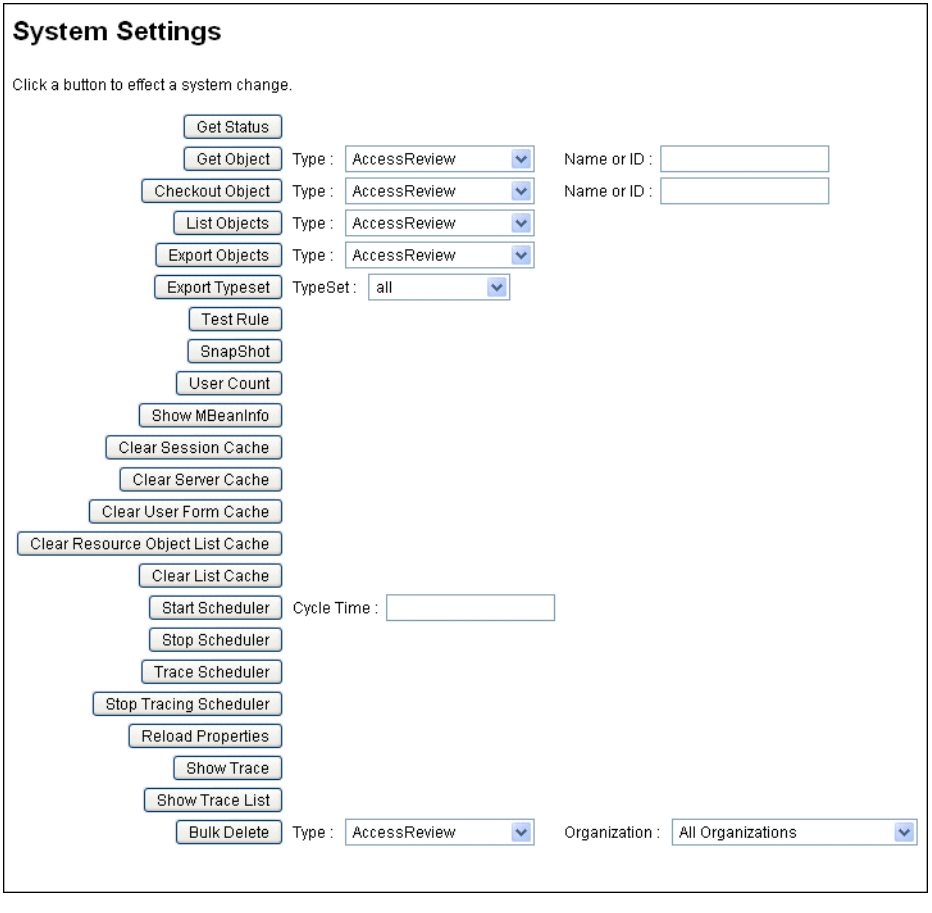
The administrator interface includes pages that are useful when you need to optimize Identity Manager or troubleshoot a problem. To access these pages open the Identity Manager Debug Page, which is also called the System Settings page.

To open the Identity Manager Debug Page, type the following URL into your browser. (Depending on your platform and configuration, URLs may be case-sensitive.)

```
http://<AppServerHost>:<Port>/idm/debug/session.jsp
```

Users must have the Debug capability to view `/idm/debug/` pages. For information about capabilities, see "Assigning Capabilities" on page 242.

Figure 2-5 The Identity Manager Debug Page (System Settings)



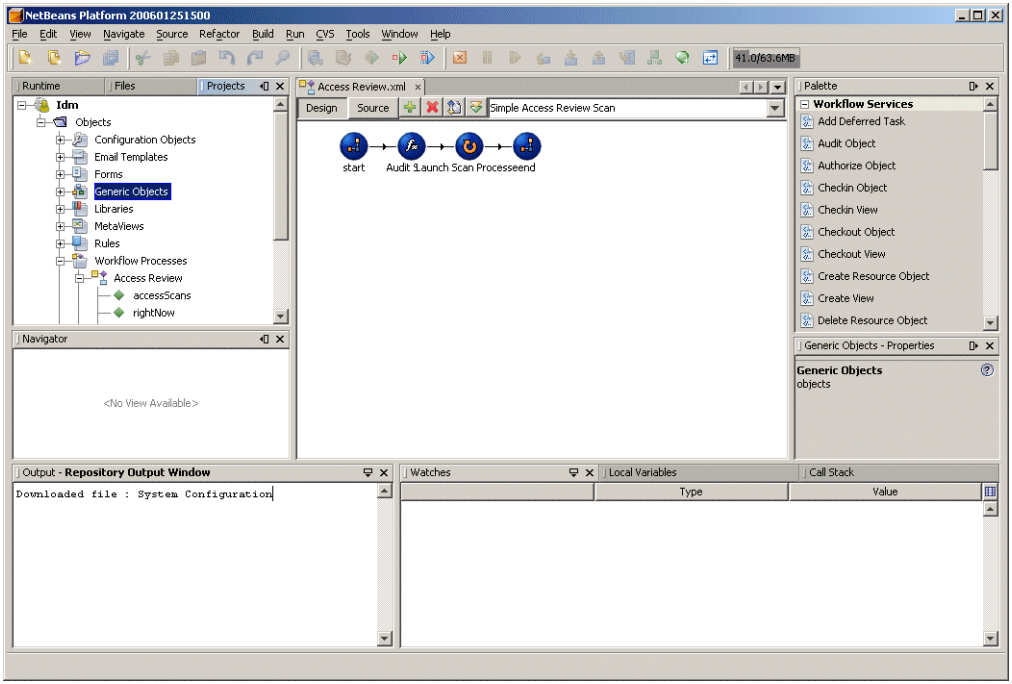
For information about troubleshooting Identity Manager, see *Identity Manager Tuning, Troubleshooting, and Error Messages*.

Identity Manager IDE

The Identity Manager Integrated Development Environment (IDE) provides a graphical view of Identity Manager forms, rules, and workflows. It is a fully integrated NetBeans plugin that is distributed with Identity Manager in the Identity Manager distribution package.

Using the IDE, you create and edit forms that establish the features available on each Identity Manager page. You can also modify Identity Manager *workflows*, which define the sequence of actions followed or tasks performed when working with Identity Manager user accounts. Additionally, you can modify rules defined in Identity Manager that determine workflow behaviors.

Figure 2-6 Identity Manager IDE interface



To download the Identity Manager IDE, visit this website:

https://identitymanageride.dev.java.net/

You can also use the Business Process Editor (BPE) to make customizations, if you have it installed with earlier versions of Identity Manager.

Where to Go from Here

After you become familiar with Identity Manager interfaces and the ways that you can find information, use the following reference to guide you to the topics you want to focus on:

Chapter Topic	Description
Chapter 3, "User and Account Management"	Describes the Accounts area of the interface and provides procedures for managing user accounts.
Chapter 4, "Roles and Resources"	Describes how to work with Identity Manager roles and resources.
Chapter 5, "Configuration & System Maintenance"	Describes the configuration tasks and how to set up Identity Manager objects.
Chapter 6, "Administration"	Explains how to create and manage Identity Manager administrators and organizations.
Chapter 7, "Data Loading and Synchronization"	Provides a guide to the features and tools you can use to maintain current data in Identity Manager.
Chapter 8, "Reporting"	Describes the reports and how to generate them.
Chapter 9, "Task Templates"	Describes the Task Templates you can use to configure certain workflow behaviors.
Chapter 10, "Audit Logging"	Describes the audit logs and how the auditing system works.
Chapter 11, "PasswordSync"	Describes how to set up the PasswordSync utility to synchronize password changes in Windows Active Directory domains with changes with Identity Manager.
Chapter 12, "Security"	Describes the security features and how to use them.

Chapter Topic	Description
Chapter 13, “Identity Auditing: Basic Concepts”	Describes basic auditing concepts.
Chapter 14, “Auditing: Audit Policies”	Describes how to create audit policies.
Chapter 15, “Auditing: Monitoring Compliance”	Describes how to conduct audit reviews and implement practices that help you manage compliance with federally mandated regulations
Chapter 16, “Data Exporter”	The Data Exporter feature allows you to write information about users, roles, and other object types to an external data warehouse.
Chapter 17, “Service Provider Administration”	Describes features for managing service provider users.
Appendix A, “lh Reference”	Describes commands available from the Identity Manager command line.
Appendix B, “Audit Log Database Schema”	Audit data schema values for the supported database types and audit log database mappings
Appendix C, “User Interface Quick Reference”	A quick reference to performing administrative tasks in the UI. It shows the primary location where you will go to begin each task, as well as alternate locations or methods (if available) that you can use to perform the same task.
Appendix D, “Capabilities Definitions”	A list of Identity Manager’s default task-based and functional capabilities (with definitions). This appendix also lists the tabs and subtabs that may be accessed with each task-based capability.

Chapter 3

User and Account Management

This chapter provides information and procedures for creating and managing users from the Identity Manager Administrator interface. This information is organized into the following sections:

The Accounts Area of the Interface

A user is anyone who holds an Identity Manager system account. Identity Manager stores a range of data for each user. Collectively, this information forms a user's Identity Manager identity.

The Identity Manager Accounts / User List page lets you manage Identity Manager users. To access this area, click **Accounts** on the Administrator interface menu bar.

The accounts list shows all Identity Manager user accounts. Accounts are grouped into organizations and virtual organizations, which are represented hierarchically in folders.

You can sort the accounts list by full name (Name), user last name (Last Name), or user first name (First Name). Click the header bar to sort by a column. Clicking the same header bar toggles between ascending and descending sort order. When you sort by full name (the Name column), then all items in the hierarchy, at all levels, are sorted alphabetically.

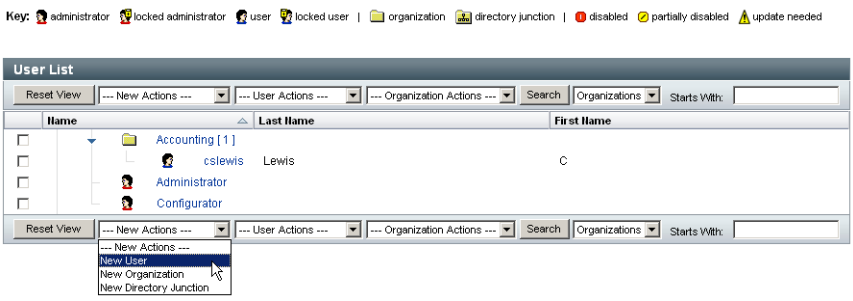
To expand the hierarchical view and see accounts in an organization, click the triangular indicator next to a folder. Collapse the view by clicking the indicator again.

Actions Lists in the Accounts Area

Use the actions lists (located at the top and bottom of the accounts area, as shown in Figure 3-1), to perform a range of actions. Actions list selections are divided among:

- **New Actions** — Create users, organizations, and directory junctions.
- **User Actions** — Edit, view, and change status of users; change and reset passwords; delete, enable, disable, unlock, move, update, and rename users; and run a user audit report.
- **Organization Actions** — Perform a range of organization and user actions.

Figure 3-1 Accounts List



Searching in the Accounts List Area

Use the accounts area search feature to locate users and organizations. Select Organizations or Users from the list, enter one or more characters that the user or organization name starts with in the search area, and then click **Search**. For more details about searching in the accounts area, see "Finding & Viewing User Accounts" on page 79.

User Account Status

Icons that display next to each user account indicate current, assigned account status. Table 3-1 describes what each icon represents.

Table 3-1 User Account Status Icon Descriptions

Indicator	Status
	The user's Identity Manager account is locked. Note that this icon only reflects the locked state of the Identity Manager account, not any of the user's resource accounts. Users become locked after exceeding the maximum number of failed Identity Manager account login attempts as defined in the Identity Manager Account Policy. Only failed password or question logins to Identity Manager accounts are counted towards the maximum allowed. Therefore, if an Identity Manager login application (that is, the administrator interface, the end-user interface, and so on) does not include the Identity Manager Login Module in its login module group, then the Identity Manager failed password policy will not be considered. However, regardless of the stack of login modules configured for a given Identity Manager login application, failed question logins that exceed the maximum configured in the Identity Manager Account Policy can cause a user to become locked and this icon to be displayed. For information on how to unlock accounts see "Unlocking User Accounts" on page 98.
	The administrator Identity Manager account is locked. Note that this icon only reflects the locked state of the Identity Manager account, not any of the administrator's resource accounts. For more information, see the description for the user lockout icon, above.
	The account is disabled on all assigned resources and on Identity Manager. (When an account is enabled, no icon appears.) For information on how to enable disabled accounts, see "Enabling User Accounts" on page 97.
	The account is partially disabled, meaning that it is disabled on one or more assigned resources.
	The system attempted but failed to create or update the Identity Manager user account on one or more resources. (When an account is updated on all assigned resources, no icon appears.)

NOTE In the Manager column, a manager's user name appears inside parentheses if Identity Manager cannot find an Identity Manager account that matches the name listed.

The User Pages (Create/Edit/View)

This section describes the Create User, Edit User, and View User pages that are available in the Administrator interface. Instructions on how to use these pages appear later in this chapter.

NOTE This documentation describes the default set of Create User, Edit User, and View User pages that ship with Identity Manager. To better reflect your business processes or specific administrator capabilities, however, you should create custom user forms specifically for your environment. For more information about customizing the user form, see *Identity Manager Workflows, Forms, and Views*.

The default Identity Manager user pages are organized into the following tabs or sections:

- Identity
- Assignments
- Security
- Delegations
- Attributes
- Compliance

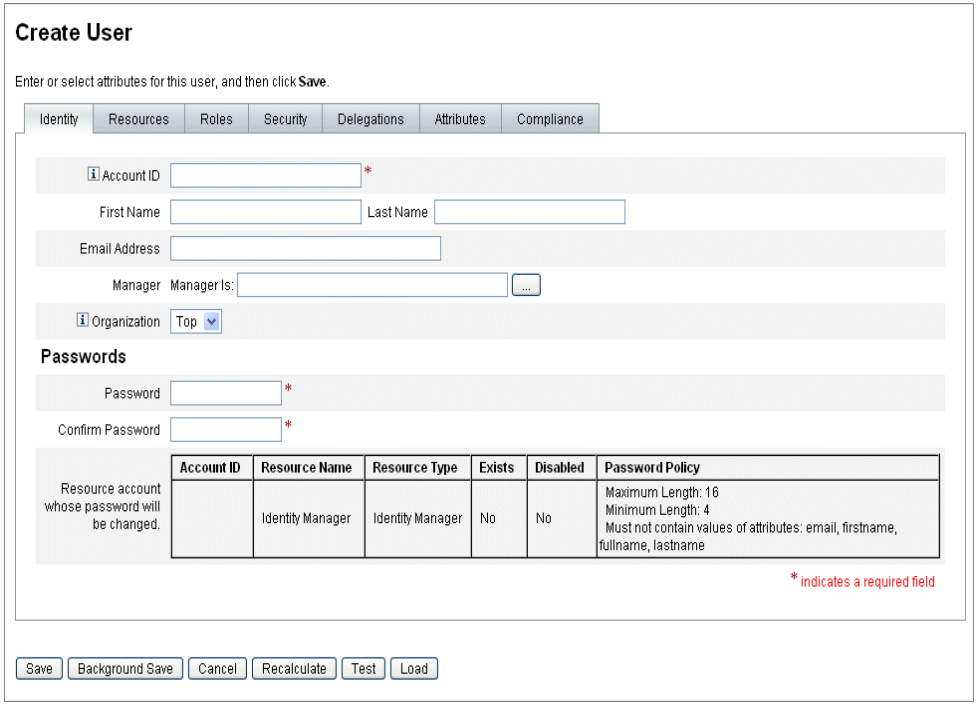
Identity

The Identity area defines a user's account ID, name, contact information, manager, governing organization, and Identity Manager account password. It also identifies the resources to which the user has access, and the password policy governing each resource account.

NOTE For information about setting up account password policies, read the section in this chapter titled "Managing Account Security and Privileges" on page 108.

The following figure illustrates the Identity area of the Create User page.

Figure 3-2 Create User - Identity



Resources

The Resources area provides for the direct assignment of resources and resource groups to a user. Resource exclusions can also be assigned.

Directly assigned resources supplement resources that are indirectly assigned to the user through role assignment.

- **Roles** assignment — Profiles a class of users. Roles define user access to resources through indirect assignment.

Roles

The Roles tab is used to assign one or more roles to a user, and manage those role assignments.

See "Assigning Roles to Users" on page 154 for information about this tab.

Security

In Identity Manager terminology, a user who is assigned extended capabilities is an Identity Manager *administrator*. Use the Security tab to assign a user administrator privileges.

For more information on using the Security tab to create administrators, see "Creating Administrators" on page 220.

The **Security** form consists of the following sections.

- **Admin roles** — Assigns one or more administrative roles to the user. A role is a specific pairing of capabilities and controlled organizations that facilitates assigning administrative duties to users in a coordinated way.
- **Capabilities** — Enables rights in the Identity Manager system. Each Identity Manager administrator is assigned one or more capabilities, frequently aligned with job responsibilities.

  Capabilities are discussed on page 238. A list of task-based capabilities with definitions is included in Appendix D, "Capabilities Definitions" on page 667. This appendix also lists the tabs and subtabs that may be accessed with each capability.
- **Controlled organizations** — Assigns organizations that this user has rights to manage as an administrator. He can manage objects in the assigned organization and in any organizations below that organization in the hierarchy.

NOTE To have administrator capabilities, a user must be assigned at least one Admin role, or one or more capabilities AND one or more controlled organizations. For more information about Identity Manager administrators, see"Understanding Identity Manager Administration" on page 218.

- **User Form** — Specifies the user form that the administrator will use when creating and editing users. If **None** is selected, the administrator will inherit the user form assigned to his organization.
- **View User Form** — Specifies the user form that the administrator will use when viewing users. If **None** is selected, the administrator will inherit the view user form assigned to his organization.
- **Account policy** — Establishes password and authentication limits.

Delegations

The Delegations tab on the Create User page lets you delegate work items to other users for a specified length of time. For more information about delegating work items, read "Delegating Work Items" on page 257.

Attributes

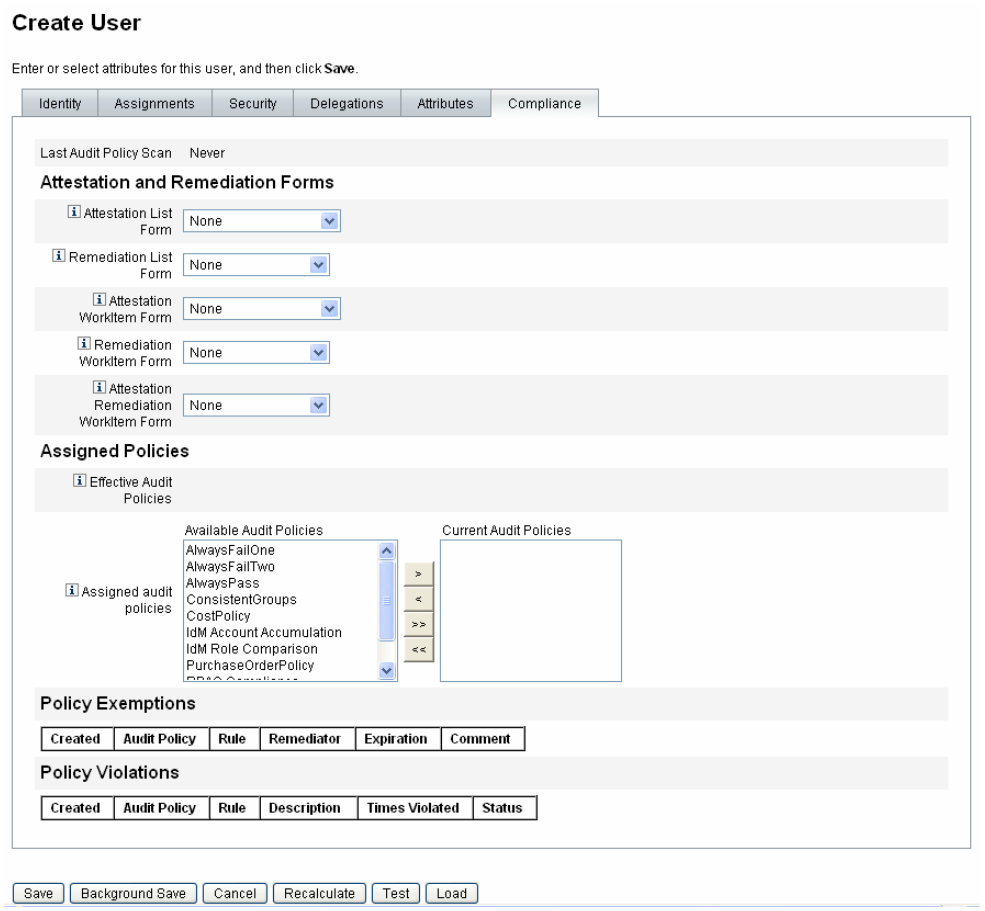
The Attributes tab on the Create User page defines account attributes associated with assigned resources. Listed attributes are categorized by assigned resource, and differ depending on which resources are assigned.

Compliance

The Compliance tab:

- Lets you select the attestation and remediation forms for the user account.
- Specifies the assigned audit policies for the user account, including those in effect through the user's Organization assignment. These policy assignments can be changed only by editing the user's current organization or moving the user to another Organization.
- Indicates the current status of policy scans, violations, and exemptions (as illustrated by the following figure), if applicable for the user account. The information includes the date and time of the last audit policy scan for the selected user.

Figure 3-3 Create User page - Compliance tab



To assign audit policies, move selected policies from the **Available Audit Policies** list to the **Current Audit Policies** list.

.

NOTE You can also access the information on the Compliance tab by selecting **View Compliance Status** in the **User Actions** list. To view compliance violations logged for a user for a specific time period, select **View Compliance Violation Log** from the **User Actions** list and specify the range of entries to view.

Creating Users and Working with User Accounts

From the Accounts / User List page in the Administrator interface, you can perform a range of actions on the following system objects:

- **Administrators & Users** — View, create, edit, move, rename, deprovision, enable, disable, update, unlock, delete, unassign, unlink, and audit.

  For more information on creating and editing administrator accounts, see "Understanding Identity Manager Administration" on page 218.

- **Organizations** — Create, edit, refresh, and perform user actions on members of the organization.

  For more information on organizations, see "Understanding Identity Manager Organizations" on page 228.

- **Directory Junctions** — Create.

  For more information on directory junctions, see "Understanding Directory Junctions and Virtual Organizations" on page 235.

Enabling Process Diagrams

Process diagrams depict the workflow that Identity Manager follows when it creates or otherwise acts on a user account. When enabled, process diagrams display on the results page or task summary page that is created when Identity Manager completes the task.

In Identity Manager version 8.0, process diagrams are disabled for both new and upgrade installations.

To enable process diagrams for use in Identity Manager, follow these steps:

1. Open the system configuration object for editing by following the procedure on page 214.
2. Locate the following XML element:

```
<Attribute name='disableProcessDiagrams'>
  <Boolean>true</Boolean>
</Attribute>
```

3. Change the `true` value to `false`.
4. Click **Save**.
5. Restart your server (or servers) in order for the change to take effect.

Process diagrams can also be enabled in the end-user interface, but only if they are first enabled in the Administrator interface using the steps described above. For details, see "Enabling Process Diagrams in the End-User Interface" on page 209.

Creating Users

To create a user in Identity Manager, follow these steps:

1. In the Administrator interface, click **Accounts**.
2. To create a user in a specific organization, select the organization, then select **New User** from the **New Actions** list.

   Otherwise, to create a user account in the Top organization, select **New User** from the **New Actions** list.
3. Fill in the information in the following tabs or sections.
   - **Identity** — Name, organization, password, and other details. (See page 70.)
   - **Resources** — Individual resource and resource group assignments, as well as resource exclusions. (See page 71.)
   - **Roles** — Role assignments. For information on roles, see "Understanding and Managing Roles" on page 124. See "Assigning Roles to Users" on page 154 for instructions on completing the Roles tab.
   - **Security** — Admin roles, controlled organizations and capabilities. Also, user form settings and account policy. (See page 71.)
   - **Delegations** — Work item delegations. (See page 72.)
   - **Attributes** — Specific attributes for assigned resources. (See page 72.)
   - **Compliance** — Select attestation and remediation forms for the user account. The compliance area also lets you specify the assigned audit policies for the user account, including those in effect through the user's organization assignment. Indicates the current status of policy scans, violations, and exemptions, and includes information about the user's last audit policy scan. (See page 72.)

   Note that selections available in one area may depend on selections you make in another.

NOTE To better reflect your business processes or specific administrator capabilities, you should customize the user form specifically for your environment. For more information about customizing the user form, see *Identity Manager Workflows, Forms, and Views*.

4. When your selections are complete, you have two options for saving a user account:

   - **Save** — Saves the user account. If you assign a large number of resources to the account, this process could take some time.
   - **Background Save** — This process saves a user account as a background task, which allows you to continue working in Identity Manager. A task status indicator displays on the Accounts page, the Find User Results page, and the Home page, for each save in progress.

   Status indicators, as described in the following table, help you monitor the progress of the save process.

Table 3-2 Description of Background Save Task Status Indicators

Status Indicator	Status
	The save process is in progress.
	The save process is suspended. Often, this means that the process is waiting for approval.
	The process completed successfully. This does not mean that the user was successfully saved; rather that the process completed with no errors.
?	The process has not yet started.
	The process completed with one or more errors.

   By moving your mouse over the user icon that displays within the status indicator, you can see details about the background save process.

NOTE If sunrise is configured, creating a user creates a work item that can be viewed from the Approvals tab. *Approving* this item overrides the sunrise date and creates the account. *Rejecting* the item cancels account creation. For more information about configuring sunrise, see "Configuring the Sunrise and Sunset Tab" on page 368.

Creating Multiple Resource Accounts for a User

Identity Manager provides the ability to assign multiple resource accounts to a single user. It does this by allowing multiple resource account types or *types of accounts* to be defined for each resource. Resource account types should be created as needed to match each functional account type on the resource—for example, *AIX SuperUser* or *AIX BusinessAdmin*.

Why Assign Multiple Accounts per User per Resource?

In some situations, an Identity Manager user may require more than one account on a resource. A user can have several different job functions related to the resource—for instance, the user can be both a user and administrator of the resource. Best practice suggests using separate accounts for each function. That way, if one account is compromised, the access granted by the other accounts is still secure.

Configuring Types of Accounts

For a resource to support multiple accounts for a single user, the resource account types must first be defined in Identity Manager. To define resource account types for a resource, use the Resource Wizard. For information, see **Types of Accounts** on page 179.

You must enable and configure resource account types before assigning them to users.

Assigning Types of Accounts

Once you have defined account types, you can assign them to a resource. Identity Manager treats each assignment of an account type as a separate account. As a result, each distinct assignment in a role can have different attributes set.

Similar to the single account per resource case, all assignments of a specific type create only one account, regardless of the number of assignments.

Although you can assign users to any number of different types of accounts on a resource, each user can be assigned one account of a given type on a resource. The exception to this rule is the built-in "default" type. Users can have any number of accounts of default type on a resource. It is not recommended that you do this however, as this leads to ambiguity when referencing accounts in forms and views.

Finding & Viewing User Accounts

The Identity Manager find feature lets you search for user accounts. After you enter and select search parameters, Identity Manager finds all accounts that match your selections.

To search for accounts, select **Accounts** from the menu bar, and then select **Find Users**. You can search for accounts by one or more of these search types:

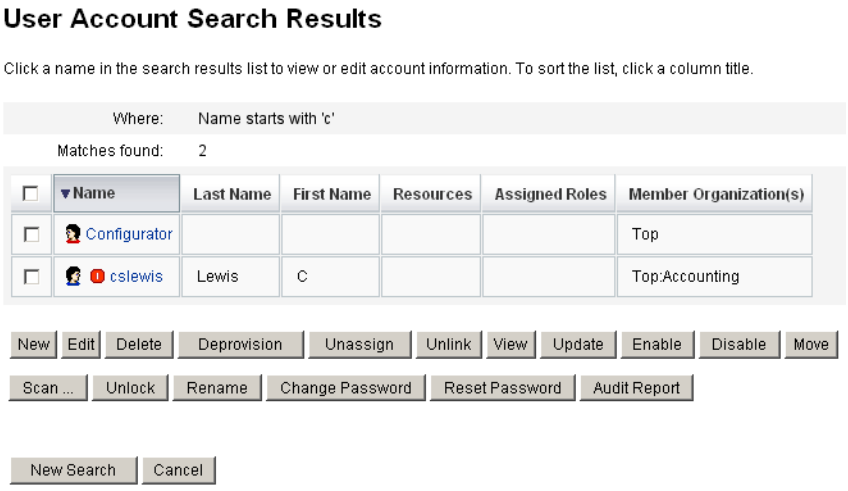
- Account detail, such as user name, email address, or last name, or first name. These choices depend on your institution's specific Identity Manager implementation.
- User's manager. The manager's user name will appear in parentheses if the user name does not match an existing account in Identity Manager.
- Resource account status, including:
  - **Disabled** — User cannot access any Identity Manager or assigned resource accounts.
  - **Partially Disabled** — User cannot access one or more assigned resource accounts.
  - **Enabled** — User has access to all assigned resource accounts.
- User account status, including:
  - **Locked** — User account is locked because the maximum number of failed password or question login attempts exceeds the maximum allowed.
  - **Not Locked** — User account access is not restricted
- Update status, including:
  - **no** — User accounts that have not been updated on any resource.
  - **some** — User accounts that have been updated on at least one, but not all, assigned resources.
  - **all** — User accounts that have been updated on all assigned resources.
- Assigned resource
- Role (See "Finding Users Assigned to a Role" on page 163.)
- Organization
- Organizational control
- Capabilities

- Admin role

The search results list shows all accounts that match your search. From the results page, you can:

- Select user accounts to edit. To edit an account, click it in the search results list; or select it in the list, and then click **Edit**.
- Perform actions (such as enable, disable, unlock, delete, update, or change/reset passwords) on one or more accounts. To perform an action, select one or more accounts in the search results list, and then click the appropriate action.
- Create user accounts.

Figure 3-4 User Account Search Results



Editing Users

The information in this section covers viewing, editing, reassigning, and renaming user accounts.

Viewing User Accounts

Use the View User page to view account information.

To view account information, follow these steps:

1. In the Administrator interface, click **Accounts** in the menu.

   The User List page opens.

2. Select the box next to the user whose account you want to view.

3. In the **User Actions** drop-down menu, select **View**.

   The View User page displays a subset of the user's identity, assignments, security, delegations, attributes, and compliance information. The information on the View User page is view-only and cannot be edited.

4. Click **Cancel** to return to the Accounts list.

Editing User Accounts

Use the Edit User page to edit account information.

To edit account information, follow these steps:

1. In the Administrator interface, click **Accounts** in the menu.

2. Select the box next to the user whose account you want to edit.

3. In the **User Actions** drop-down menu, select **Edit**.

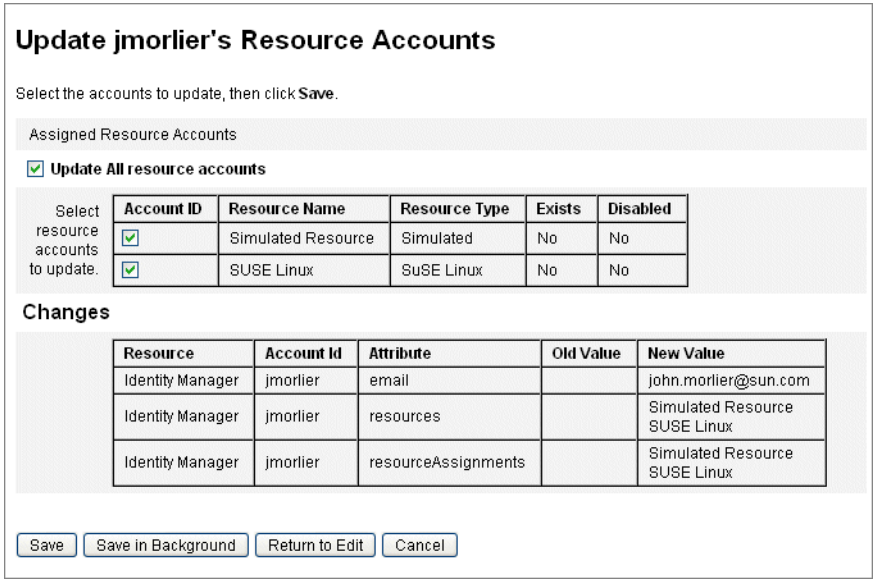
4. Make and save your changes.

   Identity Manager displays the Update Resource Accounts page. This page shows resource accounts assigned to the user and the changes that will apply to the account.

5. Select **Update All resource accounts** to apply changes to all assigned resources, or individually select none, one, or more resource accounts associated with the user to update.

6. Click **Save** again to complete the edit, or click **Return to Edit** to make further changes.

Figure 3-5 Edit User (Update Resource Accounts)



Reassigning Users to Another Organization

The move action allows you to remove one or more users from one organization and reassign, or move, the users to a new organization.

To move a user, follow these steps:

1. In the Administrator interface, click **Accounts** in the menu.

   The User List page opens.

2. Select the box next to the user (or users) to be moved.

3. In the **User Actions** drop-down menu, select **Move**.

   The Change Organization of Users task page opens.

4. Select the organization that you want to reassign the user to and click **Launch**.

Renaming Users

Typically, renaming an account on a resource is a complex action. Because of this, Identity Manager provides a separate feature to rename a user's Identity Manager account, or one or more resource accounts, that are associated with that user.

To use the rename feature, select a user account in the list, and then select the **Rename** option from the User Actions list.

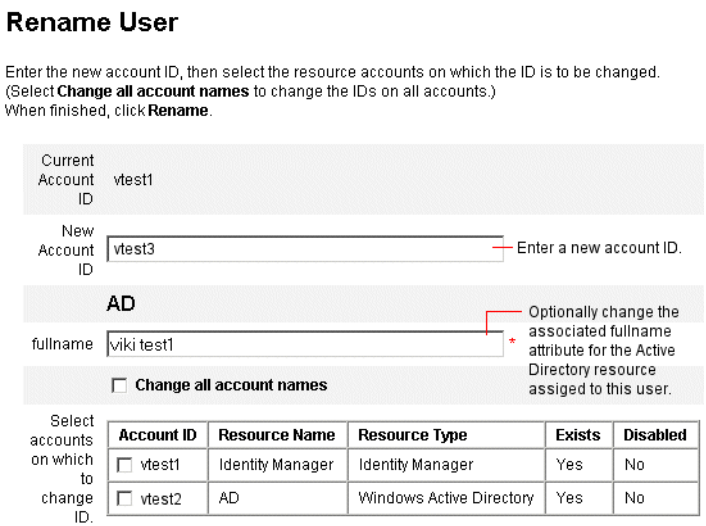
The Rename User page allows you to change the user account name, associated resource account names, and resource account attributes associated with the user's Identity Manager account.

NOTE Some resource types do not support account renaming.

As shown in the following figure, the user has an assigned Active Directory resource. During the renaming process, you can change:

- Identity Manager user account name
- Active Directory resource account name
- Active Directory resource attribute (fullname)

Figure 3-6 Rename User



Updating Resources Associated with an Account

In an update action, Identity Manager updates the resources that are associated with a user account. Updates performed from the accounts area send any pending changes that were previously made to a user to the resources selected. This situation may occur if:

- A resource was unavailable when updates were made.
- A change was made to a role or resource group that needed to be pushed to all users assigned to that role or resource group. In this case, you should use the Find User page to search for users, and then select one or more users on which to perform the update action.

When you update the user account, you have the following options:

- Choose whether assigned resource accounts will receive the updated information.
- Update all resource accounts, or select individual accounts from a list.

Updating Resources on a Single User Account

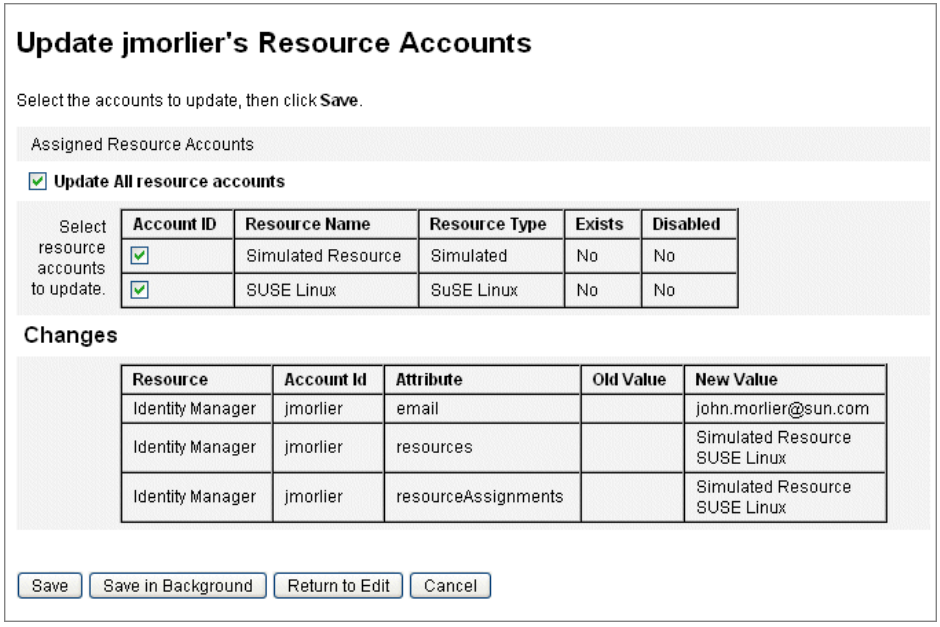
To update a user account, select it in the list, and then select **Update** from the User Actions list.

On the Update Resource Accounts page, select one or more resources to update, or select **Update All resource accounts** to update all assigned resource accounts. When finished, click **OK** to begin the update process. Alternatively, click **Save in Background** to perform the action as a background process.

A confirmation page confirms the data sent to each resource.

Figure 3-7 illustrates the Update Resource Accounts page.

Figure 3-7 Update Resource Accounts



Updating Resources on Multiple User Accounts

You can update two or more Identity Manager user accounts at the same time. Select more than one user account in the list, and then select **Update** from the User Actions list.

NOTE When you choose to update multiple user accounts, you cannot select individually assigned resource accounts from each user account. Rather, this process updates all resources on all user accounts you select.

Deleting Identity Manager User Accounts

In Identity Manager, an Identity Manager user account is deleted in the same way that a remote resource account is deleted. Follow the steps for deleting a resource account, but instead of selecting a remote resource account for deletion, select the Identity Manager account.

NOTE If a user has outstanding work items, or if a user has outstanding work items that have been delegated to another user, Identity Manager will not allow the user's Identity Manager account to be deleted. The delegated work items either need to be resolved or forwarded to another user before the user's Identity Manager account can be deleted.

For more information, see "Deleting Resources from a Single User Account" on page 88 and "Deleting Resources from Multiple User Accounts" on page 90.

Deleting Resources from User Accounts

Identity Manager provides several deletion operations that can be used to remove Identity Manager user account access from a resource:

- **Delete** — For each resource selected, Identity Manager deletes the user's account on the remote resource. (To delete a user from Identity Manager, select Identity Manager as the resource.)
  - Deleted resource accounts are automatically *unlinked* from the Identity Manager user.
  - Deleted resource accounts are not *unassigned* from the user. The resource remains assigned to the user unless the **unassign** action is also selected.
- **Unassign** — For each resource selected, Identity Manager removes the resource from the user's list of assigned resources.
  - Unassigned resource accounts are automatically *unlinked* from the Identity Manager user.
  - The user account on the remote resource *is not* deleted. The account remains intact unless the **delete** action is also selected.

- **Unlink** — For each resource selected, the user's resource account information is removed from Identity Manager.
  - The user's account on the remote resource remains intact unless a **delete** action is also selected.
  - The resource remains on the user's list of assigned resources unless an **unassign** action is also selected.
  - If you unlink an account that has been indirectly assigned to the user through a role or resource group, the link may be restored when the user is updated.

NOTE Although **deprovision** appears as a user-action in the User List page menus, there are actually only three Deletion actions in Identity Manager: **delete**, **unassign**, and **unlink**.

To deprovision a remote resource, use the **delete** and **unassign** actions on the resource.

Deleting Resources from a Single User Account

Use the following procedure to perform a delete operation on a single Identity Manager user. By working with one user account at a time, you can specify different delete, unassign, and/or unlink operations for individual resource accounts.

To start a delete, unassign, or unlink action for a single user account, follow these steps:

1. In the Administrator interface, click **Accounts** in the main menu.

   The User List page displays on the **List Accounts** tab.

2. Select a user and click the **User Actions** drop-down menu.

3. Select any of the **Deletion** actions (**Delete**, **Deprovision**, **Unassign**, or **Unlink**) from the list.

   Identity Manager displays the Delete Resource Accounts page (Figure 3-8 on page 89).

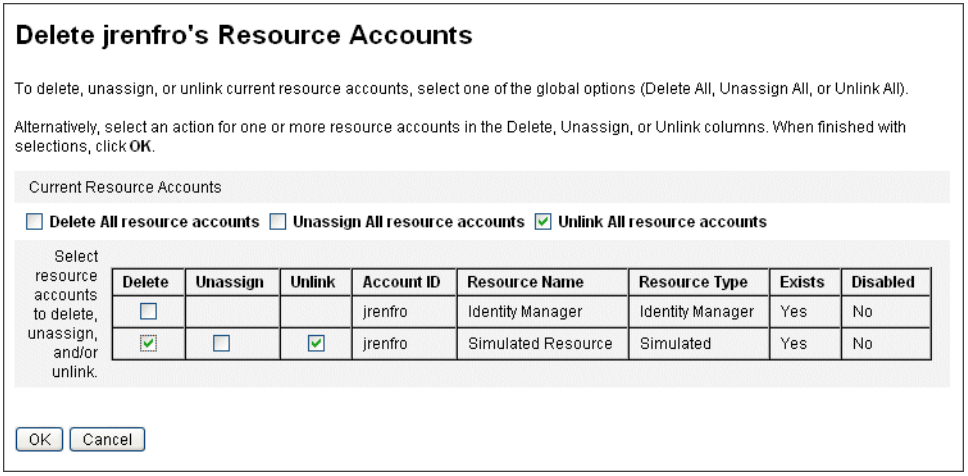
4. Complete the form. For more information on the **Delete**, **Unassign**, and **Unlink** actions, see "Deleting Resources from User Accounts" on page 86.

5. Click **OK**.

Figure 3-8 shows the Delete Resource Accounts page. In the screen capture, the user jrenfro has one active account on a remote resource (the Simulated Resource). The **Delete** action is selected, which means that when the form is submitted, jrenfro's account on the resource will be deleted. Because deleted accounts are automatically unlinked, the account information for this resource will be removed from Identity Manager. The Simulated Resource will remain assigned to jrenfro because the **Unassign** action is not selected.

To delete jrenfro's Identity Manager account, the **Delete** action should be selected for Identity Manager.

Figure 3-8 The Delete Resource Accounts page



Deleting Resources from Multiple User Accounts

You can perform a delete operation on more than one Identity Manager user account at a time, however, you can only perform the selected delete operation on *all* of the users' resource accounts.

Delete operations can also be performed using Identity Manager's Bulk Account Actions feature. See "Delete, DeleteAndUnlink, Disable, Enable, Unassign, and Unlink Commands" on page 102.

To start a delete, unassign, or unlink action for multiple users, follow these steps:

1. In the Administrator interface, click **Accounts** in the main menu.

   The User List page displays on the **List Accounts** tab.

2. Select one or more users and click the **User Actions** drop-down menu.

3. Select any of the **Deletion** actions (**Delete**, **Deprovision**, **Unassign**, or **Unlink**) from the list.

   Identity Manager displays the Confirm Delete, Unassign, or Unlink page (Figure 3-9 on page 91).

4. Select one of the following options:

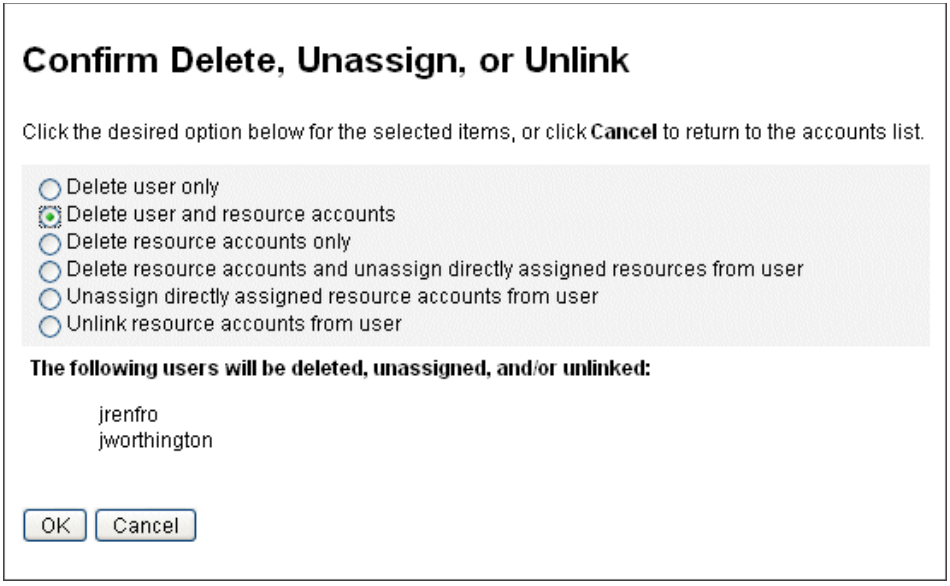
   - **Delete user only** — Deletes the users' Identity Manager accounts. This option does not delete or unassign the users' resource accounts.
   - **Delete user and resource accounts** — Deletes the users' Identity Manager accounts and all of the users' resource accounts.
   - **Delete resource accounts only** — Deletes all of the users' resource accounts. This option does not unassign the resource accounts, nor does it delete the users' Identity Manager accounts.
   - **Delete resource accounts and unassign directly assigned resources from user** — Deletes and unassigns all of the users' resource accounts, but does not delete the users' Identity Manager accounts.
   - **Unassign directly assigned resource accounts from user** — Unassigns directly assigned resource accounts. This option does not delete the users' accounts on the remote resources. Resource accounts assigned through a role or resource group are not affected.

- **Unlink resource accounts from user** — The users' resource account information is removed from Identity Manager. The users' accounts on the remote resources are not deleted and are not unassigned. Accounts that are indirectly assigned to the users through a role or resource group may be restored when the users are updated.

5. Click **OK**.

Figure 3-9 shows the Confirm Delete, Unassign, or Unlink page. The top portion of the page displays the six available actions that can be carried out for multiple users. The bottom portion of the page displays the users who will be affected by the selected action.

Figure 3-9 The Confirm Delete, Unassign, or Unlink page



Changing User Passwords

All Identity Manager users are assigned a password. When set, the Identity Manager user password is used to synchronize the user's resource account passwords. If one or more resource account passwords cannot be synchronized (for example, to comply with required password policies), you can set them individually..

NOTE For information about account password policies, as well as general information about user authentication, see "Managing Account Security and Privileges" on page 108.

Changing Passwords from the User List Page

From the User List page (**Accounts > List Accounts)** you can use the **Change Password** User Action.

To change a user account password from the User List page, follow these steps:

1. In the Administrator interface, click **Accounts** in the main menu.

   The User List page displays on the **List Accounts** tab.

2. Select a user and click the User Actions drop-down menu.

3. To change the password, select **Change Password**.

   The Change User Password page opens.

4. Type the new password and click the **Change Password** button.

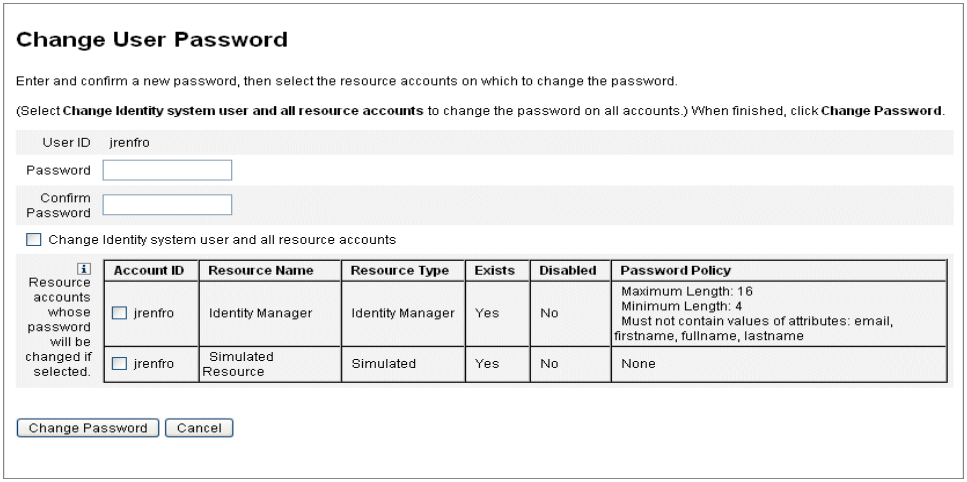
Changing Passwords from the Main Menu

To change a user account password from the main menu, follow these steps:

1. In the Administrator interface, click **Passwords** in the main menu.

   The Change User Password page appears by default.

Figure 3-10 Change User Password



2. Select a search term (such as account name, email address, last name, or first name), and then a search type (starts with, contains, or is).
3. Type one or more letters of a search term in the entry field, and then click **Find**. Identity Manager returns a list of all users whose IDs contain the entered characters. Click to select a user and return to the Change User Password page.
4. Enter and confirm new password information, and then click **Change Password** to change the user password on the listed resource accounts. Identity Manager displays a workflow diagram that shows the sequence of actions taken to change the password.

Resetting User Passwords

The process for resetting Identity Manager user account passwords is similar to the change process. The reset process differs from a password change in that you do not specify a new password. Rather, Identity Manager randomly generates a new password (depending on your selections and password policies) for the user account, resource accounts, or a combination of these.

The policy assigned to the user — either by direct assignment or through the user's organization — controls several reset options, including:

- How often a password may be reset before resets are disabled
- Where the new password is displayed or sent. Depending on the Reset Notification Option selected for the role, Identity Manager emails the new password to the user or displays it (on the Results page) to the Identity Manager administrator requesting the reset.

Resetting Passwords from the User List Page

The **Reset Password** user action is available on the User List page (Accounts > List Accounts).

To reset a password from the User List page, follow these steps:

1. In the Administrator interface, click **Accounts** in the main menu. The User List page displays on the **List Accounts** tab.
2. Select a user and click the **User Actions** drop-down menu.
3. To reset the password, select **Reset Password**.

   The Reset User Password page opens.
4. Click the **Reset Password** button.

Expiring Passwords using the Identity Manager Account Policy

By default, when you reset a user password, it is immediately expired. This means that after reset, the first time a user logs in, he must select a new password before gaining access. This default can be overridden in a form, such that the user's password will expire according to the expire password policy set in the Identity Manager Account Policy associated with the user.

To override the change-password requirement, edit the Reset User Password Form, and set the following value to `false`:

```
resourceAccounts.currentResourceAccounts[Lighthouse].expirePassword
```

There are two ways to expire a password via the Reset Option field in the Identity Manager Account Policy:

- **permanent** — The time period specified in the passwordExpiry policy attribute is used to calculate the relative date from the current date when the password is reset, and then set that date on the user. If no value is specified, the changed or reset password never expires.
- **temporary** — The time period specified in the tempPasswordExpiry policy attribute is used to calculate the relative date from the current date when the password is reset, and then set that date on the user. If no value is specified, the changed or reset password never expires. If tempPasswordExpiry is set to a value of 0, then the password is expired immediately.

  The `tempPasswordExpiry` attribute applies only when passwords are reset (randomly changed). It does not apply to password changes.

Disabling, Enabling, & Unlocking User Accounts

This section describes how to disable and enable Identity Manager user accounts. It also describes how to help users who have become locked out of their Identity Manager accounts.

Disabling User Accounts

When you disable a user account, you alter that account so that the user can no longer log in to either Identity Manager or to his assigned resource accounts.

Note that administrators can *disable* user accounts from the Administrator interface, but they cannot *lock* user accounts. Accounts can only become locked if the user exceeds the allowable number of unsuccessful login attempts defined by the Identity Manager account policy

---

NOTE If an assigned resource does not have native support for account disabling, but does support password changes, then Identity Manager can be configured to disable user accounts on that resource by assigning new, randomly generated passwords.

To ensure that this functionality works correctly, do the following:

1. Open the "Identity System Parameters" page in the Edit Resource Wizard. (See "Edit a Resource Using the Resource Wizard" on page 182 for instructions on how to open the wizard.)
2. In the "Account Features Configuration" table verify that both the **Password** feature and the **Disable** feature *do not* have check marks in the **Disable?** column. (To display the **Disable** feature, select **Show All Features**.)

   If the **Disable** feature *does* have a check mark in the **Disable?** column, accounts in the resource cannot be disabled.

Disabling Single User Accounts

To disable a user account, select it in the **User List**, and then select **Disable** from the **User Actions** drop-down menu.

On the displayed Disable page, select the resource accounts to disable, and then click **OK**. Identity Manager displays the results of disabling the Identity Manager user account and all associated resource accounts. The accounts list indicates that the user account is disabled.

Disabling Multiple User Accounts

You can disable two or more Identity Manager user accounts at the same time. Select more than one user account in the list, and then select **Disable** from the User Actions list.

NOTE When you choose to disable multiple user accounts, you cannot select individually assigned resource accounts from each user account. Rather, this process disables all resources on all user accounts you select.

Enabling User Accounts

User account enabling reverses the disabling process.

Depending on selected notification options, Identity Manager also displays the password on the administrator's results page.

The user can then reset his password (through the authentication process), or a user with administrator privileges can reset it.

NOTE If an assigned resource does not have native support for account enabling, but does support password changes, then Identity Manager can be configured to enable user accounts on that resource through password resets.

To ensure that this functionality works correctly, do the following:

1. Open the "Identity System Parameters" page in the Edit Resource Wizard. (See "Edit a Resource Using the Resource Wizard" on page 182 for instructions on how to open the wizard.)
2. In the "Account Features Configuration" table, verify that both the **Password** feature and the **Enable** feature *do not* have check marks in the **Disable?** column. (To display the **Enable** feature, select **Show All Features**.)

   If the **Enable** feature *does* have a check mark in the **Disable?** column, accounts in the resource cannot be enabled.

Enabling Single User Accounts

To enable a user account, select it in the list, and then select **Enable** from the User Actions list.

On the displayed Enable page, select the resources to enable, and then click **OK**. Identity Manager displays the results of enabling the Identity Manager account and all associated resource accounts.

Enabling Multiple User Accounts

You can enable two or more Identity Manager user accounts at the same time. Select more than one user account in the list, and then select Enable from the User Actions list.

NOTE When you choose to enable multiple user accounts, you cannot select individually assigned resource accounts from each user account. Rather, this process enables all resources on all user accounts you select.

Unlocking User Accounts

Users become locked out if they are unsuccessful at logging in to Identity Manager. To become locked out, the user has to exceed the allowable number of unsuccessful login attempts defined by the Identity Manager account policy.

NOTE Only login attempts on an Identity Manager user interface are counted towards an Identity Manager lockout (that is, either the administrator interface, the end-user interface, the command-line interface, or the SPML API interface). Failed login attempts on resource accounts are not counted and will not cause the user to be locked out of their Identity Manager account.

The Identity Manager account policy establishes the maximum number of *failed password* or *question* login attempts that can be made.

- Users who exceed the maximum number of *failed password* login attempts are locked out of all Identity Manager application interfaces, including the "Forgot My Password" interface.
- Users who exceed the maximum number of *failed question* login attempts can authenticate to any Identity Manager application interface except "Forgot My Password."

Failed Password Login Attempts

Users who are locked out of Identity Manager due to excessive failed password login attempts will not be able to log in until an administrator unlocks the account or until the lock expires.

- An administrator can unlock an account if the administrator has administrative control of the user's member organization, as well as the "Unlock User" capability.
- If a "Lock Timeout" value is set in the Identity Manager Account Policy, a lock placed on an account will eventually expire. The "Lock Timeout" value for failed password login attempts is set by the **Account lock created by failed password-logins expires in** value.

Failed Question Login Attempts

Users who are locked out of the "Forgot My Password" interface due to excessive failed question login attempts will not be able to log in to that interface until an administrator unlocks the account, or until the locked user (or a user with appropriate capabilities) changes or resets the user's password, or until the lock expires.

- An administrator can unlock an account if the administrator has administrative control of the user's member organization, as well as the "Unlock User" capability.
- If a "Lock Timeout" value is set in the Identity Manager Account Policy, a lock placed on an account will eventually expire. The "Lock Timeout" value for failed question login attempts is set by the **Account lock created by failed question-logins expires in** value

An administrator with appropriate capabilities can perform the following operations on a user in locked state:

- Update (including resource re-provisioning)
- Change or reset password
- Disable or enable
- Rename
- Unlock

To unlock accounts, select one or more user accounts in the list, and then select **Unlock Users** from the **User Actions or Organization Actions** list.

Bulk Account Actions

You can perform several *bulk* actions on Identity Manager accounts, which allow you to act on multiple accounts at the same time.

You can initiate the following Bulk actions:

- **Delete** — This action deletes, unassigns, and unlinks selected resource accounts. Select the "Target the Identity Manager Account" option to also delete each user's Identity Manager account.
- **Delete and Unlink** — This action deletes any selected resource accounts and unlinks the accounts from the users.
- **Disable** — Disables any selected resource accounts. Select the "Target the Identity Manager Account" option to also disable each user's Identity Manager account.
- **Enable** — Enables any selected resource accounts. Select the "Target the Identity Manager Account" option to enable each user's Identity Manager account.
- **Unassign, Unlink**— Unlinks any selected resource accounts and removes the Identity Manager user account's assignments to those resources. Unassigning does not remove the account from the resource. You cannot unassign an account that has been indirectly assigned to the Identity Manager user through a role or resource group.
- **Unlink** — Removes a resource account's association (link) with the Identity Manager user account. Unlinking does not remove the account from the resource. If you unlink an account that has been indirectly assigned to the Identity Manager user through a role or resource group, the link may be restored when the user is updated.

Bulk actions work best if you have a list of users in a file or application, such as an email client or spreadsheet program. You can copy and paste the list into a field on this interface page, or you can load the list of users from a file.

Many of these actions can be performed on the results of a user search. Use the Find Users page (**Accounts > Find Users**) to search for users.

You can save the results of a bulk account operation to a CSV file by clicking **Download CSV** when the task results appear upon completion of the task.

Launching Bulk Account Actions

To launch bulk account actions, follow these steps:

1. In the Administrator interface, click **Accounts** in the main menu.
2. Click **Launch Bulk Actions** in the secondary menu.
3. Complete the form and then click **Launch**.

   Identity Manager launches a background task to perform the bulk actions.

To monitor the status of the bulk actions task, click **Server Tasks** in the main menu, and then click **All Tasks**.

Using Action Lists

You can specify a list of bulk actions using comma-separated values (CSV) format. This allows you to provide a mix of different action types in a single action list. In addition, you can specify more complicated creation and update actions.

The CSV format consists of two or more input lines. Each line consists of a list of values separated by commas. The first line contains field names. The remaining lines each correspond to an action to be performed on an Identity Manager user, the user's resource accounts, or both. Each line should contain the same number of values. Empty values will leave the corresponding field value unchanged.

Two fields are required in any bulk action CSV input:

- **user** — Contains the name of the Identity Manager user.
- **command** — Contains the action taken on the Identity Manager user. Valid commands are:
  - **Delete** — Deletes, unassigns, and unlinks resource accounts, the Identity Manager account, or both.
  - **DeleteAndUnlink** — Deletes and unlinks resource accounts.
  - **Disable** — Disables resource accounts, the Identity Manager account, or both.
  - **Enable** — Enables resource accounts, the Identity Manager account, or both.
  - **Unassign** — Unassigns and unlinks resource accounts.
  - **Unlink** — Unlinks resource accounts.

- **Create** — Creates the Identity Manager account. Optionally creates resource accounts.
- **Update** — Updates the Identity Manager account. Optionally creates, updates, or deletes resource accounts.
- **CreateOrUpdate** — Performs a create action if the Identity Manager account does not already exist. Otherwise, it performs an update action.

Delete, DeleteAndUnlink, Disable, Enable, Unassign, and Unlink Commands

If you are performing Delete, DeleteAndUnlink, Disable, Enable, Unassign, or Unlink actions, the only additional field you need to specify is resources. Use the resources field to specify which accounts on which resources will be affected.

The resources field can have the following values:

- **all** — Process all resource accounts including the Identity Manager account.
- **resonly** — Process all of the resource accounts excluding the Identity Manager account.
- *resource_name* [| *resource_name ...*] — Process the specified resource accounts. Specify Identity Manager to process the Identity Manager account.

The following is an example of the CSV format for several of these actions:

```
command,user,resources
Delete,John Doe,all
Disable,Jane Doe,resonly
Enable,Henry Smith,Identity Manager
Unlink,Jill Smith,Windows Active Directory|Solaris Server
```

Create, Update, and CreateOrUpdate Commands

If you are performing Create, Update, or CreateOrUpdate commands, then you can specify fields from the User View in addition to the user and command fields. The field names used are the path expressions for the attributes in the views. See *Identity Manager Workflows, Forms, and Views* for information on the attributes that are available in the User View. If you are using a customized User Form, then the field names in the form contain some of the path expressions that you can use.

Some of the more common path expressions used in bulk actions are:

- **waveset.roles** — A list of one or more role names to assign to the Identity Manager account.
- **waveset.resources** — A list of one or more resource names to assign to the Identity Manager account.

- **waveset.applications** — A list of one or more role names to assign to the Identity Manager account.
- **waveset.organization** — The organization name in which to place the Identity Manager account.
- **accounts**[*resource_name*].*attribute_name* — A resource account attribute. The names of the attributes are listed in the schema for the resource.

The following is an example of the CSV format for create and update actions:

```
command,user,waveset.resources,password.password,password.confirmPassword,
accounts[Windows Active Directory].description,accounts[Corporate
Directory].location
Create,John Doe,Windows Active Directory|Solaris
Server,changeit,changeit,John Doe - 888-555-5555,
Create,Jane Smith,Corporate Directory,changeit,changeit,,New York
CreateOrUpdate,Bill Jones,,,,,California
```

Fields with More Than One Value

Some fields can have multiple values. These are known as multivalued fields. For example, the `waveset.resources` field can be used to assign multiple resources to a user. You can use the vertical bar (`|`) character (also known as the "pipe" character) to separate multiple values in a field. The syntax for multiple values can be specified as follows:

```
value0 | value1 [ | value2 ... ]
```

When updating multivalued fields on existing users, replacing the current field's values with one or more new values may not be what you want. You may want to remove some values or add to the current values. You can use field directives to specify how to treat the existing field's values. Field directives go in front of the field value and are surrounded by the vertical bar character, as follows:

```
|directive [ ; directive ] | field values
```

You can choose from the following directives:

- **Replace** — Replace the current values with the specified values. This is the default if no directive (or just the List directive) is specified.
- **Merge** — Add the specified values to the current values. Duplicate values are filtered.
- **Remove** — Remove the specified values from the current values.

- **List** — Force the field's value to be handled as if it had multiple values, even if it only has a single value. This directive is not usually needed as most fields are handled appropriately regardless of the number of values. This is the only directive that can be specified with another directive.

NOTE Field values are case-sensitive. This is important when specifying the Merge and Remove directives. The values must match exactly to correctly remove values or avoid having multiple similar values when merging.

Special Characters in Field Values

If you have a field value with a comma (,) or double quote (") character, or you want to preserve leading or trailing spaces, you must embed your field value within a pair of double quotes ("field_value"). You then need to replace double quotes in the field value with two double quote (") characters. For example, `"John ""Johnny"" Smith"` results in a field value of `John "Johnny" Smith`.

If you have a field value with a vertical bar (|) or backslash (\) character in it, you must precede it with a backslash (`\| or \\`).

Bulk Action View Attributes

When the Create, Update, or CreateOrUpdate actions are performed, there are additional attributes in the User View that are only used or available during bulk action processing. These attributes can be referenced in the User Form to allow behavior specific to bulk actions. The attributes are as follows:

- **waveset.bulk.fields.***field_name* — These attributes contain the values for the fields that were read in from the CSV input, where *field_name* is the name of the field. For example, the command and user fields are in the attributes with path expressions `waveset.bulk.fields.command` and `waveset.bulk.fields.user`, respectively.
- **waveset.bulk.fieldDirectives.***field_name* — These attributes are only defined for those fields for which a directive was specified. The value is the directive string.
- **waveset.bulk.abort** — Set this Boolean attribute to true to abort the current action.
- **waveset.bulk.abortMessage** — Set this to a message string to display when waveset.bulk.abort is set to true. If this attribute is not set, a generic abort message is displayed.

Correlation and Confirmation Rules

Use correlation and confirmation rules when you do not have the Identity Manager user name available to put in the user field of your actions. If you do not specify a value for the user field, then you must specify a correlation rule when launching the bulk action. If you do specify a value for the user field, then the correlation and confirmation rules will not be evaluated for that action.

A correlation rule looks for Identity Manager users that match the action fields. A confirmation rule tests an Identity Manager user against the action fields to determine whether the user is a match. This two-stage approach allows Identity Manager to optimize correlation by quickly finding possible users (based on name or attributes), and by performing expensive checks only on the possible users.

Create a correlation or confirmation rule by creating a rule object with a subtype of `SUBTYPE_ACCOUNT_CORRELATION_RULE` or `SUBTYPE_ACCOUNT_CONFIRMATION_RULE`, respectively.

For more information about correlation and confirmation rules, see the Data Loading and Synchronization chapter in *Identity Manager Technical Deployment Overview.*

Correlation Rules

Input for any correlation rule is a map of the action fields. Output must be one of the following:

- String (containing user name or ID)
- List of String elements (each a user name or ID)
- List of WSAttribute elements
- List of AttributeCondition elements

A typical correlation rule generates a list of user names based on values of the fields in the action. A correlation rule may also generate a list of attribute conditions (referring to queryable attributes of `Type.USER`) that will be used to select users.

A correlation rule should be relatively inexpensive but as selective as possible. If possible, defer expensive processing to a confirmation rule.

Attribute conditions must refer to queryable attributes of `Type.USER`. These are configured in the Identity Manager configuration object named `IDM Schema Configuration`.

Correlating on an extended attribute requires special configuration:

- The extended attribute must be specified as queryable. To set an extended attribute as queryable, follow these steps:

  a. Open `IDM Schema Configuration`. You must have the IDM Schema Configuration capability to view or edit `IDM Schema Configuration`.

  b. Locate the `<IDMObjectClassConfiguration name='User'>` element.

  c. Locate the `<IDMObjectClassAttributeConfiguration name='`*`xyz`*`'>` element, where *xyz* is the name of the attribute that you want to set as queryable.

  d. Set `queryable='true'`

  In Code Example 3-1 the `email` extended attribute is defined as queryable.

Code Example 3-1 XML excerpt that defines the email extended attribute as queryable

```
<IDMSchemaConfiguration>
  <IDMAttributeConfigurations>
    <IDMAttributeConfiguration name='email'
                               syntax='STRING'/>
    </IDMAttributeConfiguration>
  </IDMAttributeConfigurations>
  <IDMObjectClassConfigurations>
    <IDMObjectClassConfiguration name='User'
                                 extends='Principal'
                                 description='User description'>
       <IDMObjectClassAttributeConfiguration name='email'
                                             queryable='true'/>
    </IDMObjectClassConfiguration>
  </IDMObjectClassConfigurations>
</IDMSchemaConfiguration>
```

- The Identity Manager application (or the application server) needs to be restarted for the `IDM Schema Configuration` change to take effect.

Confirmation Rules

Inputs to any confirmation rule are as follows:

- **`userview`** — Full view of an Identity Manager user.
- **`account`** — Map of action fields.

A confirmation rule returns a string-form Boolean value of true if the user matches the action fields; otherwise, it returns a value of false.

A typical confirmation rule compares internal values from the user view to the values of the action fields. As an optional second stage in correlation processing, the confirmation rule performs checks that cannot be expressed in a correlation rule (or that are too expensive to evaluate in a correlation rule). In general, you need a confirmation rule only for the following situations:

- The correlation rule may return more than one matching user.
- User values that must be compared are not queryable.

A confirmation rule is run once for each matching user returned by the correlation rule.

Managing Account Security and Privileges

This section discusses actions you can take to provide secure access for user accounts and to manage user privileges in Identity Manager.

Setting Password Policies

Resource password policies establish the limitations for passwords. Strong password policies provide added security to help protect resources from unauthorized login attempts. You can edit a password policy to set or select values for a range of characteristics.

To begin working with password policies, click **Security** on the main menu, and then click **Policies**.

To edit a password policy, click it in the Policies list. To create a password policy, select **String Quality Policy** from the **New... l**ist of options.

NOTE For more information on policies, see "Configuring Identity Manager Policies" on page 190.

Creating a Policy

Password policies are the default type for string quality policies. After naming and providing an optional description for the new policy, select options and parameters for the rules that define it.

Length Rules

Length rules set the minimum and maximum required character length for a password. Select this option to enable the rule, and then enter a limit value for the rule.

Character Type Rules

Character type rules establish the minimum and maximum characters of certain types and number that can be included in a password. These include:

- Minimum and maximum alphabetic, numeric, uppercase, lowercase, and special characters

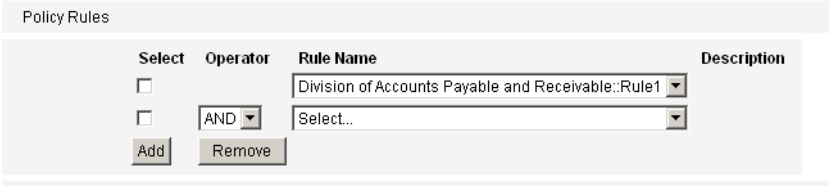
- Minimum and maximum embedded numeric characters
- Maximum repetitive and sequential characters
- Minimum beginning alphabetic and numeric characters

Enter a numeric limit value for each character type rule; or enter All to indicate that all characters must be of that type.

Minimum Number of Character Type Rules. You can also set the minimum number of character type rules that must pass validation, as illustrated in Figure 3-11. The minimum number that must pass is one. The maximum cannot exceed the number of character type rules that you have enabled.

NOTE To set the minimum number that must pass to the highest value, enter All.

Figure 3-11 Password Policy (Character Type) Rules



Dictionary Policy Selection

You can choose to check passwords against words in a dictionary to guard against simple dictionary attacks. Before you can use this option, you must:

- Configure the dictionary
- Load dictionary words

You configure the dictionary from the Policies page. For more information about how to set up the dictionary, see "Dictionary Policy" on page 193.

Password History Policy

You can prohibit re-use of passwords that were used immediately preceding a newly selected password.

In the Number of Previous Passwords that Cannot be Reused field, enter a numeric value greater than one to prohibit re-use of the current and preceding passwords. For example, if you enter a numeric value of 3, the new password cannot be the same as the current password or the two passwords used immediately before it.

You can also prohibit re-use of similar characters from passwords used previously. In the Maximum Number of Similar Characters from Previous Passwords that Cannot be Reused field, enter the number of consecutive characters from the previous password or passwords that cannot be repeated in the new password. For example, if you enter a value of 7, and the previous password was password1, then the new password cannot be password2 or password3.

If you enter a value of 0, then all characters must be different regardless of sequence. For example, if the previous password was abcd, then the new password cannot include the characters a, b, c, or d.

The rule can apply to one or more previous passwords. The number of previous passwords checked is the number specified in the Number of Previous Passwords that Cannot be Reused field.

Must Not Contain Words

You can enter one or more words that the password may not contain. In the entry box, enter one word on each line.

You can also exclude words by configuring and implementing the dictionary policy. For more information, see "Dictionary Policy" on page 193.

Must Not Contain Attributes

Select one or more attributes that the password may not contain. Attributes include:

- accountID
- email
- firstname
- fullname
- lastname

You can change the allowed set of "must not contain" attributes for passwords in the `UserUIConfig` configuration object. See "Must Not Contain Attributes in Policies" on page 193 for more information.

Implementing Password Policies

Password policies are established for each resource. To put a password policy in place for a specific resource, select it from the Password Policy list of options, which is located in the Policy Configuration area of the Create or Edit Resource Wizard: Identity Manager Parameters pages.

User Authentication

If a user forgets his password or his password is reset, the user can answer one or more account authentication questions to gain access to Identity Manager. You establish these questions, and the rules that govern them, as part of an Identity Manager account policy. Unlike password policies, Identity Manager account policies are assigned to the user directly or through the organization assigned to the user (on the Create and Edit User pages).

To set up authentication in an account policy, follow these steps:

1. Click **Security** in the main menu, and then click **Policies**.
2. Select "Default Identity Manager Account Policy" from the list of policies.

   Authentication selections are offered in the Secondary Authentication Policy Options area of the page.

Important! When first set up, the user should log in to the User interface and provide initial answers to his authentication questions. If these answers are not set, the user cannot successfully log in without his password.

The authentication question policy determines what happens when a user clicks on the **Forgot Your Password?** button on the login page or when accessing the Change My Answers page. Table 3-3 describes each option.

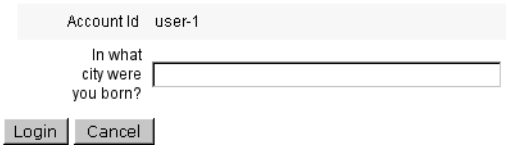
Table 3-3 Authentication Question Policy Options

Option	Description
Round robin	Identity Manager selects the next question from the list of configured questions and assigns this question to the user. The first user is assigned the first question in the list of authentication questions, and the second user is assigned the second question. This pattern continues until the number of questions is exceeded. At that point, questions are assigned to users in sequential order. For example, if there are 10 questions, the 11th and 21st users are assigned the first question. The selected question is the only one that is displayed. If you want the user to answer a different question every time, use the Random policy and set the number of questions to 1. Users cannot define their own authentication questions. See Personalized Authentication Questions for more information about this feature.
Random	This option allows the administrator to specify how many questions the user must answer. Identity Manager randomly selects and displays the specified number of questions from the list of questions defined in the policy as well as those the user has defined. The user must answer all questions displayed.
Any	Identity Manager displays all policy-defined and personalized questions. You must specify how many questions the user must answer.
All	The user must answer all policy-defined and personalized questions.

You can verify your authentication choices by logging in to the Identity Manager User interface, clicking **Forgot Your Password?**, and answering the presented question or questions.

Figure 3-12 shows an example of the User Account Authentication screen.

Figure 3-12 User Account Authentication

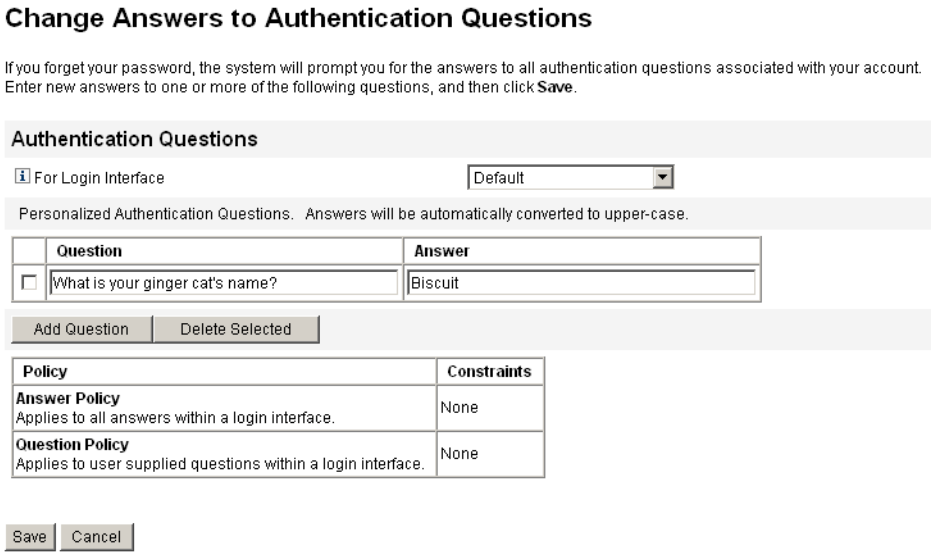


Personalized Authentication Questions

In the Identity Manager account policy, you can select an option to allow users to supply their own authentication questions in the User and Administrator interfaces. You can additionally set the minimum number of questions that the user must provide and answer to be able to log in successfully by using personalized authentication questions.

Users then can add and change questions from the Change Answers to Authentication Questions page. An example of this page is shown in Figure 3-13.

Figure 3-13 Change Answers — Personalized Authentication Questions



Bypassing the Change Password Challenge after Authentication

When a user successfully authenticates by answering one or more questions, by default he is challenged by the system to provide a new password. You can configure Identity Manager to bypass the change password challenge, however, by setting the `bypassChangePassword` system configuration property for one or more Identity Manager applications.

For instructions on editing the system configuration object, see page 214.

To bypass the change password challenge for all applications following successful authentication, set the `bypassChangePassword` property as follows in the system configuration object:

Code Example 3-2 Setting the attribute to Bypass the Change Password Challenge

```
<Attribute name="ui"
  <Object>
    <Attribute name="web">
      <Object>
        <Attribute name='questionLogin'>
          <Object>
            <Attribute name='bypassChangePassword'>
              <Boolean>true</Boolean>
            </Attribute>
          </Object>
        </Attribute>
        ...
      </Object>
    ...
```

To disable this password challenge for a specific application, set it as follows:

Code Example 3-3 Setting the attribute to disable the Change Password Challenge

```
<Attribute name="ui">
  <Object>
    <Attribute name="web">
      <Object>
        <Attribute name='user'>
          <Object>
            <Attribute name='questionLogin'>
              <Object>
                <Attribute name='bypassChangePassword'>
                  <Boolean>true</Boolean>
                </Attribute>
              </Object>
            </Attribute>
              </Object>
        </Attribute>
        ...
      </Object>
    ...
```

Assigning Administrative Privileges

You can assign Identity Manager administrative privileges, or capabilities, to users as follows:

- Admin Roles — Users assigned an Admin Role inherit the capabilities and controlled organizations defined by the role. By default, all Identity Manager user accounts are assigned the `User Admin Role` when created. For detailed information about Admin Roles and creating an Admin Role, see "Understanding and Managing Resources" in Chapter 4.
- Capabilities — Capabilities are defined by rules. Identity Manager provides sets of capabilities grouped into functional capabilities that you can select from. Assigning capabilities allows for more granularity in assigning administrative privileges. For information about capabilities and creating capabilities, see "Understanding and Managing Capabilities" in Chapter 6.
- Controlled organizations — Controlled organizations grant administrative control privileges over specified organizations. For more information, see Understanding Identity Manager Organizations in Chapter 6.

For more information about Identity Manager Administrators and administrative duties, see Chapter 6, "Administration."

User Self-Discovery

The Identity Manager end-user interface allows end-users to *discover* resource accounts. This means that a user with an Identity Manager identity can associate it with an existing, but unassociated, resource account.

Enabling Self-Discovery

To enable self-discovery, you must edit a special configuration object (End User Resources) and add to it the name of each resource on which the user will be allowed to discover accounts. U

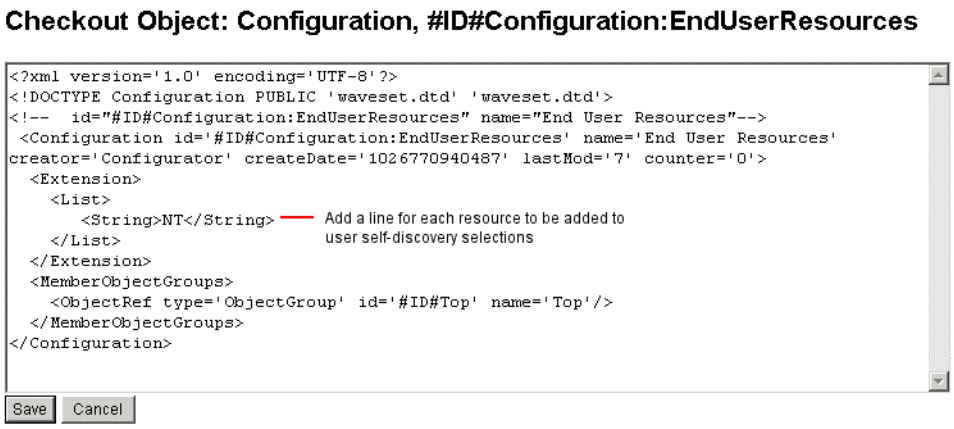
To enable self-discovery, follow these steps:

1. Edit the "End User Resources" configuration object.

   For instructions on editing Identity Manager configuration objects, see "Editing Identity Manager Configuration Objects" on page 214.

2. Add `<String>`*Resource*`</String>`, where *Resource* matches the name of a resource object in the repository, as illustrated in Figure 3-14.

Figure 3-14 End User Resources Configuration Object



3. Click **Save**.

When self-discovery is enabled, the user is presented with a new selection under the Profile menu tab on the Identity Manager User interface (Self Discovery). This area allows the user to select a resource from an available list, and then enter the resource account ID and password to link the account with his Identity Manager identity.

NOTE To give end-users access to Identity Manager configuration objects, administrators can also use the "End User" organization. See "The "End User" Organization" on page 253 for details.

Anonymous Enrollment

The anonymous enrollment feature allows a user without an Identity Manager account to obtain one by request.

Enabling Anonymous Enrollment

By default, the anonymous enrollment feature is disabled.

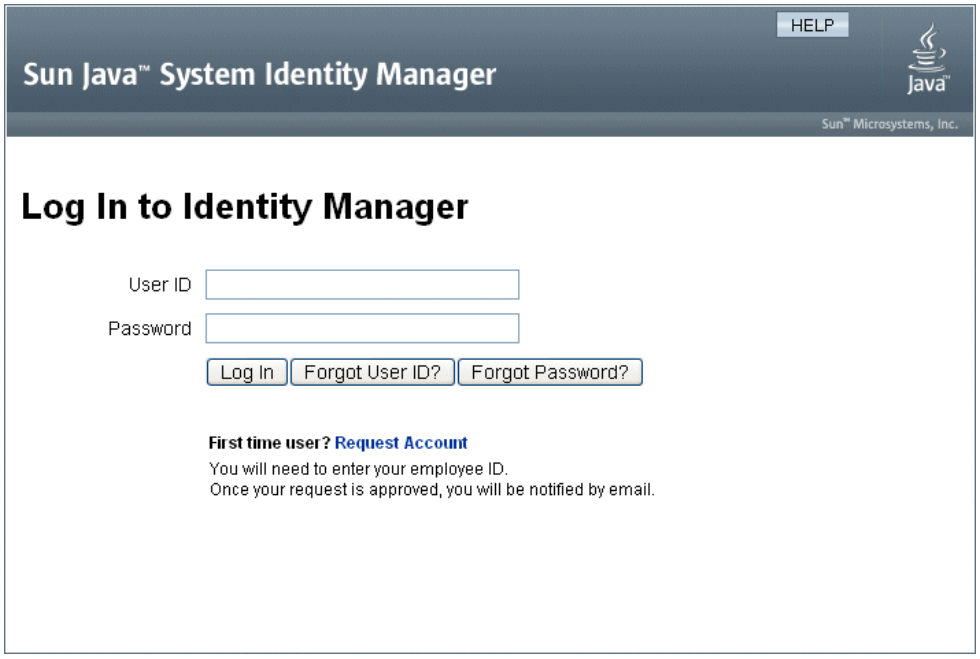
To enable the anonymous enrollment feature, follow these steps:

1. In the Administrator interface, click **Configure**, and then click **User Interface**.
2. In the **Anonymous Enrollment** area, select the **Enable** option, and then click **Save**.

When a user logs in to the User interface, the login page will display the text **First time user?** followed by a **Request Account l**ink.

NOTE The text **First time user? Request Account** is customizable. See the *Identity Manager Technical Deployment Overview* for details.

Figure 3-15 The User Interface page with the “Request Account” link enabled



Configuring Anonymous Enrollment

From the Anonymous Enrollment area on the User Interface page, you can configure these options for the anonymous enrollment process:

- **Notification Template** — Specify the ID of an email template to use to send notifications to the user requesting an account.
- **Require Privacy Policy** — If selected, then the user must accept the privacy policy before he can request an account. This is enabled by default.
- **Enable Validation** — If selected, then the user must validate his employment before he can request an account. This is enabled by default.
- **Process Launch URL** — Enter a URL to specify which workflow will be used for the anonymous enrollment process.
- **Enable Notifications** — If selected, then a notification email will be sent to the user when his account has been created.
- **Email Domain** — Enter the name of the email domain to use to construct the user's email address.

Click **Save** when finished.

User Enrollment Process

When a user logs on to the User interface, that user can request an account by clicking **Request Account** on the login page.

Identity Manager displays the first of two registration pages, which requests a first name, last name, and employee ID. If the Enable Validation attribute is set to yes (the default), then this information must be validated before the user can proceed to the next page.

The `verifyFirstname`, `verifyLastname`, `verifyEmployeeId`, and `verifyEligibility` rules in `EndUserLibrary` validate the information for each attribute.

NOTES You may need to modify one or more of these rules. In particular, you should modify the rule that verifies the employee ID to use a Web services call or Java class to verify the information.

If the Enable Validation attribute is disabled, then the initial registration page does not display. In this case, you must modify the End User Anonymous Enrollment Completion form to allow the user to enter information normally captured by the initial validation form.

From the information provided on the Registration page, Identity Manager generates:

- An account ID (following the convention of first initial, last initial, employee ID).
- An email address in the form:

  FirstName.LastName@EmailDomain

  where *EmailDomain* is the domain set by the Email Domain attribute in anonymous enrollment configuration.
- The manager attribute (`idmManager`). You can set this attribute by modifying the `EndUserRuleLibrary:getIdmManager` rule. By default, the manager is set to Configurator. The administrator designated as the manager must approve the user request before his account is provisioned.

- The organization attribute. You can set this attribute by customizing the `EndUserRuleLibrary:getOrganization` rule. By default, users are assigned to the top of the organizational hierarchy (“Top”).

If the information provided by the user on the Registration page validates correctly, then Identity Manager presents the user with the second Registration page. Here the user must enter a password and password confirmation. If the Require Privacy Policy attribute is set to yes, then the user must also select an option to accept the terms of the privacy policy.

When the user clicks Register, Identity Manager presents a confirmation page. If the Enable Notifications attribute is set to yes, then the page indicates the user will receive email notification when he account has been created.

The account is created after the standard Create User process (including approvals required by the `idmManager` attribute and policy settings) is complete.

Chapter 4

Roles and Resources

This chapter discusses Identity Manager roles and resources.

The information in this chapter is organized into the following topics:

Understanding and Managing Roles

Read this section for information about setting up roles in Identity Manager. In large organizations, role-based resource assignments greatly simplify resource management.

NOTE Do not confuse *roles* and *admin-roles*. Roles are used to manage end-user access to external resources. Admin-roles, on the other hand, are primarily used to manage administrator access to internal Identity Manager objects such as users, organizations, and capabilities.

The information in this section discusses roles. For information about admin-roles, see "Understanding and Managing Admin Roles" on page 243.

What are Roles?

A role is an Identity Manager object that allows resource access rights to be grouped and efficiently assigned to users. Roles are organized into four role types:

- Business Roles
- IT Roles
- Applications
- Assets

Business Roles organize into groups the access rights that people who do similar tasks in an organization need to do their job duties. Typically, Business Roles represent user job functions. In a financial institution, for example, Business Roles might correspond to job functions like bank teller, loan officer, branch manager, clerk, accountant, or administrative assistant.

IT Roles, *Applications*, and *Assets* organize resource entitlements into groups. In order to provide end-users with access to resources, IT Roles, Applications, and Assets are assigned to Business Roles so that users can access the resources they need to do their jobs. IT Roles contain a specific set of Applications, Assets, and/or Resources, including specific entitlements on those assigned Resources. IT Roles can also contain other IT Roles.

NOTE The concept of role types is new in Identity Manager version 8.0. If your organization upgraded to version 8.0 from an earlier version of Identity Manager, your legacy roles were imported as IT Roles. For more information, see "Managing Roles Created In Versions Prior to Version 8.0" on page 126.

IT Roles, Applications, and Assets can be *required*, *conditional*, or *optional*.

- A required role will always be assigned to the end-user.
- A conditional role has conditions that must evaluate to true in order for the role to be assigned.
- An optional role can be requested separately, and, upon approval, assigned to the end-user.

Required, conditional, and optional roles allow a Business Role designer to define coarse-grained access to contained roles in order to achieve regulatory compliance, while still allowing flexibility for an end-user's manager to fine-tune the end-user's access rights. Users assigned conditional or optional roles can still share the same assigned Business Role, but have different assigned access rights. With this approach, there is no need to define a new Business Role for each permutation of access requirements within an organization (a problem known as *role explosion*).

Putting Role Types to Work

The following discussion describes how to use role types effectively. For role type descriptions, see the previous section.

Managing Roles Created In Versions Prior to Version 8.0

Organizations that upgraded from an earlier version of Identity Manager to version 8.0 will automatically have their legacy roles converted to IT Roles. These IT Roles will remain directly assigned to users. Legacy roles will not be assigned a role owner as part of the upgrade process. A role owner can be assigned later, however. (For information on role owners, see page 139.)

By default, organizations that upgrade to version 8.0 can directly assign both IT Roles and Business Roles to users (see Figure 4-2 on page 129).

Organizations with legacy roles should consider creating new roles based on the guidelines outlined in the next section.

Using Role Types to Design Flexible Roles

IT Roles, Applications, and Assets are the role designer's building blocks. These three role types are used in combination to build up user entitlements (or, *access rights*). IT Roles, Applications, and Assets are then assigned to Business Roles.

Designing Business Roles

In Identity Manager, a user can be assigned one or more roles, or no role. With the introduction of role types in Identity Manager 8.0, it is recommended that you only directly assign Business Roles to users. In fact, by default, you cannot directly assign any of the other role types to users unless your organization had a pre-8.0 version of Identity Manager installed and upgraded to at least version 8.0. This default restriction can be changed by modifying the role configuration object (page 165).

To reduce complexity, Business Roles cannot be nested—that is, one Business Role cannot contain another Business Role. In addition, Business Roles cannot directly contain resources and resource groups. Instead, resources and resource groups should be assigned to either an IT Role or an Application, which can then be assigned to one or more Business Roles.

Designing IT Roles

IT Roles can contain Applications, and Assets, as well as other IT Roles. IT Roles can also contain resources and resource groups.

IT Roles are intended to be created and managed either by your organization's IT staff, or by the resource owners who understand the entitlements that are required to enable specific privileges within the resource.

Designing Applications and Assets

Applications and Assets are role types that are intended to represent commonly used business terms to describe things that end-users need in order to do their jobs. For example, an Application role could be named "Customer Support Tools" or "Intranet HR-Tool Admin."

- Applications cannot contain roles, but they can contain resources and resource groups. Applications can also define specific entitlements that restrict access to only specific applications on contained resources.
- Assets are (typically) non-connected or non-digital resources, such as mobile phones and portable computers, that require manual provisioning. Consequently, assets cannot contain roles, resources, or resource groups.

Applications and Assets are intended to be assigned to Business Roles and IT Roles.

NOTE Role administrators should be assigned one or more of the following capabilities:

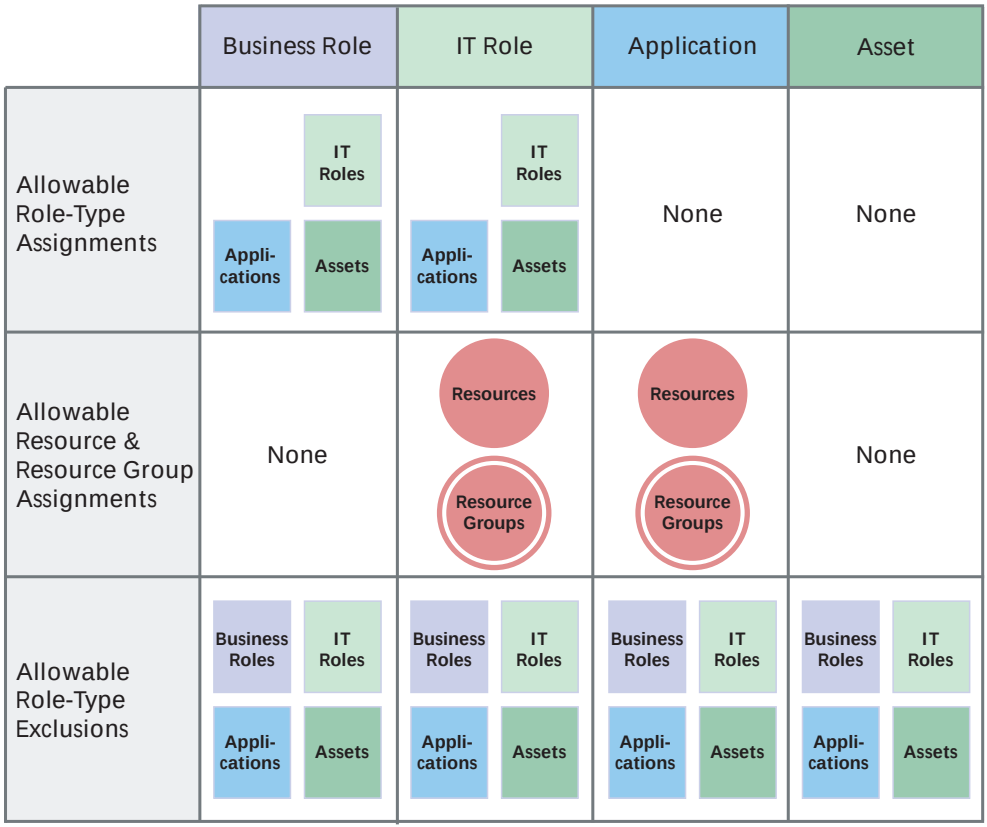
- Asset Administrator
- Application Administrator
- Business Role Administrator
- IT Role Administrator

See "Assigning Capabilities" on page 242 for more information.

Role Types in Summary

Figure 4-1 shows which role-types, resources, and resource-groups can be assigned to each of the four role-types. The figure also shows that role-type exclusions can be assigned to all four role-types. (Role exclusions are described on page 132.)

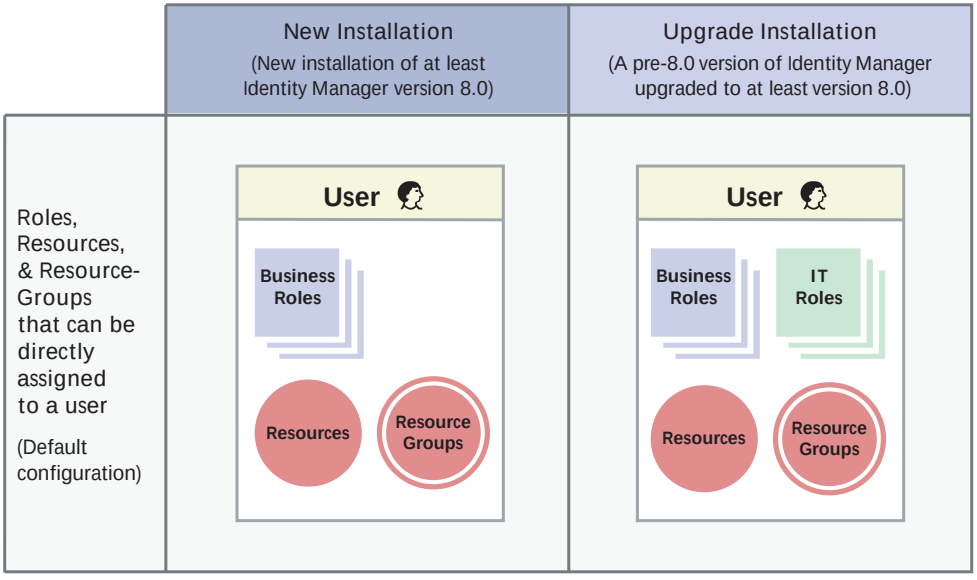
Figure 4-1 The Business Role, IT Role, Application, and Asset role-types.



Optional, conditional, and required contained-roles (page 125) provide added flexibility. Flexible role definitions can reduce the total number of roles your organization needs to manage.

Figure 4-2 shows that Business Roles and IT Roles are directly assignable to users if a pre-8.0 version of Identity Manager is upgraded to at least version 8.0. On upgrade, legacy roles are converted to IT Roles, and, to ensure backwards compatibility, IT Roles are directly assigned to users. If Identity Manager was not upgraded from a pre-8.0 version, then only Business Roles are directly assignable to users.

Figure 4-2 Roles and resources that can be directly assigned to users.



Creating Roles

This section describes how to create roles. For tips on designing roles, see "Using Role Types to Design Flexible Roles" on page 126.

When you create or edit a role, Identity Manager launches the `ManageRole` workflow. This workflow saves the new or updated role in the repository, and allows you to insert approvals or other actions before the role is created or saved.

Completing the Create Role Form

To create a role, follow these steps:

1. In the Administrator interface, click **Roles** in the main menu.

   The Roles page (List Roles tab) opens.

2. Click **New** at the bottom of the page.

   The Create IT Role page opens. To create another type of role, use the **Type** drop-down menu.

3. Complete the form fields on the **Identity** tab.

   Figure 4-3 on page 131 shows the **Identity** tab.

4. Complete the form fields on the **Resources** tab (if applicable). For help filling out the fields on this tab, refer to online help, and also see "Assigning Resources and Resource Groups" on page 132.

   For help setting extended attributes values on roles, see "Editing Assigned Resource Attribute Values" on page 134.

   Figure 4-4 on page 133 shows the **Resources** tab.

5. Complete the form fields on the **Roles** tab (if applicable). For help filling out the fields on this tab, refer to online help, and also see "Assigning Roles and Role Exclusions" on page 137.

   Figure 4-6 on page 138 shows the **Roles** tab.

6. Complete the form fields on the **Security** tab. For help filling out the fields on this tab, refer to online help, and also see "Designating Role Owners and Role Approvers" on page 139 and "Designating Notifications" on page 141.

   Figure 4-7 on page 140 shows the **Security** tab.

7. Click **Save** at the bottom of the page.

Entering a Name and a Description for the Role

Enter a role name and description on the **Identity** tab of the Create Role form. If you are creating a new role, use the **Type** drop-down menu to select the role-type you are creating.

Figure 4-3 shows the Create Role form's **Identity** tab. For help using this form, see online help.

Figure 4-3 The "Identity" portion of the "Create Role" tabbed form.

Assigning Resources and Resource Groups

Resources and Resource Groups can be directly assigned to IT Roles and Application roles using the **Resources** tab of the Create Role form. Resources are described later in this chapter on page 172. Resource Groups are described in the section "Resource Groups" on page 185

- Resources and Resource Groups cannot be directly assigned to Business Roles, because only roles can be assigned to Business Roles.
- Resources and Resource Groups cannot be assigned to Asset roles, because Asset roles are reserved for non-connected or non-digital resources that require manual provisioning.

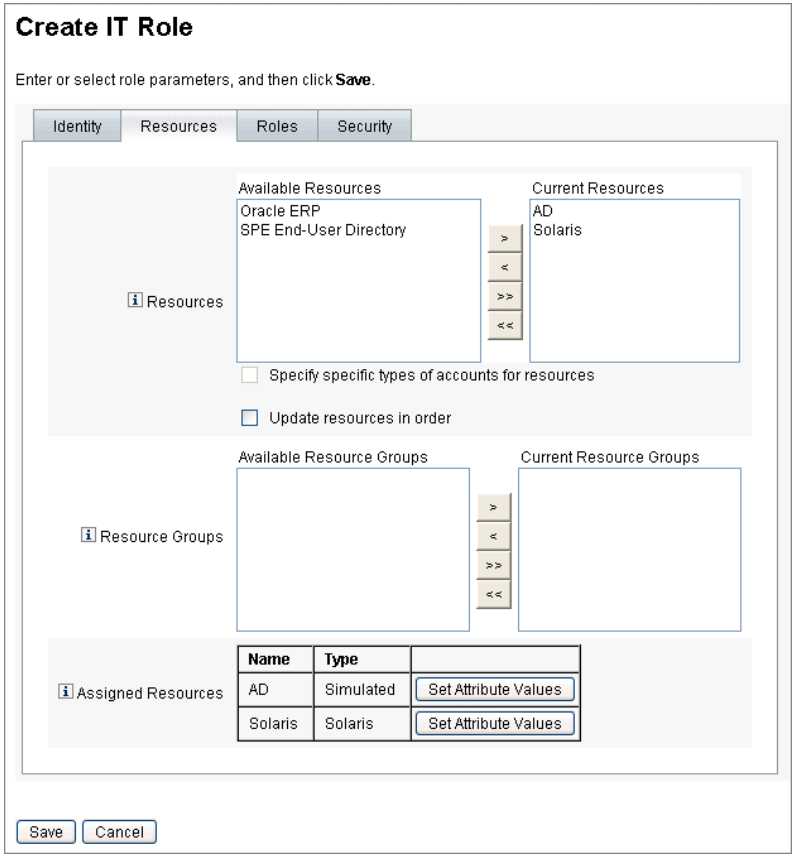
This procedure describes how to assign resources and resource groups to a role when completing the Create Role form. See "Completing the Create Role Form" on page 130 to get started.

To complete the Resources tab, follow these steps:

1. Click the **Resources** tab in the Create Role page.
2. To assign a resource, select it in the **Available Resources** column and move it to the **Current Resources** column by clicking the arrow buttons.
3. If you are assigning multiple resources, you can specify the order in which the resources are updated: Select the **Update resources in order** checkbox and use the + and - buttons to change the order of the resources in the **Current Resources** column.
4. To assign a resource group to this role, select it in the **Available Resource Groups** column and move it to the **Current Resource Groups** column by clicking the arrow buttons. A resource group is a collection of resources that provides another way to specify the order in which resource accounts are created and updated.
5. To specify account attributes for this role on a per resource basis, click **Set Attribute Values** in the **Assigned Resources** section. See "Editing Assigned Resource Attribute Values" on page 134 for more information.
6. Click **Save** to save the role, or click the **Identity**, **Roles**, or **Security** tabs to continue with the role creation process.

Figure 4-4 shows the Create Role form's **Resources** tab.

Figure 4-4 The "Resources" portion of the "Create Role" tabbed form



Editing Assigned Resource Attribute Values

Use the **Assigned Resources** table to set or modify resource attribute values on resources assigned to a role. A resource can have different attribute values defined on a role-by-role basis. Clicking the **Set Attribute Values** button opens the Resource Account Attributes page.

Figure 4-5 on page 136 shows the Resource Account Attributes page.

From this page, you can specify new values for each attribute and determine how attribute values are set. Identity Manager enables you to directly set values or use a rule to set values. It also provides a range of options for overriding existing values or merging values with existing values.

For general information about resource attribute values, see "Working with Account Attributes" on page 183.

Make selections to establish values for each resource account attribute:

- **Value override** — Select one of the following options:
  - **None** — The default selection. No value is established.
  - **Rule** — Uses a rule to set the value. If you select this option, you must select a rule name from the list.
  - **Text** — Uses specified text to set the value. If you select this option, you must enter the text in the adjacent **Text** field.
- **How to set** — Select one of the following options:
  - **Default value** — Makes the rule or text the default attribute value. The user can change or override this value.
  - **Set to value** — Sets the attribute value as specified by the rule or text. The value will be set and override any user changes.
  - **Merge with value** — Merges the current attribute value with the values specified by the rule or text.
  - **Merge with value, clear existing** — Removes the current attribute values; sets the value to a merger of values specified by this and other assigned roles.
  - **Remove from value** — Removes the value specified by the rule or text from the attribute value.

- **Authoritative set to value** — Sets the attribute value as specified by the rule or text. The value will be set and override any user changes. If you remove the role, the new value is null, even if it previously existed on the attribute.
- **Authoritative merge with value** — Merges the current attribute value with the values specified by the rule or text. If you remove the role, the new attribute value is null, even if it previously existed on the attribute.

  For multi-valued attributes, you must edit the role object in the repository to indicate that it holds a comma-separated value (CSV) string—for example:

  ```
  <RoleAttribute name='attrs role:Database Table:attrs' csv='true'>
  ```

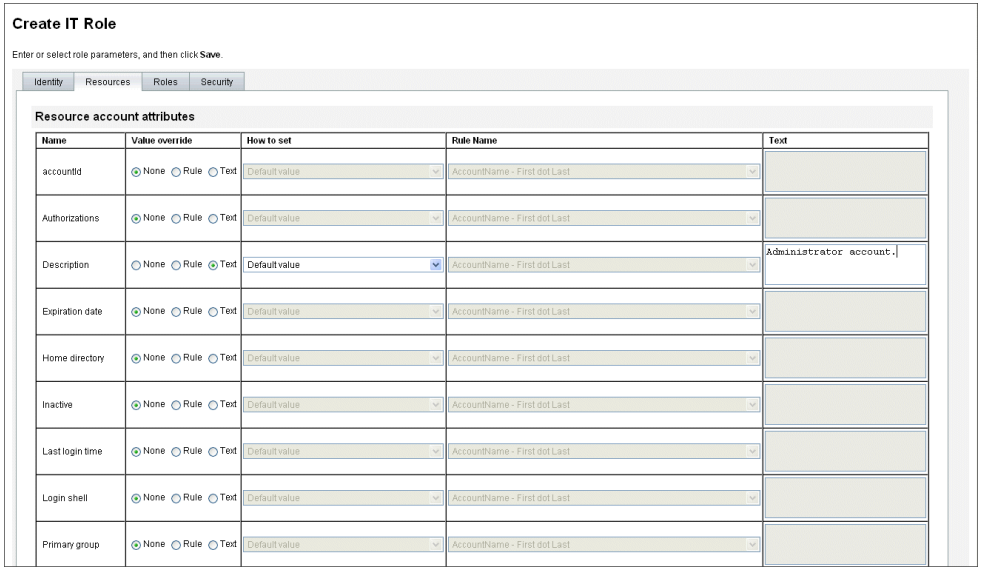
- **Authoritative merge with value, clear existing** — Removes the current attribute values; sets the value to a merger of values specified by this and other assigned roles. Clears the attribute value specified by this role if the role is removed, even if it previously existed on the attribute.

- **Rule Name** — If you select Rule in the Value override area, select a rule from the list.
- **Text** — If you select Text in the Value override area, enter text to be added to, deleted from, or used as the attribute value.

Click **OK** to save your changes and return to the Create or Edit Role page.

Figure 4-5 shows the Resource Account Attributes page, which is used to set extended attribute values on resources assigned to a role.

Figure 4-5 The Resource Account Attributes page.



Assigning Roles and Role Exclusions

Roles can be assigned to Business Roles and IT Roles using the **Roles** tab of the Create Role form. Assigned roles should be added to the **Contained Roles** table.

- Roles cannot be assigned to Application roles and Asset roles.
- Business roles cannot be assigned to any role type.

Role exclusions can be assigned to all four role types using the **Roles** tab of the Create Role form. If a role with a role exclusion is assigned to a user, the excluded role cannot also be assigned to the user. Role exclusions should be added to the **Role Exclusions** table.

This procedure describes how to assign one or more roles to a role when completing the Create Role form. See "Completing the Create Role Form" on page 130 to get started.

To complete the Roles tab, follow these steps:

1. Click the **Roles** tab in the Create Role page.
2. Click **Add** in the **Contained Roles** section.

   The tab refreshes and displays the **Find Roles to Contain** form.
3. Search for the role (or roles) that you will be assigning to this role. Start first with any *required* roles. (You will add conditional and optional roles later.)

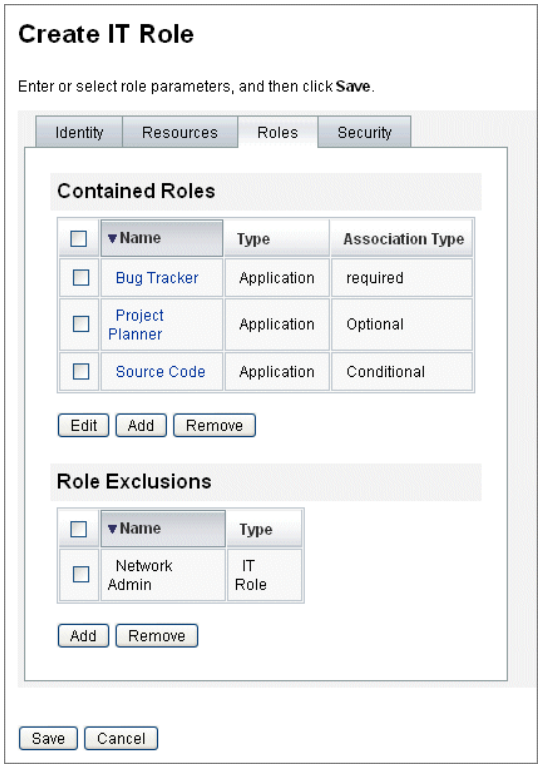
   See page 144 for help using the search form. Business Roles cannot be nested or assigned to other role-types.
4. Use the checkboxes to select the role(s) to be assigned, then click **Add**.

   The tab refreshes and displays the **Add Contained Role** form.
5. Select **Required** (or **Conditional** or **Optional**, as appropriate) from the **Association Type** drop-down menu.

   Click **OK**.
6. Repeat the previous four steps to add conditional roles (if required). Repeat the previous four steps again to add optional roles (if required).
7. Click **Save** to save the role, or click the **Identity**, **Resources**, or **Security** tabs to continue with the role creation process.

Figure 4-6 shows the Create Role form's **Roles** tab. For help using this form, see online help.

Figure 4-6 The "Roles" portion of the "Create Role" tabbed form]



Designating Role Owners and Role Approvers

Roles have designated *owners* and *approvers.* Only role owners can authorize changes to the parameters that define the role, and only role approvers can authorize the assignment of the role to end-users.

To be a role owner is to be the business owner responsible for the underlying resource account rights that are assigned through the role. If an administrator makes changes to a role, a role owner must approve of the changes before they can be carried out. This feature guards against an administrator changing a role without a business owner's knowledge and approval. If change approvals have been disabled in the Role configuration object, however, a role owner's approval is not required in order for changes to be carried out.

In addition to approving role changes, roles cannot be enabled, disabled, or deleted without a role owners' approval.

Owners and approvers can either be directly added to a role, or dynamically added using a role-assignment rule. In Identity Manager it is possible (but not recommended) to create roles without owners and approvers.

NOTE Role-assignment rules have an authType of `RoleUserRule`. If you need to create a custom role-assignment rule, refer to the three default role-assignment rule objects and use them as an example:

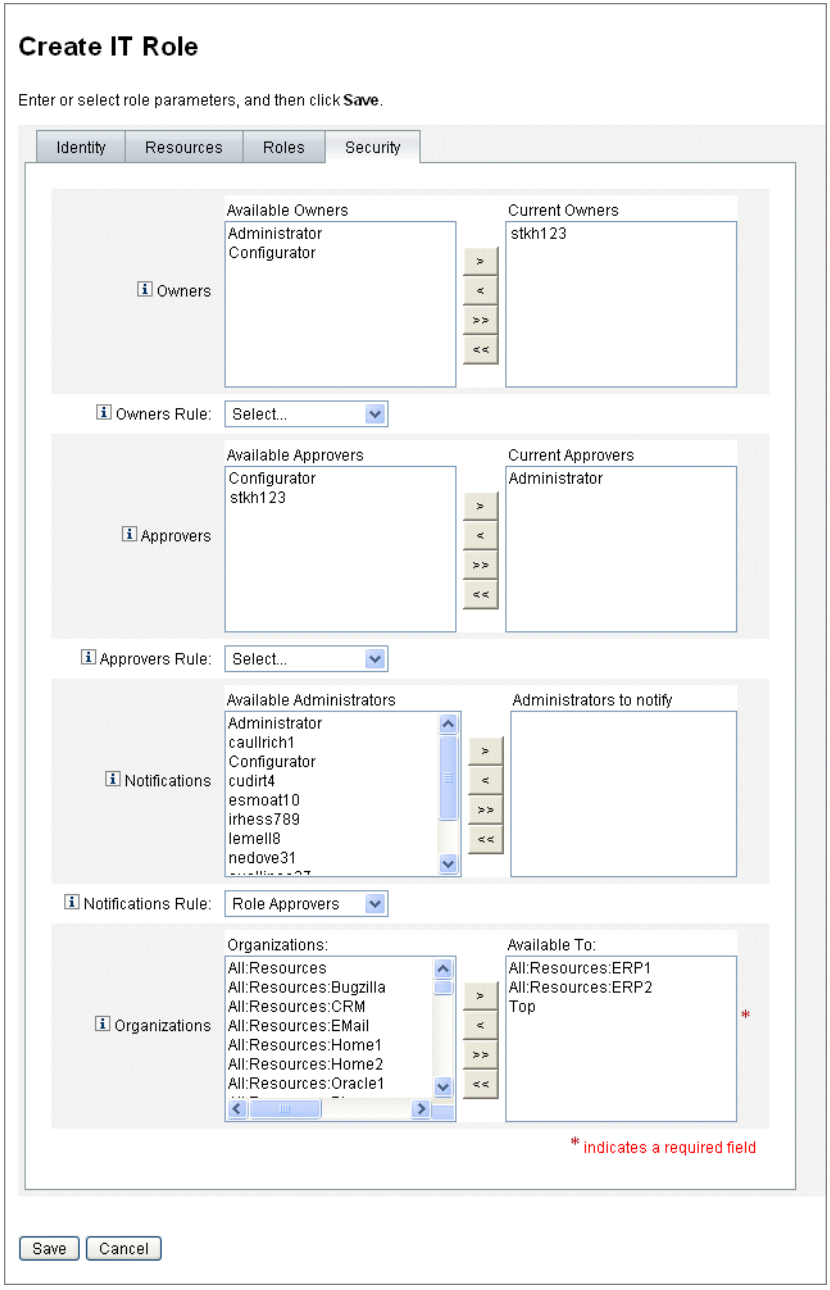
- Role Approvers
- Role Notifications
- Role Owners

Owners and approvers are notified by email if a work item requires their approval. Change-approval work items and approval work items are discussed on page 141 in the "Initiating Change-Approval and Approval Work Items" section.

Owners and approvers are added to roles on the Security tab in the Create Role form.

Figure 4-7 on page 140 shows the Create Role form's **Security** tab. For help using this form, see online help.

Figure 4-7 The "Security" portion of the "Create Role" tabbed form



Designating Notifications

One or more administrators can be sent *notifications* when a role is assigned to a user.

Specifying a notification recipient is optional. You could choose to notify an administrator if you decide not to require an approval when a role is assigned to a user. Or you could designate one administrator to serve as an approver, and, another administrator to serve as a notification recipient when the approval is made.

As with owners and approvers, notifications can either be directly added to a role, or dynamically added using a role-assignment rule. Notification recipients are notified by email when a role is assigned to a user. A work item is not created, however, because an approval is not required.

Notifications are assigned to roles on the Security tab on the Create Role form. Figure 4-7 on page 140 shows the Create Role form's **Security** tab.

Initiating Change-Approval and Approval Work Items

When changes are made to a role, role owners can receive a *change-approval* email, a *change-notification* email, or no email. When a role is assigned to a user, role approvers receive role *approval* emails.

By default, role owners are sent change-approval emails whenever the roles they own are changed. This behavior is configurable, however, on a role-type by role-type basis. For example, you could choose to enable change-approvals for Business Roles and IT Roles, and enable change-notifications for Application and Asset roles.

For instructions on enabling and disabling change-approval and change-notification emails, see "Enabling and Disabling Change-Approval and Change-Notification Work Items" on page 169.

This is how change-approvals and change-notifications work:

- If *change-approvals* are enabled, when an administrator changes a role, a work item is generated and an approval email is sent to the role owner. A role owner must approve the work item in order for the change to be made. Change-approval work items can be delegated. See "Approvals" on page 262 for more information.

  If change-approvals are disabled, no work item is generated and no change approval email is sent to the role owner.

- If *change-notifications* are enabled, when an administrator changes a role, the change is made immediately, and a notification email is sent to the role owner.

If change-notifications are disabled, no notifications are sent to the role owner.

When a role is assigned to a user, role approvers receive role *approval* emails. Role approval emails cannot be disabled in Identity Manager.

This is how role approvals work:

- When a user is assigned a role, a work item is generated and an approval email is sent to the role approver. A role approver must approve the work item in order for the role to be assigned to the user.

Change-approval and approval work items can be delegated. For more information on delegating work items, see "Delegating Work Items" on page 257.

Editing and Managing Roles

Most role editing and role management tasks can be performed using the **Find Roles** and **List Roles** subtabs, which are located under the **Roles** tab in the main menu.

This section contains the following topics:

Searching for Roles

Use the **Find Roles** tab to search for roles that meet the search criteria you specify.

Using the Find Roles tab, you can search for roles based on a wide variety of criteria such as role owners and approvers, assigned account types, contained roles, and so on.

For information on finding users assigned to a role, see page 163.

To open the Find Role tab, follow these steps:

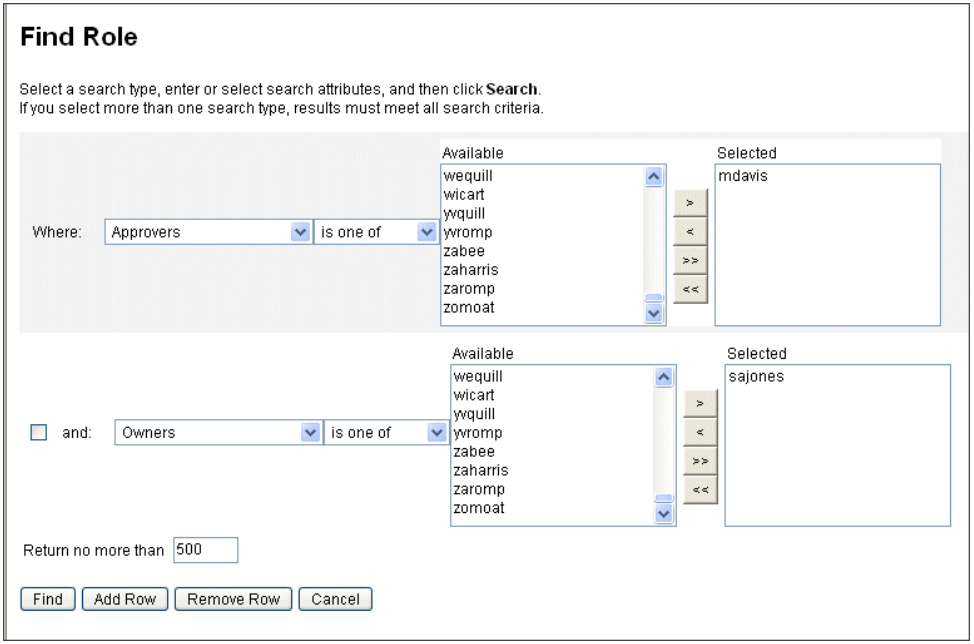
1. In the Administrator interface, click the **Roles** tab.

   The **List Roles** tab opens.

2. Click the **Find Roles** secondary tab.

   Figure 4-8 shows the **Find Role** tab. For help using this form, see online help.

Figure 4-8 The "Find Role" tab



Use the drop-down menus to define the parameters of your search. Click the **Add Row** button to add additional parameters.

Viewing Roles

Use the List Roles tab to view roles. Use the filter fields at the top of the List Roles page to find roles by name or role type. Filtering is not case-sensitive.

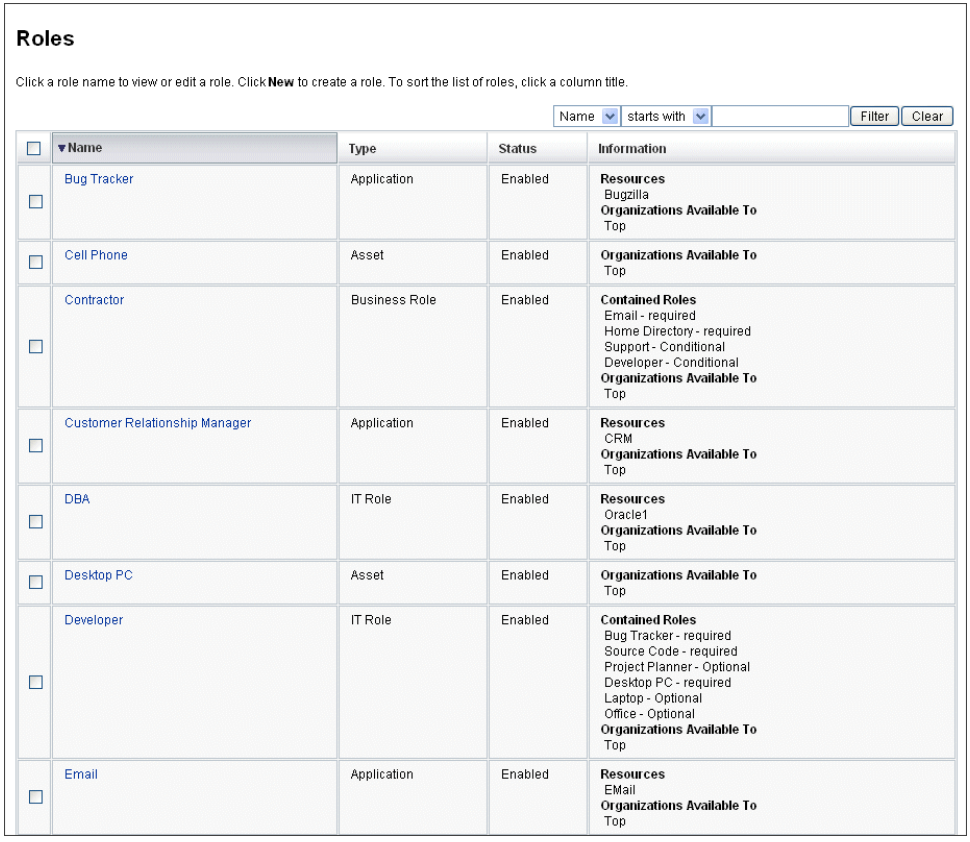
To open the List Roles tab, follow these steps:

1. In the Administrator interface, click the **Roles** tab.

   The **List Roles** tab opens.

Figure 4-9 on page 145 shows the **List Roles** tab. For help using this form, see online help.

Figure 4-9 The "List Roles" tab



Roles

Click a role name to view or edit a role. Click **New** to create a role. To sort the list of roles, click a column title.

Name | starts with | Filter | Clear

Name	Type	Status	Information
Bug Tracker	Application	Enabled	**Resources** Bugzilla **Organizations Available To** Top
Cell Phone	Asset	Enabled	**Organizations Available To** Top
Contractor	Business Role	Enabled	**Contained Roles** Email - required, Home Directory - required, Support - Conditional, Developer - Conditional **Organizations Available To** Top
Customer Relationship Manager	Application	Enabled	**Resources** CRM **Organizations Available To** Top
DBA	IT Role	Enabled	**Resources** Oracle1 **Organizations Available To** Top
Desktop PC	Asset	Enabled	**Organizations Available To** Top
Developer	IT Role	Enabled	**Contained Roles** Bug Tracker - required, Source Code - required, Project Planner - Optional, Desktop PC - required, Laptop - Optional, Office - Optional **Organizations Available To** Top
Email	Application	Enabled	**Resources** EMail **Organizations Available To** Top

Editing Roles

Search for the role you want to edit using the **List Roles** or **Find Roles** tabs. If you make changes to a role, and change approvals are set to true, a role owner must approve your changes before they can be carried out.

For information on updating users with role changes, see "Updating Roles Assigned to Users" on page 158.

To edit a role, follow these steps:

1. Search for the role you want to edit by following the instructions on page 144 or page 145.
2. Click the name of the role you want to edit.

   The Edit Role page opens.
3. Edit the role as needed. Refer to the steps in the "Completing the Create Role Form" section on page 130 for help completing the **Identity**, **Resources**, **Roles**, and **Security** tabs.

   Click **Save**. The Confirm Role Changes page opens.
4. If this role is assigned to users, you can select when to update the users with role changes. See "Updating Roles Assigned to Users" on page 158 for more information.
5. Click **Save** to save your changes.

Cloning Roles

To make a copy of a role, follow these steps:

1. Search for the role you want to edit by following the instructions on page 144 or page 145.
2. Click the name of the role you want to clone.

   The Edit Role page opens.
3. Enter a new name in the **Name** field, and then click **Save**.

   The *Role: Create or Rename?* page opens.
4. Click **Create** to make a copy of the role.

Assigning a Role to a Role

Identity Manager's requirements around role assignments are described in "What are Roles?" on page 124 and "Putting Role Types to Work" on page 126. You should understand this information before assigning roles.

Identity Manager will change a role's role assignments if the role-owner of the parent role approves.

To assign a role to another role, follow these steps:

1. Search for the Business Role or IT Role to which you will be assigning one or more *contained* roles. (Roles can only be assigned to Business Roles and IT Roles.) Use the instructions on page 144 or page 145 to search for roles.
2. Click the Business Role or IT Role to open it.

   The Edit Role page opens.
3. Click the **Roles** tab in the Edit Role page.
4. Click **Add** in the **Contained Roles** section.

   The tab refreshes and displays the **Find Roles to Contain** form.
5. Search for the role (or roles) that you will be assigning to this role. Start first with any *required* roles. (You will add conditional and optional roles later.)

   See page 144 for help using the search form. Business Roles cannot be nested or assigned to other role-types.
6. Use the checkboxes to select the role(s) to be assigned, then click **Add**.

   The tab refreshes and displays the **Add Contained Role** form.
7. Select **Required** (or **Conditional** or **Optional**, as appropriate) from the **Association Type** drop-down menu.

   Click **OK**.
8. Repeat the previous four steps to add conditional roles (if required). Repeat the previous four steps again to add optional roles (if required).
9. Click **Save** to open the Confirm Role Changes page.

   The Confirm Role Changes page opens.
10. In the **Update Assigned Users** section select an **Update Assigned Users** menu option. See "Updating Roles Assigned to Users" on page 158 for more information.
11. Click **Save** to save your role assignments

Removing a Role From a Role

Identity Manager will remove a contained role from another role if the role-owner of the parent role approves. The removed role will be removed from users when users receive role updates. (See "Updating Roles Assigned to Users" on page 158 for more information.) When the role is removed, users lose the entitlements that were bestowed by the role.

- For information on removing a role assigned to one or more users, see "Removing Roles Assigned to Users" on page 164.
- For information on disabling a role, see "Enabling and Disabling Roles" on page 149.
- For information on deleting a role from Identity Manager, see "Deleting Roles" on page 150.

To remove a role assigned to another role, follow these steps:

1. Search for the Business Role or IT Role from which you want to remove a role. Use the instructions on page 144 or page 145 to search for roles.
2. Click the role to open it.

   The Edit Role page opens.
3. Click the **Roles** tab in the Edit Role page.
4. In the **Contained Roles** section, select the checkbox next to the role that you want to remove, then click **Remove**. Select multiple checkboxes to remove multiple roles.

   The table updates to show the remaining contained roles.
5. Click **Save**.

   The Confirm Role Changes page opens.
6. In the **Update Assigned Users** section select an **Update Assigned Users** menu option. See "Updating Roles Assigned to Users" on page 158 for more information.
7. Click **Save** to finalize your changes.

Enabling and Disabling Roles

Roles can be enabled and disabled on the **List Roles** tab. Role status is displayed in the **Status** column. Click the **Status** column header to sort the table by role status.

Roles that are disabled do not appear on the **Roles** tab in the Create/Edit user form and cannot be directly assigned to users. Roles that contain disabled roles can be assigned to users, but the disabled roles cannot be assigned.

Users who are assigned roles that are later disabled do not lose their entitlements. Role disablement only blocks *future role assignments* from occurring.

Disabling and re-enabling a role requires the permission of the role owner.

Upon enabling or disabling a role with assigned users, Identity Manager will prompt you to update these users. For more information, see "Updating Roles Assigned to Users" on page 158.

To enable/disable roles, follow these steps:

1. Search for the role you want to delete by following the instructions on page 144 or page 145.
2. Click the checkboxes next to the roles that need to be enabled or disabled.
3. Click **Enable** or **Disable** at the bottom of the Roles table.

   The **Enable Role** or **Disable Role** confirmation page opens.
4. Click **OK** to enable or disable the role.

Deleting Roles

This section describes the procedure for deleting a role from Identity Manager.

- For information on removing a role assigned to another role, see "Removing a Role From a Role" on page 148.
- For information on removing a role assigned to one or more users, see "Removing Roles Assigned to Users" on page 164.

If you delete a role that is currently assigned to a user, Identity Manager blocks the deletion when you try to save the role. You must unassign (or reassign) all users assigned to a role before Identity Manager can delete it. You also must remove the role from any other roles.

Identity Manager requires a role owner's approval before it will delete a role.

To delete a role, follow these steps:

1. Search for the role you want to delete by following the instructions on page 144 or page 145.
2. Select the checkbox next to each role that you want to delete.
3. Click **Delete**.

   The Delete Role confirmation page displays.
4. Click **OK** to delete the role(s).

Assigning a Resource or Resource Group to a Role

Identity Manager's requirements around resource and resource group assignments are described in "What are Roles?" on page 124 and "Putting Role Types to Work" on page 126. You should understand this information before assigning resources to roles.

Identity Manager will change a role's resource and resource group assignments if the role-owner approves.

To assign a resource to a role, follow these steps:

1. Search for the IT Role or Application to which you want to add a resource or resource group. For instructions on how to search for a role, see page 144 or page 145.
2. Click the role to open it.
3. Click the **Resources** tab in the Edit Role page.
4. To assign a resource, select it in the **Available Resources** column and move it to the **Current Resources** column by clicking the arrow buttons.
5. If you are assigning multiple resources, you can specify the order in which the resources are updated: Select the **Update resources in order** checkbox and use the + and - buttons to change the order of the resources in the **Current Resources** column.
6. To assign a resource group to this role, select it in the **Available Resource Groups** column and move it to the **Current Resource Groups** column by clicking the arrow buttons. A resource group is a collection of resources that provides another way to specify the order in which resource accounts are created and updated.
7. To specify account attributes for this role on a per resource basis, click **Set Attribute Values** in the **Assigned Resources** section. See "Editing Assigned Resource Attribute Values" on page 134 for more information.
8. Click **Save** to open the Confirm Role Changes page.

   The Confirm Role Changes page opens.
9. In the **Update Assigned Users** section select an **Update Assigned Users** menu option. See "Updating Roles Assigned to Users" on page 158 for more information.
10. Click **Save** to save your resource assignments.

Removing a Resource or Resource Group from a Role

Identity Manager will remove a resource or resource group from a role if the role-owner approves. The removed resource will be removed from users when users receive role updates. (See "Updating Roles Assigned to Users" on page 158 for more information.) When the resource is removed, users lose their entitlements on that resource unless the resource is also directly assigned to the user.

To remove a resource or resource group assigned to a role, follow these steps:

1. Search for the IT Role or Application from which you want to remove a resource or resource group. Use the instructions on page 144 or page 145 to search for roles.
2. Click the role to open it.

   The Edit Role page opens.
3. Click the **Resources** tab in the Edit Role page.
4. To remove a resource, select it in the **Current Resources** column and move it to the **Available Resources** column by clicking the arrow buttons.

   To remove a resource group, select it in the **Current Resource Groups** column and move it to the **Available Resource Groups** column by clicking the arrow buttons.
5. Click **Save**.

   The Confirm Role Changes page opens.
6. In the **Update Assigned Users** section select an **Update Assigned Users** menu option. See "Updating Roles Assigned to Users" on page 158 for more information.
7. Click **Save** to finalize your changes.

Managing User Role Assignments

Roles are assigned to users in the Accounts area of Identity Manager.

This section contains the following topics:

Assigning Roles to Users

Use the following procedure to assign one or more roles to a user (or users).

End-users can also make role assignment requests for themselves. (Only optional roles where the parent role is already assigned to the user can be requested.) See "Requests" on page 55 in the "Identity Manager End-User Interface " section for information on how end-users can request available roles.

To assign one or more roles to a user, follow these steps:

1. In the Administrator interface, click the **Accounts** tab.

   The **List Accounts** subtab opens.

2. To assign a role to an existing user, follow these steps:

   a. Click the user's name in the User List.

   b. Click the **Roles** tab.

   c. Click **Add** to add one or more roles to the user account.

      By default, only Business Roles can be directly assigned to users. (If your installation of Identity Manager was upgraded from a pre-8.0 version, both Business Roles and IT Roles can be directly assigned to users.)

   d. In the table of roles, select the role(s) you want to assign to the user and then click **OK**.

      To sort the table alphabetically by **Name**, **Type**, or **Description**, click the column headers. Click a second time to reverse sort. To filter the list by role type, make a selection from the **Current** drop-down menu.

      The table updates to show the selected role assignment(s), plus any required role assignments that are connected to the parent role assignment(s).

   e. Click **Add** to view optional role assignments that can also be assigned to the user.

      Select the optional role(s) to be assigned to the user and click **OK**.

f. (Optional) In the **Activate On** column, select the date that the role should become active. If you do not specify a date, the role assignment will become active as soon as a designated role approver approves the role assignment.

To make the role assignment temporary, select the date that the role should become inactive in the **Deactivate On** column. Role deactivation takes effect at the beginning of the selected day.

See "Activating and Deactivating Roles on Specific Dates" on page 156 for more information.

g. Click **Save**.

Activating and Deactivating Roles on Specific Dates

When assigning a role to a user, you can specify an activate date and a deactivate date. Role-assignment work-item requests are created when the assignment is made. If a role assignment is not approved by the scheduled activation date, however, the role is not assigned. Role activations and deactivations take place a little after midnight (12:01 AM) on the date scheduled.

By default, only Business Roles can have activate dates and deactivate dates. All other role-types inherit the activate date and deactivate date of the Business Role that is directly assigned to the user. Identity Manager can be configured to allow other role types to have directly assignable activate and deactivate dates. For instructions, see page 167.

Scheduling the Deferred Task Scanner Task

The Deferred Task Scanner scans user role assignments and activates and deactivates roles as needed. By default, the Deferred Task Scanner task runs every hour.

To edit the schedule for the Deferred Task Scanner, follow these steps:

1. In the Administrator interface, click **Server Tasks**.
2. Click **Manage Schedule** in the secondary menu.
3. In the **Tasks Available For Scheduling** section, click on the **Deferred Task Scanner** TaskDefinition.

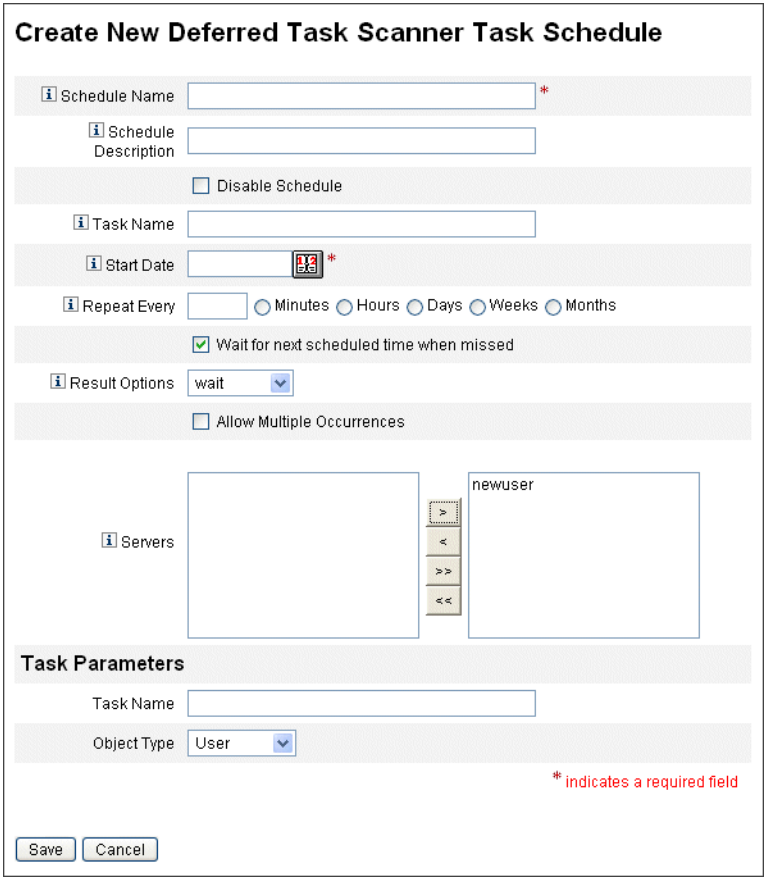
   The "Create New Deferred Task Scanner Task Schedule" page opens.
4. Complete the form. For help, refer to the i-Helps and online help.

   To specify a date and time when the task should run, in **Start Date** use the format `mm/dd/yyyy hh:mm:ss`. For example, to schedule a task to start running at 7:00 P.M. on September 29, 2008, type `09/29/2008 19:00:00`.

   In the **Result Options** drop-down menu, select **rename**. If you select **wait**, future instances of this task will not run until you remove the previous results. See online help for more information on the various **Result Options** settings.
5. Click **Save** to save the task.

Figure 4-10 shows the scheduled task form for the Deferred Task Scanner task.

Figure 4-10 The Deferred Task Scanner scheduled task form.



Updating Roles Assigned to Users

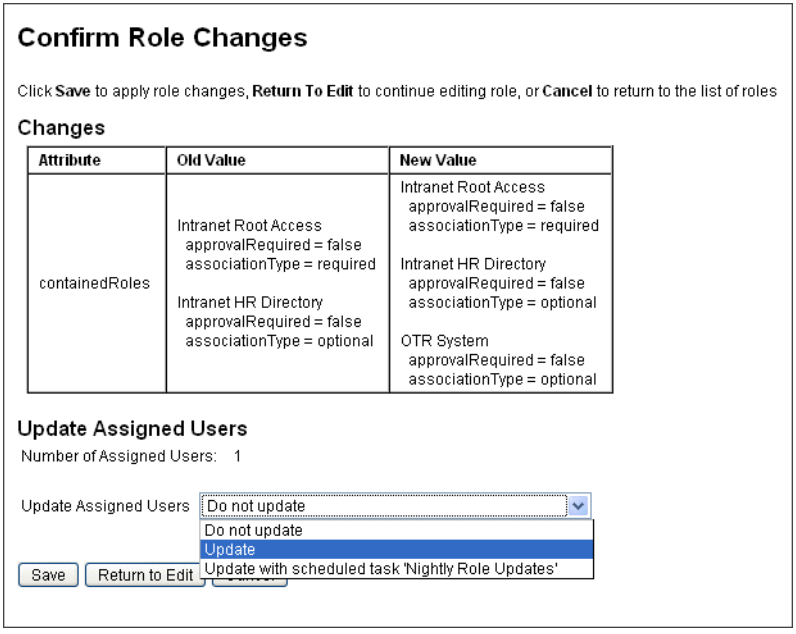
When editing roles assigned to users you can choose to update users with the new role changes immediately, or defer the update to run during a scheduled maintenance window.

Upon making changes to a role, the Confirm Role Changes page opens. The Confirm Roles Changes page is shown in Figure 4-11 on page 159.

- The **Update Assigned Users** section of this page displays the number of users who currently have the role assigned.
- Use the **Update Assigned Users** menu to select whether to immediately update users with the new role changes (**Update**), to defer updating users until a later time (**Do not update**), or to select a custom scheduled update task.
    - Because **Update** updates users immediately, you should avoid choosing this option if a large number of users will be affected. Updating users can be time and resource-intensive. If many users need to be updated, it is preferable to schedule the update for off-peak hours.
    - When **Do not update** is selected for a role, users assigned to the role will not receive role updates until an administrator views the user's user profile or until the user is updated by the Update Role Users task. For information on scheduling the Update Role Users task, see the next section.
    - If you have created an Update Role Users task schedule, you can select it from the menu. The selected Update Role Users task will update users assigned to the role according to the schedule defined for the task. See the next section for more information.

Figure 4-11 shows the Confirm Role Changes page. The **Update Assigned Users** section displays the number of users who currently have this role assigned. The **Update Assigned Users** drop-down menu has two default options: **Do not update** and **Update**. You can also select from a list of scheduled Update Role Users tasks. For instructions on creating scheduled Update Role Users tasks, see "Scheduling the Update Role Users Task" on page 161.

Figure 4-11 The Confirm Role Changes page.



Manually Updating Assigned Users

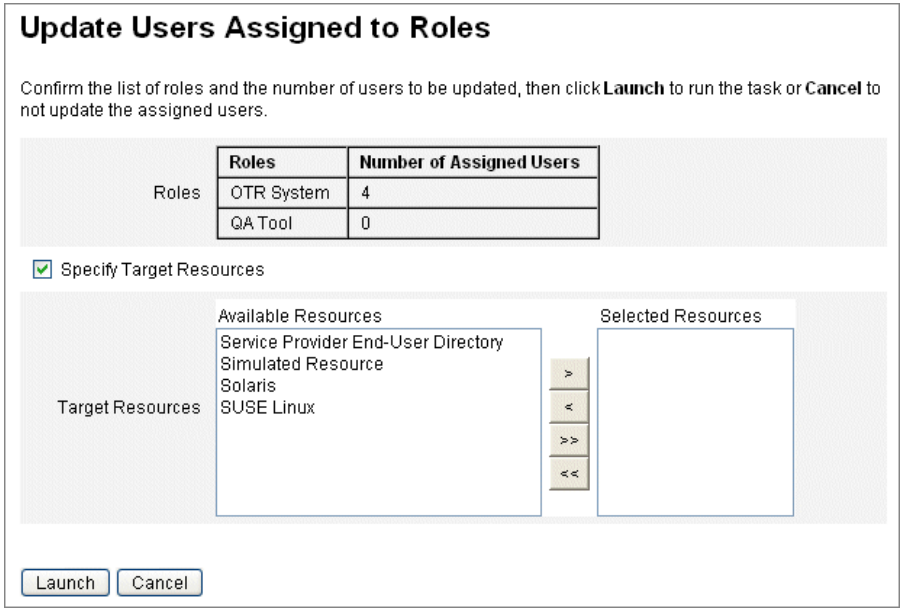
You can update users assigned to roles by selecting one or more roles and clicking the **Update Assigned Users** button. This procedure runs an instance of the Update Role Users Task for the roles specified.

To start updating users assigned to roles, follow these steps:

1. Search for the role (or roles) whose assigned users should be updated by following the instructions on page 144 or page 145.
2. Select the role (or roles) using the checkboxes.
3. Click **Update Assigned Users**.

   The Update Users Assigned to Roles page (Figure 4-12) displays.
4. Click **Launch** to start the update.
5. Check the status of the Update Role Users task by clicking **Server Tasks** in the main menu, then click **All Tasks** in the secondary menu.

Figure 4-12 The Update Users Assigned to Roles page



Scheduling the Update Role Users Task

It is recommended that an Update Role Users task be scheduled to run on a regular basis.

To update users with outstanding role changes, schedule the Update Role Users task using the following steps:

1. In the Administrator interface, click **Server Tasks**.
2. Click **Manage Schedule** in the secondary menu.
3. In the **Tasks Available For Scheduling** section, click on the **Update Role Users** TaskDefinition.

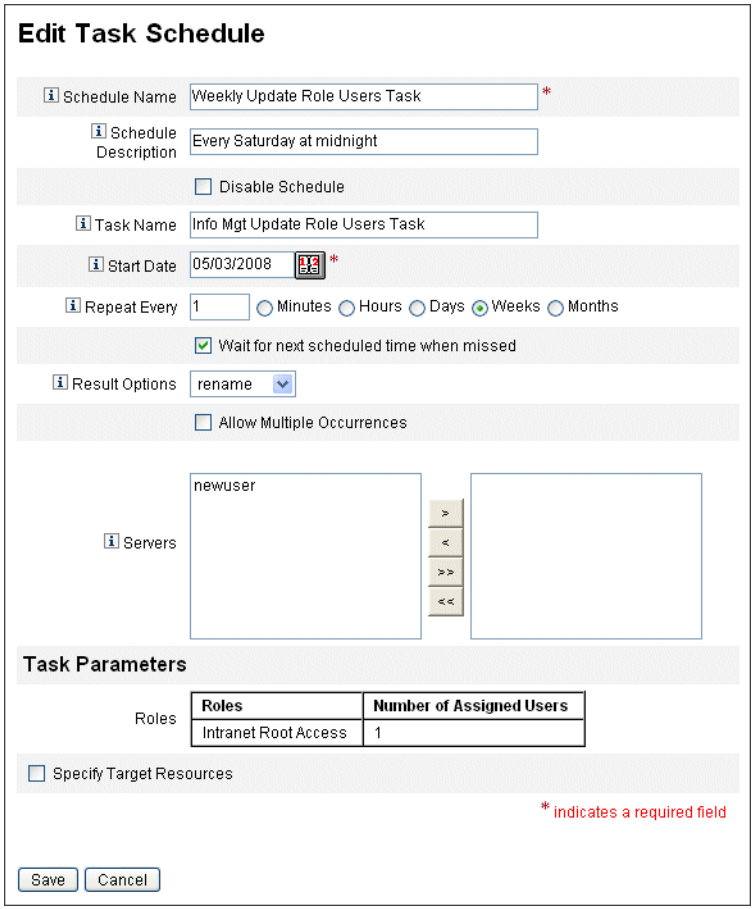
   The "Create New Update Role Users Task Schedule" page opens, or, if you are editing an existing task, the "Edit Task Schedule" page opens (Figure 4-13 on page 162).
4. Complete the form. For help, refer to the i-Helps and online help.

   To specify a date and time when the task should run, in **Start Date** use the format `mm/dd/yyyy hh:mm:ss`. For example, to schedule a task to start running at 7:00 P.M. on September 29, 2008, type `09/29/2008 19:00:00`.

   In the **Result Options** drop-down menu, select **rename**. If you select **wait**, future instances of this task will not run until you remove the previous results. See online help for more information on the various **Result Options** settings.
5. Click **Save** to save the task.

Figure 4-13 shows the scheduled task form for the Update Role Users task. Specific roles can be assigned to specific Update Role Users tasks (as shown in the **Task Parameters** section.) See "Updating Roles Assigned to Users" on page 158 for more information.

Figure 4-13 The Update Role Users scheduled task form.



Finding Users Assigned to a Role

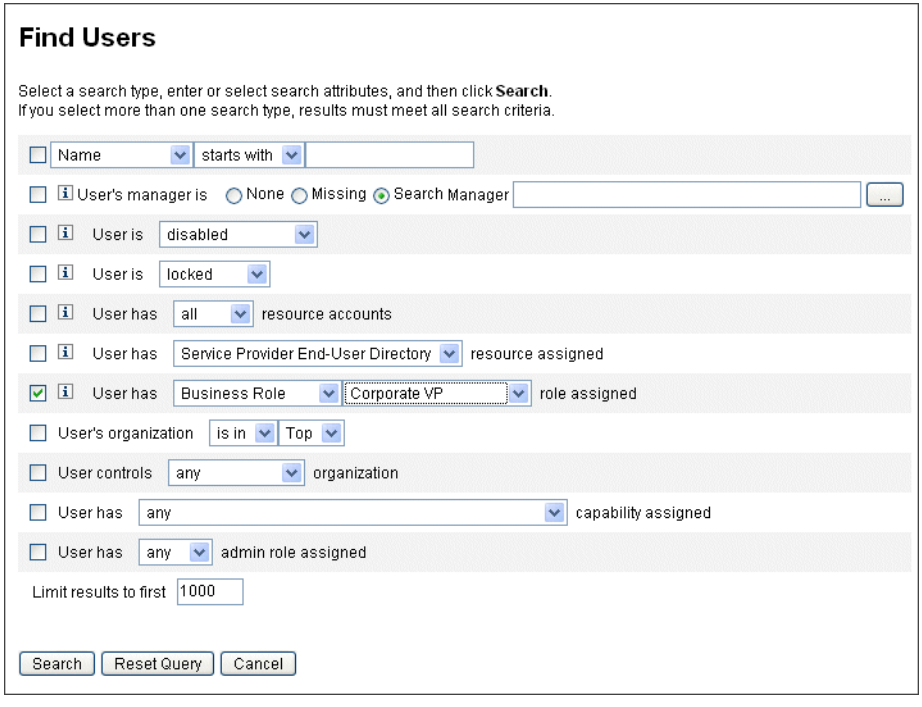
You can search for users who have a specific role assigned.

To find users with a specific role assigned, follow these steps:

1. In the Administrator interface, click **Accounts**.
2. Click **Find Users** in the secondary menu. The Find Users page opens.
3. Locate the search type **User has [Select Role Type...] role assigned**.
4. Select the option box and use the **Select Role Type...** drop-down menu to filter the list of available roles.

   A second role menu opens.
5. Select a role.
6. Clear the other search-type checkboxes, unless you want to narrow your search further.
7. Click **Search**.

Figure 4-14 Searching for users assigned a role using the Find Users page



Removing Roles Assigned to Users

Using the Edit User page, one or more roles can be removed from a user account. Only a directly assigned role can be removed. Indirectly assigned roles (that is, conditional and/or required *contained roles*) are removed when the parent role is removed. Another way for an indirectly assigned role to be removed from a user is if the role is removed from the parent role (see "Removing a Role From a Role" on page 148).

End-users can also request that assigned roles be removed from their user accounts. See "Requests" on page 55 in the "Identity Manager End-User Interface " section.

For information on removing a role using a scheduled deactivation date, see "Activating and Deactivating Roles on Specific Dates" on page 156.

To remove one or more roles from a user, follow these steps:

1. In the Administrator interface, click the **Accounts** tab.

   The **List Accounts** subtab opens.

2. Click the user from which you want to remove a rule (or rules).

   The Edit User page opens.

3. Click the **Roles** tab.

4. In the table of roles, select the role(s) you want to remove from the user and then click **OK**.

   To sort the table alphabetically by **Name**, **Type**, **Activate On**, **Deactivate On**, **Assigned By**, or **Status**, click the column headers. Click a second time to reverse sort. To filter the list by role type, make a selection from the **Current** drop-down menu.

   The table shows the parent role assignment(s) (those roles that can be selected), plus any role assignments that are connected to the parent role assignment(s) (those roles that cannot be selected).

5. Click **Remove**.

   The table of assigned roles updates to show the remaining assigned roles.

6. Click **Save**.

   The Update Resource Accounts page opens. Deselect any resource accounts that you do not want removed.

7. Click **Save** to save your changes.

Configuring Role Types

Role Type functionality can be modified by editing the Role configuration object.

Configuring Role Types to be Directly Assignable to Users

By default, only certain role types can be directly assigned to users. To change these settings, use the following steps.

NOTE It is a recommended best practice that you only directly assign Business Roles to users. See "Using Role Types to Design Flexible Roles" on page 126 for more information.

To change which role types can be directly assigned to users, follow these steps:

1. Open the Role configuration object for editing using the steps in "Editing Identity Manager Configuration Objects" on page 214.
2. Locate the role object that corresponds to the role type that you wish to edit.
   - To edit the IT Role, locate `Object name='ITRole'`
   - To edit the Application Role, locate `Object name='ApplicationRole'`
   - To edit the Asset Role, locate `Object name='AssetRole'`
3. Depending on how you want to update your configuration, pick the appropriate set of instructions:
   - To modify a role type so that it can be directly assigned to a user, locate the following `userAssignment` attribute inside the role object:

     ```
     <Attribute name='userAssignment'>
         <Object/>
     </Attribute>
     ```

     And replace it with the following:

     ```
     <Attribute name='userAssignment'>
         <Object>
             <Attribute name='manual' value='true'/>
         </Object>
     </Attribute>
     ```

- To modify a role type so that it cannot be directly assigned to a user, locate the `userAssignment` attribute inside the role object and delete the `manual` attribute as follows:

```
<Attribute name='userAssignment'>
    <Object>
    </Object>
</Attribute>
```

4. Save the Role configuration object. You do not need to restart your application server(s) in order for the changes to take effect.

Enabling Role Types for Assignable Activation Dates and Deactivation Dates

By default, only Business Roles can have activate dates and deactivate dates that can be specified when roles are assigned. All other roles will inherit the activate date /deactivate date of the Business Role that is directly assigned to the user.

NOTE It is a recommended best practice that you only directly assign Business Roles to users. See "Using Role Types to Design Flexible Roles" on page 126 for more information.

If you opt to allow another role type to be directly assignable to users (for example, the IT Role type), you may also want to be able to assign activate and deactivate dates for that role type.

To change which role types can have assignable activate dates and deactivate dates, follow these steps:

1. Open the Role configuration object for editing using the steps in "Editing Identity Manager Configuration Objects" on page 214.
2. Locate the role object that corresponds to the role type that you wish to edit.
   - To edit the Business Role, locate `Object name='BusinessRole'`
   - To edit the IT Role, locate `Object name='ITRole'`
   - To edit the Application Role, locate `Object name='ApplicationRole'`
   - To edit the Asset Role, locate `Object name='AssetRole'`

3. Depending on how you want to update your configuration, pick the appropriate set of instructions:

   - To modify a role type so that it can have directly assignable activate dates and deactivate dates, locate the following `userAssignment` attribute inside the role object:

     ```
     <Attribute name='userAssignment'>
         <Attribute name='manual' value='true'/>
     </Attribute>
     ```

     And replace it with the following:

     ```
     <Attribute name='userAssignment'>
         <Object>
             <Attribute name='activateDate' value='true'/>
             <Attribute name='deactivateDate' value='true'/>
             <Attribute name='manual' value='true'/>
         </Object>
     </Attribute>
     ```

   - To modify a role type so that it cannot have directly assignable activate dates and deactivate dates, locate the `userAssignment` attribute inside the role object and delete the `activateDate` and `deactivateDate` attributes as follows:

     ```
     <Attribute name='userAssignment'>
         <Object>
         </Object>
     </Attribute>
     ```

4. Save the Role configuration object. You do not need to restart your application server(s) in order for the changes to take effect.

Enabling and Disabling Change-Approval and Change-Notification Work Items

By default, change-approval work items are enabled for all role types. This means that every time a role is changed (whether it is a Business Role, an IT Role, an Application, or an Asset), if the role has an owner, the owner must approve the change in order for the change to be made.

For more information on change-approval and change-notification work items, see "Initiating Change-Approval and Approval Work Items" on page 141.

To enable or disable change-approval and change-notification work items for role types, follow these steps:

1. Open the Role configuration object for editing using the steps in "Editing Identity Manager Configuration Objects" on page 214.
2. Locate the role object that corresponds to the role type that you wish to edit.
   - To edit the Business Role, locate `Object name='BusinessRole'`
   - To edit the IT Role, locate `Object name='ITRole'`
   - To edit the Application Role, locate `Object name='ApplicationRole'`
   - To edit the Asset Role, locate `Object name='AssetRole'`
3. Locate the following attributes located in the `<Object>` element, which is located in the `<Attribute name='features'>` element:

   ```
   <Attribute name='changeApproval' value='true'/>
   <Attribute name='changeNotification' value='true'/>
   ```

4. Set the attribute values to true or false as needed.
5. If necessary, repeat steps 2 - 4 to configure another role type.
6. Save the Role configuration object. You do not need to restart your application server(s) in order for the changes to take effect.

Configuring the Maximum Number of Rows that the Role List Page will Load

The "List Roles" page in the Administrator interface can display a configurable maximum number of rows. The default number is 500. Use the steps in the section to change the number.

To change the maximum number of rows that the "List Roles" page can display, follow these steps:

1. Open the Role configuration object for editing using the steps in "Editing Identity Manager Configuration Objects" on page 214.
2. Locate the following attribute and change the value:

   ```
   <Attribute name='roleListMaxRows' value='500'/>
   ```

3. Save the Role configuration object. You do not need to restart your application server(s) in order for the changes to take effect.

Synchronizing Identity Manager Roles and Resource Roles

You can synchronize Identity Manager roles with roles created natively on a resource. When synchronized, the resource is assigned, by default, to the role. This applies to roles that are created with the synchronization task, as well as existing Identity Manager roles that match one of the resource role names.

To synchronize an Identity Manager role with a Resource role, follow these steps:

1. In the Administrator interface, click **Server Tasks** in the main menu.
2. Click **Run Tasks**. The Available Tasks page opens.
3. Click the **Synchronize Identity System Roles with Resource Roles** task.
4. Complete the form. Click **Help** for more information.
5. Click **Launch**.

Understanding and Managing Resources

Read this section for information and procedures to help you set up Identity Manager resources.

What are Resources?

Identity Manager resources store information about how to connect to a resource or system on which accounts are created. Identity Manager resources define the relevant attributes about a resource and help specify how resource information is displayed in Identity Manager.

Identity Manager provides resources for a wide range of resource types, including:

- Mainframe security managers
- Databases
- Directory services
- Operating systems
- Enterprise Resource Planning (ERP) systems
- Messaging platforms

The Resources Area in the Interface

Identity Manager displays information about existing resources on the Resources page.

To access resources, select **Resources** on the menu bar.

Resources in the resource list are grouped by type. Each resource type is represented by a folder icon. To see currently defined resources, click the indicator next to the folder. Collapse the view by clicking the indicator again.

When you expand a resource type folder, it dynamically updates and displays the number of resource objects it contains (if it is a resource type that supports groups).

Some resources have additional objects you can manage, including the following:

-  Organizations
-  Organizational units
-  Groups
-  Roles

Select an object from the resources list, and then make selections from one of these options lists to initiate a management task:

- **Resource Actions** — Perform a range of actions on resources, including edit, active synchronization, rename, and delete; as well as work with resource objects and manage resource connection.
- **Resource Object Actions** — Edit, create, delete, rename, save as, and find resource objects.
- **Resource Type Actions** — Edit resource policies, work with the account index, and configure managed resources.

When you create or edit a resource, Identity Manager launches the `ManageResource` workflow. This workflow saves the new or updated resource in the repository, and allows you to insert approvals or other actions before the resource is created or saved.

Managing the Resources List

Before you can create a new resource, you have to tell Identity Manager which resource types you want to be able to manage. To enable resources and create custom resources, use the "Configure Managed Resources" page.

Opening the Configure Managed Resources Page

To open the "Configure Managed Resources" page, follow these steps:

1. Log in to the Administrator interface and click the **Resources** tab.
2. Locate the **Resource Type Actions** drop-down list and select **Configure Managed Resources**.

   The Configure Managed Resources page opens.

The Configure Managed Resources page has two sections:

- **Resources** — This section lists resource types that are commonly found in large enterprise environments. The version of the Identity Manager adapter that connects to the resource is listed in the **Version** column.
- **Custom resources** — This section is used to add custom resources to the Resources list.

Enabling Resource Types

Enable a resource type from the Configure Managed Resources page.

To enable a resource type, do the following:

1. The Configure Managed Resources page should be open. If not, open it (page 174).
2. In the **Resources** section, select the box in the **Managed?** column for the resource type that you want to enable.

   To enable all of the listed resource types, select **Manage all resources**.
3. Click **Save** at the bottom of the page.

   The resource is added to the Resources list.

Adding a Custom Resource

Add a custom resource from the Configure Managed Resources page.

To add a custom resource, do the following:

1. The Configure Managed Resources page should be open. If not, open it (page 174).
2. In the **Custom Resources** section, click **Add Custom Resource** to add a row to the table.
3. Enter the resource class path for the resource, or enter your custom-developed resource. For adapters provided with Identity Manager, see the *Identity Manager Resources Reference* for the full class path.
4. Click **Save** to add the resource to the Resources list.

Creating Resources

Once a resource type is enabled, you can then create an instance of that resource in Identity Manager. To create a resource, use the *Resource Wizard*. The Resource Wizard will guide you in setting up the following items:

- **Resource-specific parameters** — You can modify these values from the Identity Manager interface when creating a specific instance of this resource type.
- **Account attributes** — Defined in the schema map for the resource. These determine how Identity Manager user attributes map to attributes on the resource.
- **Account DN or identity template** — Includes account name syntax for users, which is especially important for hierarchical namespaces.
- **Identity Manager parameters for the resource** — Sets up policies, establishes resource approvers, and sets up organization access to the resource.

Creating a Resource with the Resource Wizard

The Resource Wizard guides you through the process of configuring the Identity Manager resource adapter that will manage objects on the resource.

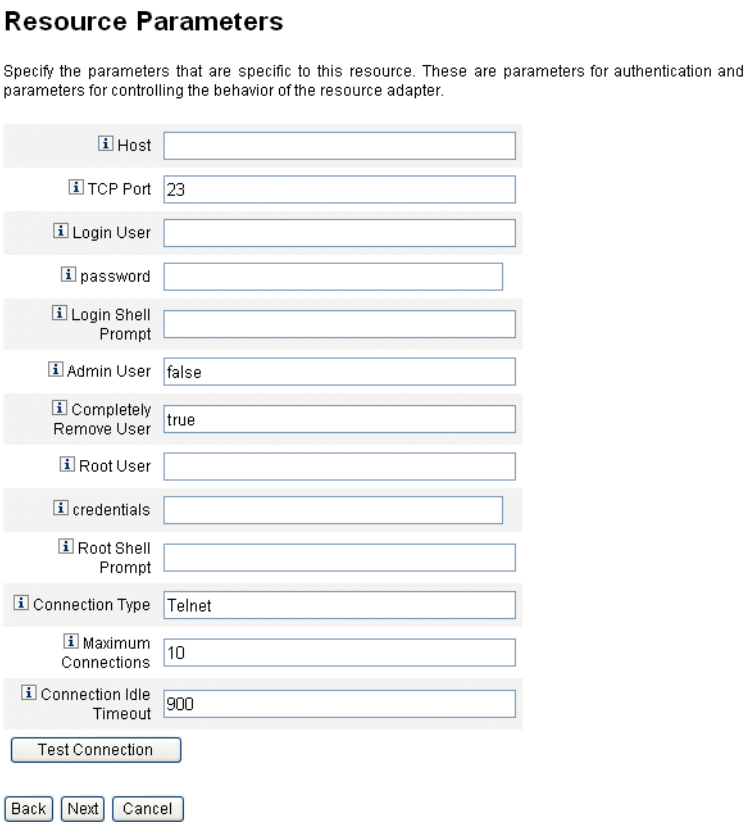
To create a resource, follow these steps:

1. Log in to the Administrator interface.
2. Click the **Resources** tab. Verify that the **List Resources** subtab is selected.
3. Locate the **Resource Type Actions** drop-down list and select **New Resource**.

   The "New Resource" page opens.
4. Select a resource type from the drop-down list. (If the resource type you are looking for is not listed, you need to enable it. See "Managing the Resources List" on page 174.)
5. Click **New** to display the Resource Wizard Welcome page.
6. Click **Next** to begin defining the resource. Resource Wizard steps and pages display in the following order:
   - **Resource Parameters** — Set up resource-specific parameters that control authentication and resource adapter behavior. Enter parameters, and then click **Test Connection** to ensure the connection is valid. On confirmation, click **Next** to set up account attributes.

Figure 4-15 shows the Resource Parameters page for Solaris resources. The form fields on this page are different for different resources.

Figure 4-15 Resource Wizard: Resource Parameters

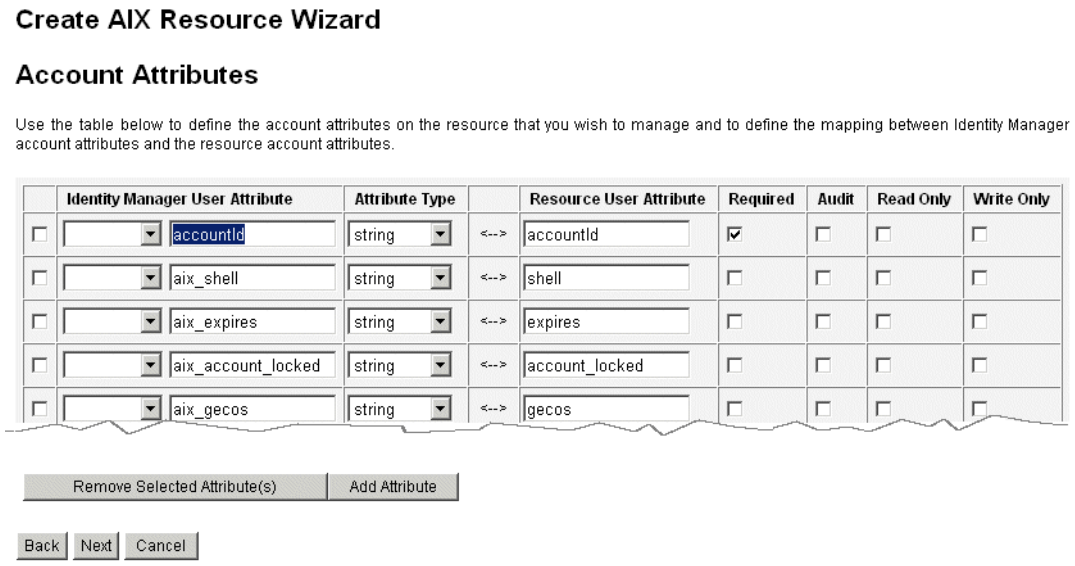


- **Account Attributes (schema map)** — Maps Identity Manager account attributes to resource account attributes. For more information about resource account attributes, see "Working with Account Attributes" on page 183.
  - To add an attribute, click **Add Attribute**.
  - To remove one or more attributes, select the boxes next to the attribute and click **Remove Selected Attribute(s)**.

  When finished, click **Next** to set up the Identity Template.

  Figure 4-16 shows the Account Attributes page in the Resource Wizard.

Figure 4-16 Resource Wizard: Account Attributes (Schema Map)



- **Identity Template** — Defines account name syntax for users. This feature is particularly important for hierarchical namespaces.
  - To add an attribute to the template, select it from the **Insert Attribute** list.
  - To delete an attribute, highlight it in the string and use the delete key on your keyboard. Delete the attribute name, as well as the preceding and following $ (dollar sign) characters.
  - **Type of accounts**—Identity Manager provides the ability to assign multiple resource accounts to a single user. For example, a user may require an administrator-level account as well as a regular user account on a particular resource. To support multiple account types on this resource, select the **Type of accounts** check box.

    Note: You cannot select the **Type of accounts** check box if you have not created one or more Identity Generation rules identified by the subtype `IdentityRule`. Because accountIds must be distinct, different types of accounts must generate different accountIds for a given user. Identity Generation rules specify how these unique accountIds should be created.

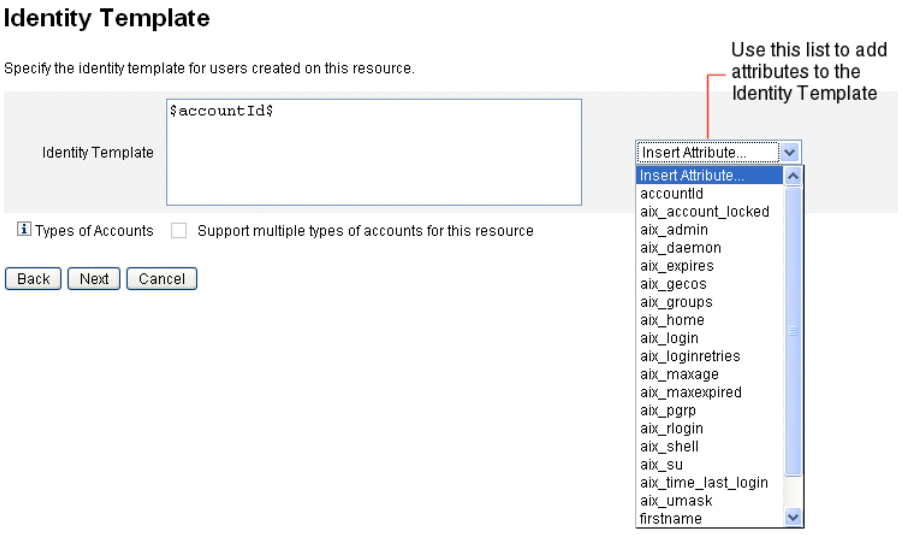
    Sample identity rules are provided in `sample/identityRules.xml`.

    You cannot remove an account type until it is no longer referenced by other objects within Identity Manager. You cannot rename an account type.

    See online Help for more information on completing the **Type of accounts** form.

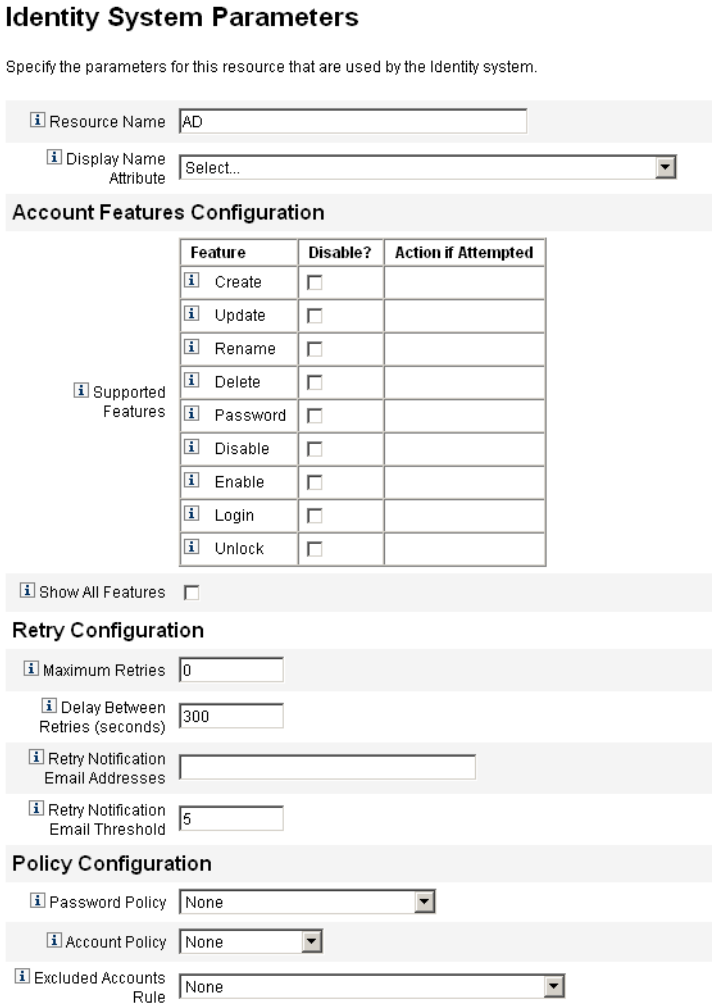
    For more information on creating multiple resource accounts for a user, see page 78.

Figure 4-17 Resource Wizard: Identity Template



- **Identity System Parameters** — Sets Identity Manager parameters for the resource, including retry and policy configuration, as shown in Figure 4-18.

Figure 4-18 Resource Wizard: Identity System Parameters



Use **Next** and **Back** to move among the pages. When you complete all selections, click **Save** to save the resource and return to the list page.

Managing Resources

This section describes how to manage existing resources.

View the Resource List

Use the **Resource List** to view existing resources. The **Resource List** commands can be used to perform a range of edit actions on a resource.

To view the Resource List, follow these steps:

1. Log in to the Administrator Interface.
2. Click **Resources** in the main menu.

   The **Resource List** is displayed on the **List Resources** subtab.

Edit a Resource Using the Resource Wizard

Use the Resource Wizard to edit resource parameters, account attributes, and identity system parameters. You can also specify the identity template that should be used for users created on the resource.

To edit a resource using the Resource Wizard, follow these steps:

1. In the Identity Manager Administrator Interface, click **Resources** in the main menu.

   The **Resource List** is displayed on the **List Resources** subtab.
2. Select the resource you want to edit.
3. In the **Resource Actions** drop-down menu, select **Resource Wizard** (under **Edit**).

   The Resource Wizard opens in Edit mode for the selected resource.

Edit a Resource Using the Resource List Command Options

In addition to the Edit Resource Wizard, you can use the **Resource List** commands to perform a range of edit actions on a resource:

- **Delete resources** — Select one or more resources, and then select Delete from the Resource Actions list. You can select resources of several types at the same time. You cannot delete a resource if any roles or resource groups are associated with it.

- **Search for resource objects** — Select a resource, and then select Find Resource Object from the Resource Object Actions list to find a resource object (such as an organization, organizational unit, group, or person) by object characteristics.
- **Manage resource objects** — For some resource types, you can create new objects. Select the resource, and then select Create Resource Object from the Resource Object Actions list.
- **Rename resources** — Select a resource, and then select Rename from the Resource Actions list. Enter a new name in the entry box that appears, and then click **Rename**.
- **Clone resources** — Select a resource, and then select Save As from the Resource Actions list. Enter a new name in the entry box that appears. The cloned resource appears in the resource list with the name you select.
- **Perform bulk operations on resources** — Specify a list of resources and actions to apply (from CSV-formatted input) to all resources in the list. Then launch bulk operations to initiate the bulk-operation background task.

Working with Account Attributes

Resource account attributes (or schema maps) provide an abstract method for referring to attributes on managed resources. The schema map allows you to specify how attributes will be referred to within Identity Manager (the left side of the schema map) and how that name is mapped to the attribute name on the actual resource (the right side of the schema map). You can then refer to the Identity Manager attribute name within forms or workflow definitions and effectively reference the attribute on the resource, itself.

Figure 4-16 on page 178 shows the Resource Account Attributes page.

An example of a mapping between attributes in Identity Manager and those for an LDAP resource is as follows:

Identity Manager Attribute		LDAP Resource Attribute
`firstname`	`<-->`	`givenName`
`lastname`	`<-->`	`sn`

Any reference to the Identity Manager attribute, `firstname`, is actually a reference to the LDAP attribute, `givenName` when an action is taken upon that resource.

When managing multiple resources from Identity Manager, mapping a common Identity Manager account attribute to many resource attributes can greatly simplify resource management. For example, the Identity Manager `fullname` attribute can be mapped to the Active Directory resource attribute `displayName`. Meanwhile, on an LDAP resource, the same Identity Manager `fullname` attribute can be mapped to the LDAP attribute `cn`. As a result, an administrator only needs to provide a `fullname` value once. When the user is saved, the `fullname` value is then passed to the resources that have different attribute names.

By setting up a schema map on the Account Attributes page of the Resource Wizard, you can do the following:

- Define attribute names and data types for attributes coming from managed resources
- Limit resource attributes to only those that are essential for your company or organization
- Create common Identity Manager attribute names to use with multiple resources
- Identify required user attributes and attribute types

Editing Resource Account Attributes

To view or edit resource account attributes, follow these steps:

1. In the Administrator interface, click **Resources**.
2. Select the resource for which you want to view or edit the account attributes.

3. In the **Resource Actions** list, click **Edit Resource Schema**.

   The Edit Resource Account Attributes page opens.

   Figure 4-16 on page 178 shows the Resource Account Attributes page.

The left column of the schema map (titled **Identity System User Attribute**) contains the names of Identity Manager account attributes that are referenced by the forms used in the Identity Manager Administrator and User interfaces. The right column of the schema map (titled **Resource User Attribute**) contains the names of attributes from the external source.

Resource Groups

Use the resources area to manage resource groups, which let you group resources to be updated in a specific order. By including and ordering resources in a group, and assigning the group to a user, you determine the order in which that user's resources are created, updated, and deleted.

Activities are performed on each resource in turn. If an action fails on a resource, the remaining resources are not updated. This type of relationship is important for related resources.

For example, an Exchange Server 2007 resource relies on an existing Windows Active Directory account. This account must exist before the Exchange account can be successfully created. By creating a resource group with (in order) a Windows Active Directory resource and an Exchange Server 2007 resource, you ensure the correct sequence when creating users. Conversely, this order ensures that resources are deleted in the correct sequence when you delete users.

Select **Resources**, and then select **List Resource Groups** to display a list of currently defined resource groups. From that page, click **New** to define a resource group. When defining a resource group, a selection area lets you choose and then order chosen resources, as well as select the organizations to which the resource group will be available.

Global Resource Policy

You can edit properties in the Global Resource Policy for a resource. From the Edit Global Resource Policy Attributes page, you can edit the following policy attributes:

- **Default Capture Timeout** — Enter a value, in milliseconds, that specifies the maximum time that the adapter should wait from the command line prompt before the adapter times out. This value applies to GenericScriptResourceAdapter or ShellScriptSourceBase adapters only. Use this setting when the results of a command or script are important and will be parsed by the adapter.

  The default value for this setting is 30000 (30 seconds).

- **Default Wait for Timeout** — Enter a value, in milliseconds, to specify the maximum time that a scripted adapter should wait between polls before checking to see if a command has characters (or results) ready. This value applies to GenericScriptResourceAdapter or ShellScriptSourceBase adapters only. Use this setting when the results of a command or script are not examined by the adapter.

- **Wait for Ignore Case** — Enter a value, in milliseconds, to specify the maximum time the adapter should wait for the command line prompt before timing out. This value applies to GenericScriptResourceAdapter or ShellScriptSourceBase adapters only. Use this setting when the case (uppercase or lowercase) is irrelevant.

- **Resource Account Password Policy** — If applicable, select a resource account password policy to apply to the selected resource. **None** is the default selection.

- **Excluded Resource Accounts Rule** — If applicable, select a rule that governs excluded resource accounts. **None** is the default selection.

You must click **Save** to save your changes to the policy.

Setting additional Timeout values

You can modify the `maxWaitMilliseconds` property by editing the Waveset properties file. The `maxWaitMilliseconds` property controls the frequency in which an operation's timeout will be monitored. If this value is not specified, the system will use a default value of 50.

To set this value, add the following line to the Waveset.properties file:

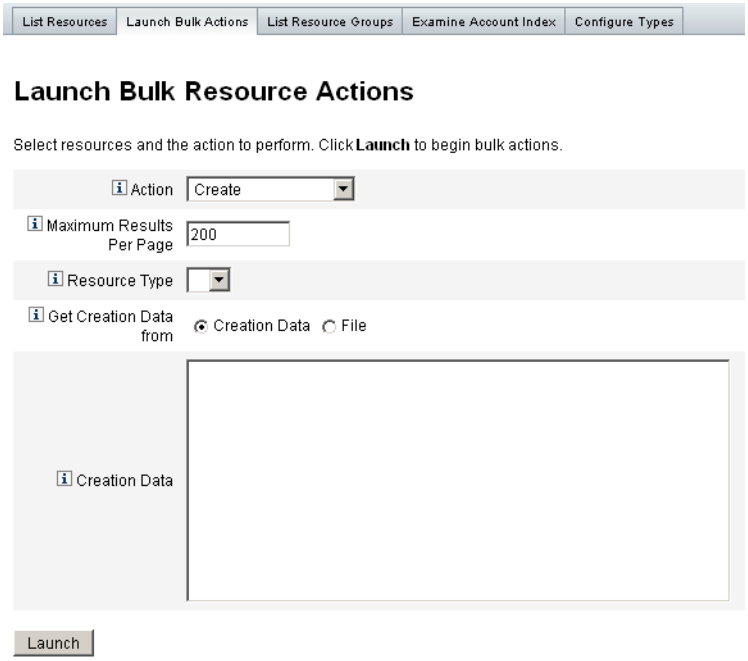
```
com.waveset.adapter.ScriptedConnection.ScriptedConnection.maxwaitMilliseconds.
```

Bulk Resource Actions

You can perform bulk operations on resources by using a CSV-formatted file or by creating or specifying the data to apply for the operation.

Figure 4-19 shows the launch page for bulk operations using a create action.

Figure 4-19 Launch Bulk Resource Actions Page



The options available for the bulk resource operation depend on the Action you select for the operation. You can specify a single action to apply to the operation or select **From Action List** to specify multiple actions.

- **Actions** — To specify a single action, select one of the following options: create, clone, update, delete, change password, reset password.

For a single action selection, you will be presented with options to specify the the resource involved with the action. For a Create action, you will specify the resource type.

If you specify From Action List, use the **Get action list from** area to specify either the file to use that contains the actions or the actions you specify in the Input area.

NOTE The actions you enter in the input area list or in the file must be in comma-separated value (CSV) format.

- **Maximum Results Per Page** — Use this option to specify the maximum number of bulk action results to display on each task results page. The default value is 200.

Click **Launch** to start the operation, which runs as a background task.

Chapter 5

Configuration & System Maintenance

This chapter provides information and procedures for using the Administrator Interface to set up and maintain Identity Manager objects and server processes. For more information about Identity Manager objects, see "Identity Manager Objects " on page 40 of the Overview chapter.

NOTE For information about configuring Identity Manager for a Service Provider implementation, see Chapter 17, "Service Provider Administration."

This chapter is organized in the following topics:

Configuring Identity Manager Policies

Read this section for information and procedures for configuring user policies.

What are Policies?

Identity Manager policies set limitations for Identity Manager users by establishing constraints for Identity Manager account ID, login, and password characteristics.

NOTE Identity Manager also provides Audit policies that are specifically designed to audit user compliance. Audit policies are discussed in Chapter 13, "Identity Auditing: Basic Concepts."

Opening the Policies Page

You create and edit Identity Manager user policies from the Policies page.

To open the Policies page, follow these steps:

1. Log in to the Administrator interface.
2. Click the **Security** tab, then click the **Policies** subtab.

   The Policies page opens.

Policy Types

Using the Policies page you can edit existing policies and create new ones.

Policies are categorized as the following types:

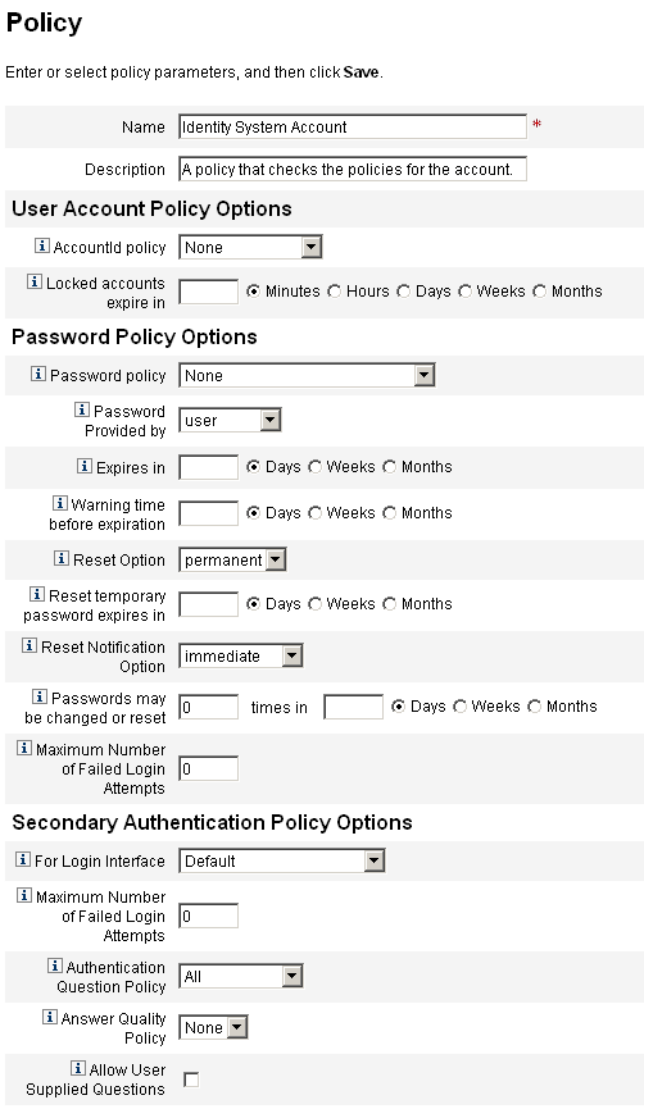
- **Identity System Account policies** — Establish user, password, and authentication policy options and constraints. You assign Identity System Account policies (shown in Figure 5-1) to organizations or users, through the Create and Edit Organization and Create and Edit User pages.

  Options you can set or select include:

  - **User policy options** — Specify how Identity Manager treats user accounts if a user fails to correctly answer authentication questions
  - **Password policy options** — Set password expiration, warning time before expiration, and reset options

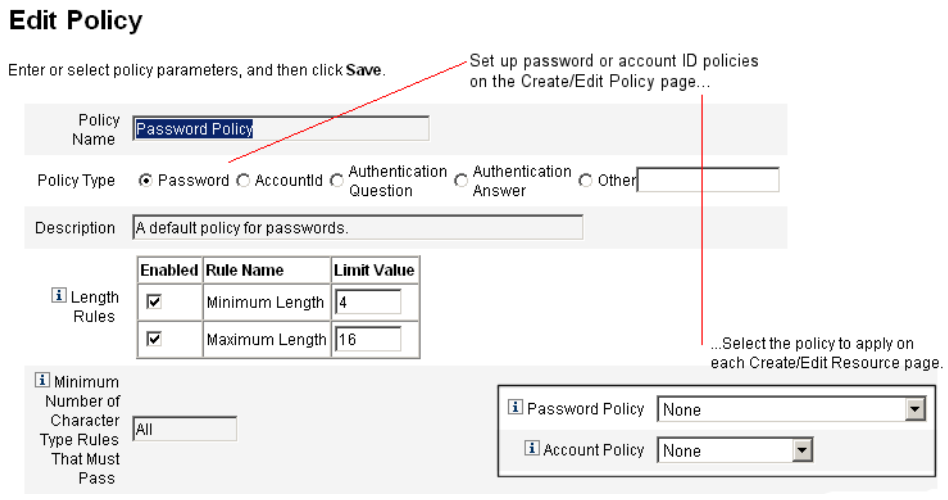
- **Authentication policy options** — Determine how authentication questions will be presented to the user, whether the user can provide his own authentication questions, enforce authentication at login, and establish the bank of questions that can be presented to a user.

Figure 5-1 Identity Manager Policy



- **Service Provider System Account policies** — This policy type is used in a service provider implementation to establish user, password, and authentication policy options and constraints for service provider users. You assign the policies to organizations or users, through the Create and Edit Organization and Create and Edit Service Provider User pages.
- **String Quality Policies** — String quality policies include policy types such as password, AccountID, and authentication, and set length rules, character type rules, and allowed words and attribute values. This type of policy is tied to each Identity Manager resource, and is set on each resource page. Figure 5-2 provides an example.

Figure 5-2 Create/Edit Password Policy



Options and rules you can set for passwords and account IDs include:

- **Length rules** — Determine minimum and maximum length.
- **Character type rules** — Set minimum and maximum allowable values for alphabetic, numeric, uppercase, lowercase, repetitive, and sequential characters.

- **Password re-use limits** — Specify the number of passwords preceding the current password that cannot be re-used. When a user attempts to change his password, the new password will be compared to the password history to ensure this is a unique password. For security reasons, a digital signature of the previous passwords is saved; new passwords are compared to this.
- **Prohibited words and attribute values** — Specify words and attributes that cannot be used as part of an ID or password.

Must Not Contain Attributes in Policies

You can change the allowed set of "must not contain" attributes in the `UserUIConfig` configuration object. Attributes are listed in `UserUIConfig` as follows:

- `<PolicyPasswordAttributeNames>` — Policy type "Password"
- `<PolicyAccountAttributeNames>` — Policy type "AccountId"
- `<PolicyOtherAttributeNames>` — Policy type "Other"

Dictionary Policy

A dictionary policy enables Identity Manager to check passwords against a word database to ensure that they are protected from a simple dictionary attack. By using this policy with other policy settings to enforce the length and makeup of passwords, Identity Manager makes it difficult to use a dictionary to guess passwords that are generated or changed in the system.

The dictionary policy extends the password exclusion list that you can set up with the policy. (This list is implemented by the Must Not Contain Words option on the Administrator Interface password Edit Policy page.)

Configuring the Dictionary Policy

To set up the dictionary policy, you must:

- Configure dictionary server support
- Load the dictionary

To set up the dictionary policy, follow these steps:

1. Open the Policies page (page 190).
2. Click **Configure Dictionary** to display the Dictionary Configuration page.
3. Select and enter database information:
    - **Database Type** — Select the database type (Oracle, DB2, SQLServer, or MySQL) that you will use to store the dictionary.
    - **Host** — Enter the name of the host where the database is running.
    - **User** — Enter the user name to use when connecting to the database.
    - **Password** — Enter the password to use when connecting to the database.
    - **Port** — Enter the port on which the database is listening.
    - **Connection URL** — Enter the URL to use when connecting. These template variables are available:
        - `%h` - host
        - `%p` - port
        - `%d` - database name
    - **Driver Class** — Enter the JDBC driver class to use while interacting with the database.
    - **Database Name** — Enter the name of the database where the dictionary will be loaded.
    - **Dictionary Filename** — Enter the name of the file to use when loading the dictionary.
4. Click **Test** to test the database connection.
5. If the connection test is successful, click **Load Words** to load the dictionary. The load task may take a few minutes to complete.
6. Click **Test** to ensure that the dictionary was loaded correctly.

Implementing the Dictionary Policy

To implement the dictionary policy, follow these steps:

1. Open the Policies page (page 190).
2. Click the **Password Policy** link to edit the password policy.
3. On the Edit Policy page, select the **Check passwords against dictionary words** option.
4. Click **Save** to save your changes.

Once implemented, all changed and generated passwords will be checked against the dictionary.

Customizing Email Templates

Identity Manager uses email templates to deliver information and requests for action to users and approvers. The system includes templates for:

- **Access Review Notice** — Sends notification that the access rights for a user needs to be reviewed. The system sends this notification when a violation of an access policy must be remediated or mitigated.
- **Account Creation Approval** — Sends notification to an approver that a new account is awaiting his approval. The system sends this notification when the Provisioning Notification Option for the associated role is set to approval.
- **Account Creation Notification** — Sends notification that an account has been created with a particular role assignment. The system sends this notification when one or more administrators are selected in the Notification recipients field on the Create Role or Edit Role pages.
- **Account Deletion Approval** — Sends notification to an approver that a user account deletion action is awaiting approval. The system sends this notification when one or more administrators are selected in the Notification recipients field on the Create Role or Edit Role pages.
- **Account Deletion Notification** — Sends notification that an account has been deleted.
- **Account Update Notification** — Sends notification to the specified email addresses or user accounts that an account has been updated.
- **Password Reset** — Sends notification of a Identity Manager password reset. Depending on the Reset Notification Option value selected for the associated Identity Manager policy, the system displays notification immediately (in the Web browser) to the administrator resetting the password or emails the user whose password is being reset.
- **Password Synchronization Notice** — Notifies the user that a password change has completed successfully on all resources. The notification lists which resources were updated successfully and indicates the origin of the password change request.
- **Password Synchronization Failure Notice** — Notifies the user that the password change was not successful on all resources. The notification provides a list of errors and indicates the origin of the password change request.
- **Policy Violation Notice** — Sends a notice that an account policy violation has occurred.

- **Reconcile Account Event**, **Reconcile Resource Event**, **Reconcile Summary** — Called from the Notify Reconcile Response, Notify Reconcile Start, and Notify Reconcile Finish default workflows, respectively. Notification is sent as configured in each workflow.
- **Report** — Sends a generated report to a specified list of recipients.
- **Request Resource** — Sends notification to a resource administrator that a resource has been requested. The system sends this notification when an administrator requests a resource from the Resources area.
- **Retry Notification** — Sends notification to an administrator that a particular operation has been unsuccessfully attempted on a resource a specified number of times.
- **Risk Analysis** — Sends a risk analysis report. The system sends this report when one or more email recipients are specified as part of a resource scan.
- **Temporary Password Reset** — Sends notification to the user or role approver that a temporary password has been provided for the account. Depending on the Password Reset Notification Option value selected for the associated Identity Manager policy, the system displays notification immediately (in the Web browser) to the user, emails the user, or emails the role approvers.
- **User ID Recovery** — Sends a recovered user ID to the specified email address.

Editing an Email Template

You can customize email templates to provide specific directions to the recipient, telling him how to accomplish a task or how to see results. For example, you might want to customize the Account Creation Approval template to direct an approver to an account approval page by adding the following message:

```
Please go to http://host.example.com:8080/idm/approval/approval.jsp to
approve account creation for $(fullname).
```

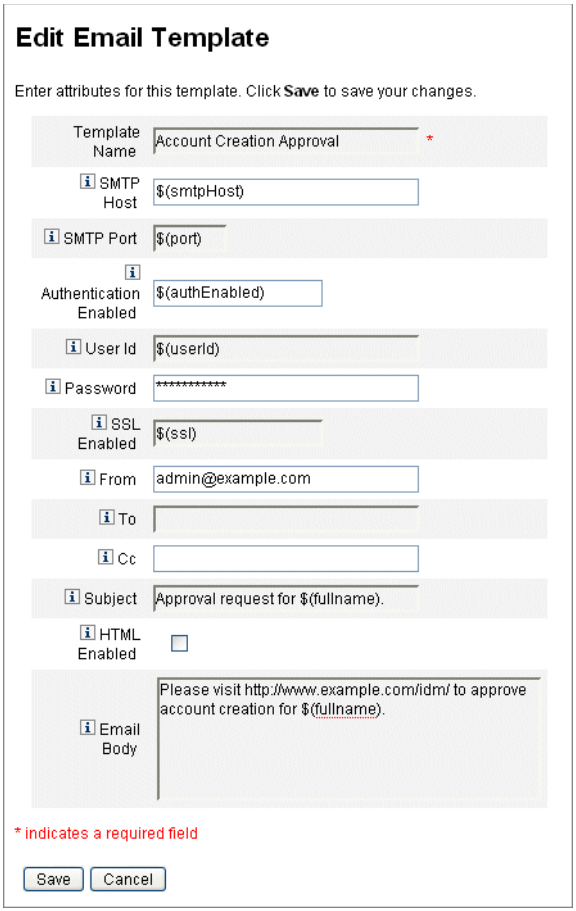
To customize an email template, use the following procedure using the Account Creation Approval template as an example:

1. In the Administrator interface, click the **Configure** tab, then click the **Email Templates** subtab.

   The Email Templates page opens.

2. Click to select the **Account Creation Approval** template.

Figure 5-3 Editing an Email Template



3. Enter details for the template:
   - In the SMTP Host field, enter the SMTP server name so that email notification can be sent.
   - In the From field, customize the originating email address.
   - In the To and Cc fields, enter one or more email addresses or Identity Manager accounts that will be the recipients of the email notification.
   - In the Email Body field, customize the content to provide a pointer to your Identity Manager location.

4. Click **Save**.

You can also modify email templates by using the Identity Manager IDE. For information on the IDE, see "Identity Manager IDE" on page 61.

HTML and Links in Email Templates

You can insert HTML-formatted content into an email template to display in the body of an email message. Content can include text, graphics, and Web links to information. To enable HTML-formatted content, select the HTML Enabled option.

Allowable Variables in the Email Body

You can also include references to variables in the email template body, in the form $(*Name*); for example: `Your password $(password) has been recovered.`

Allowable variables for each template are defined in the following table.

.

Table 5-1 Email Template Variables

Template	Allowable Variables
Password Reset	$(password) – newly generated password
Update Approval	$(fullname) – user's full name $(role) – user's role
Update Notification	$(fullname) – user's full name $(role) – user's role
Report	$(report) – generated report $(id) – encoded ID of the task instance $(timestamp) – time when email was sent
Request Resource	$(fullname) – user's full name $(resource) – resource type
Risk Analysis	$(report) – risk analysis report
Temporary Password Reset	$(password) – newly generated password $(expiry) – password expiration date

Configuring Audit Groups and Audit Events

Setting up audit configuration groups allows you to record and report on system events you select.

The Audit Configuration Page

Use the Audit Configuration page to set up audit groups. Setting up audit groups will enable you to run AuditLog reports later.

Opening the Audit Configuration Page

To open the Audit Configuration page, follow these steps:

1. Open the Administrator interface.
2. Click the **Configure** tab, then click the **Audit** subtab.

   The Audit Configuration page opens.

Configuring Audit Groups

Configuring audit groups and events requires the Configure Audit administrative capability.

If it is not already open, open the Audit Configuration page. (See steps, above.)

The Audit Configuration page shows the list of audit groups, each of which may contain one or more events. For each group, you can record successful events, failed events, or both.

Click an audit group in the list to display the Edit Audit Configuration Group page. This page lets you select the types of audit events to be recorded as part of an audit configuration group in the system audit log.

Check that the **Enable auditing** check box is selected. Clear the check box to disable the auditing system.

NOTE For more information about audit groups, see "Audit Configuration" on page 388 in the Audit Logging chapter.

Editing Events in the Audit Configuration Group

To edit events in the group, you can add or delete actions for an object type. To do this, move items in the Actions column from the **Available** to the **Selected** area for that object type, and then click **OK**.

Adding Events to the Audit Configuration Group

To add an event to the group, click **New**. Identity Manager adds an event at the bottom of the page. Select an object type from the list in the **Object Type** column, and then move one or more items in the **Actions** column from the **Available** area to the **Selected** area for the new object type. Click **OK** to add the event to the group.

Remedy Integration

You can integrate Identity Manager with a Remedy server, enabling it to send Remedy tickets according to a specified template.

Set up Remedy integration in two areas of the Administrator interface:

- **Remedy server settings** — Set up Remedy configuration by creating a Remedy resource from the Resources area. (See "Creating Resources" on page 175.) After setting up the resource, test the connection to ensure integration is enabled.
- **Remedy template** — After setting up the Remedy resource, define a Remedy template. To do this, open the Administrator interface, click the **Configure** tab, then click **Remedy Integration**. You will then select the Remedy schema and resource.

Creation of Remedy tickets is configured through Identity Manager workflow. Depending on your preferences, a call can be made at an appropriate time that uses the defined template to open a Remedy ticket. For more information about configuring workflows, see *Identity Manager Workflows, Forms, and Views*.

Configuring Identity Manager Server Settings

You can edit server-specific settings so that Identity Manager servers run only specific tasks.

To configure server-specific settings, follow these steps:

1. In the Administrator interface, click **Configure** in the main menu, then click **Servers**.

   The Configure Servers page opens.

2. Click a server in the list on the Configure Servers page to edit settings for an individual server.

   Identity Manager displays the Edit Server Settings page, where you can edit reconciler, scheduler, JMX and other settings.

Reconciler Settings

The reconciler is the Identity Manager component that performs reconciliation. To learn about reconciliation, see "Reconciliation" on page 278.

To configure reconciler settings, follow the steps under "Configuring Identity Manager Server Settings" on page 203. Select the **Reconciler** tab.

By default, reconciler settings display on the Edit Server Settings page. You can accept the default values or de-select the **Use default** option to specify custom values.

NOTE To change the *default* reconciler settings used by Identity Manager servers, see "Editing Default Server Settings" on page 208.

Configure the reconciler using the following settings:

- **Parallel Resource Limit** — Specify the maximum number of resource threads that the reconciler can process in parallel. Resource threads allocate work items to worker threads, so if you add additional resource threads, you may also need to increase the maximum number of worker threads. For new installations, the default value is **3**.
- **Minimum Worker Threads** — Specify the number of processing threads that the reconciler will always keep alive. For new installations, the default value is **2**.

- **Maximum Worker Threads** — Specify the maximum number of processing threads that the reconciler can use. The reconciler will only start as many threads as the workload requires. This places a limit on that number. Worker threads automatically close if they are idle for a short duration. For new installations, the default value is **6**.

For information about tuning and troubleshooting the reconciler, see *Identity Manager Tuning, Troubleshooting, and Error Messages*.

Viewing Reconciler Status

To view reconciler status information, open the Reconciler Status debug page.

NOTE You must have the Debug capability to view `/idm/debug/` pages. For information about capabilities, see "Assigning Capabilities" on page 242.

To open the Reconciler Status debug page, type this URL into your browser:

```
http://<AppServerHost>:<Port>/idm/debug/Show_Reconciler.jsp
```

where `AppServerHost` is a host that has the reconciler enabled.

Refresh the Reconciler Status page to view updated reconciler status information. For additional information about this page, click **Help**.

Scheduler Settings

The scheduler component controls task scheduling in Identity Manager.

To configure scheduler settings on a particular server, follow the steps under "Configuring Identity Manager Server Settings" on page 203. Select the **Scheduler** tab.

You can accept the default values or de-select the **Use default** option to specify custom values.

- **Scheduler Startup** — Select a startup mode for the scheduler on this server:
  - **Automatic** — Starts when the server is started. This is the default startup mode.
  - **Manual** — Starts when the server is started, but remains suspended until manually started.
  - **Disabled** — Does not start when the server is started.

- **Tracing Enabled** — Select this option to activate scheduler debug tracing to standard output on this server.
- **Maximum Concurrent Tasks** — Select this option to specify the maximum number of tasks, other than the default, that the Scheduler will run at any one time. Requests for additional tasks above this limit will either be deferred until later or run on another server.
- **Task Restrictions** — Specify the set of tasks that can execute on the server. To do this, select one or more tasks from the list of available tasks. The list of selected tasks can be an inclusion or exclusion list depending on the option you select. You can choose to allow all tasks except those selected in the list (the default behavior), or allow only the selected tasks.

Click **Save** to save changes to the server settings.

To change the default scheduler settings for Identity Manager servers, see "Editing Default Server Settings" on page 208.

For information about tuning and troubleshooting the scheduler, see *Identity Manager Tuning, Troubleshooting, and Error Messages*.

Email Template Server Settings

To configure SMTP server settings, follow the steps under "Configuring Identity Manager Server Settings" on page 203. Select the **Email Template** tab.

Specify the default email server by clearing the **Use Default** selection and entering the mail server to use, if other than the default. The text you enter is used to replace the *smtpHost* variable in Email Templates.

Simple Mail Transfer Protocol (SMTP) is the standard for email transmissions across the Internet.

To change the default SMTP settings for Identity Manager servers, see "Editing Default Server Settings" on page 208.

JMX

Java Management Extensions (JMX) is a Java technology that allows for managing and/or monitoring applications, system objects, devices, and service oriented networks. The managed/monitored entity is represented by objects called MBeans (for Managed Bean).

This section describes how to configure JMX on an Identity Manager server so that a JMX client can monitor the system for changes. (Identity Manager can also be configured to make audit events available via JMX. For information, see page 413.)

Configure JMX Polling Settings

To configure JMX polling settings on an individual server, follow these steps:

1. Follow the steps under "Configuring Identity Manager Server Settings" on page 203. Select the **JMX** tab.
2. Enable JMX cluster polling and configure the interval for the polling threads by using the following options:
   - **Enable JMX** — Use this option to enable or disable the polling thread for the JMX Cluster MBean. To enable JMX, clear the default selection (Use Default (false)). Because of the use of system resources for polling cycles, enable this option only if you plan to use JMX.
   - **Polling Interval (ms)** — Use this option to change the default interval at which the server will poll the repository for changes, when JMX is enabled. Specify the interval in milliseconds.

     The default polling interval is set to 60000 milliseconds. To change it, clear the check box for this option and enter the new value in the entry field provided.
3. Click **Save** to save changes to the server settings.

NOTE To change the *default* JMX polling settings for Identity Manager servers, see "Editing Default Server Settings" on page 208.

Viewing JMX Data

Use a JMX client to view data gathered by JMX. JConsole, which is included in the JDK 1.5, is one such client.

Using JConsole Locally

To use JConsole on the same machine your server is running on, set the following property:

- Set `JAVA_OPTS` as follows:
  - `-Dcom.sun.management.jmxremote`

JConsole will connect using the correct PID.

Using JConsole Remotely

To use JConsole remotely, set the following properties:

- Set `JAVA_OPTS` as follows:
  - `-Dcom.sun.management.jmxremote.port=9004`
  - `-Dcom.sun.management.jmxremote.authenticate=false`
  - `-Dcom.sun.management.jmxremote.ssl=false`
- In the `jre/lib/management` directory, edit `jmxremote.access` and make sure the following two lines appear uncommented in the file:
  - `monitorRole  readonly`
  - `controlRole  readwrite`
- To see the Identity Manager MBeans, connect to the server with an URL similar to the following:

  ```
  service:jmx:rmi:///jndi/rmi://localhost:9004/jmxrmi
  ```

Other settings may also be necessary depending on your environment. Refer to the JConsole documentation for more information.

NOTE JMX data can also be viewed by going to the Identity Manager debug page (page 60) and clicking the **Show MBean Info** button.

For more information on JMX, visit this website:

`http://java.sun.com/javase/technologies/core/mntr-mgmt/javamanagement/docs.jsp`

Editing Default Server Settings

The Default Server Settings feature lets you set the default settings for all Identity Manager servers. The servers inherit these settings unless you select differently in the individual server settings pages.

To edit the default server settings, follow these steps:

1. In the Administrator interface, click **Configure > Servers**.

   The Configure Servers page opens.

2. Click **Edit Default Server Settings**.

   The Edit Default Server Settings page opens.

The Edit Default Server Settings page displays the same options as the individual server settings pages. For help, refer to the documentation for the individual server settings pages.

Changes you make to each default server setting is propagated to the corresponding individual server setting, unless you have de-selected the Use default option for that setting.

Click **Save** to save changes to the server settings.

Configuring the End-User Interface

Administrators can configure certain aspects of the end-user interface by modifying a form in the Administrator interface.

To set options for displaying information in the end-user interface, follow these steps:

1. In the Administrator interface, click **Configure** in the main menu.
2. Click **User Interface** in the secondary menu.

   The User Interface page opens.
3. Complete and save the **End User Dashboard** portion of the form. Click **Help** if you need help with the form.

   For information on completing the **Anonymous Enrollment** portion of the form, see "Anonymous Enrollment" on page 118.

Enabling Process Diagrams in the End-User Interface

Process diagrams depict the workflow that Identity Manager follows when end-users launch a request or update their profile. When enabled, process diagrams display on the results page after the end-user submits a form.

Process diagrams must be enabled in the Administrator interface before they can be enabled in the end-user interface. See "Enabling Process Diagrams" on page 75 for more information.

To enable process diagrams in the end-user interface, follow these steps:

1. Open the User Interface configuration page by following the steps in "Configuring the End-User Interface."
2. Select the **Enable End-User Process Diagrams** option, which is located in the **Result Pages** section of the form.

   If the **Enable End-User Process Diagrams** option is not available, then you must first enable process diagrams in the Administrator interface. See "Enabling Process Diagrams" on page 75.
3. Click **Save**.

Registering Identity Manager

Administrators are encouraged to register their installation of Identity Manager.

To register, you will need a Sun Online Account and password. If you do not have a Sun Online Account, you can register for one by completing the form at this address:

`https://reg.sun.com/register`

Identity Manager can be registered from the console or by using the Administrator interface.

Registering from the console allows you to also create a local service tag, which can be used with Sun Service Tag software to track your inventory of Sun systems, software, and services. The service tags client package should be installed before you create a local service tag. This package can be downloaded by clicking the Download Service Tags button at the following address:

`http://inventory.sun.com/inventory`

In order to register Identity Manager, you should be logged on with an administrator account that allows you to configure Identity Manager objects. This account should have the Product Registration capability. For information about capabilities, see "Assigning Capabilities" on page 242.

NOTE Java on your Identity Manager application server(s) must be properly configured for SSL in order for the product registration feature to work. All JARs referenced in your `java.security` file (or equivalent) need to be present.

Registering Identity Manager from the Console

To create a local service tag, or register Identity Manager over the Internet with Sun, follow these steps:

1. On Windows, start the Identity Manager console (command-line) interface by typing the following at a command line:

   ```
   %WSHOME%\bin\lh
   ```

   On Unix, start the Identity Manager console (command-line) interface by typing the following at a command line:

   ```
   $WSHOME/bin/lh
   ```

2. To create a local service tag, use the following command:

   ```
   register -local
   ```

   To register Identity Manger over the Internet with Sun, use the following command:

   ```
   register -remote -u <userid> -p <password> -userSOA <soaUserid>
   -passSOA <soaPassword> -proxy <proxyHost> -port <proxyPortNumber>
   ```

   where:

   - `userid` is the Identity Manager userID of the Identity Manager administrator who is authorized to do the registration
   - `password` is the Identity Manager password of the Identity Manager administrator who is authorized to do the registration
   - `soaUserid` is the user ID of the Sun Online Account that will be used for registration.
   - `soaPassword` is the password of the Sun Online Account that will be used for registration.
   - `proxyHost` is the network proxy to use for access to the Sun online registration service. Only required if your network is configured to use a proxy to reach external Internet addresses.
   - `proxyPortNumber` is the port on the network proxy to use for access to the Sun online registration service. Only required if your network is configured to use a proxy to reach external Internet addresses

The `register` Command

Usage

```
register -local

register -remote [-u <userid> [-p <password>]] [-prompt] -userSOA <userid>
-passSOA <password> [-proxy <proxyHost> [-port <proxyPortNumber>]]
register [-help | -?]
```

Options

Use these *options* with the register command.:

Table 0-1 Syslog Command Options

Option	Description
`-local`	Create a service tag on this host.
`-remote`	Register this installation of Identity Manager over the network directly with Sun.
`-u <userid>`	The Identity Manager user ID of the Identity Manager administrator who is authorized to do the registration.
`-p <password>`	The Identity Manager password of the Identity Manager administrator who is authorized to do the registration.
`-prompt`	Interactively prompt for the password if missing.
`-userSOA <userid>`	The user ID of the Sun Online Account that will be used for registration. Required if registering with the `-remote` option.
`-passSOA <password>`	The password of the Sun Online Account that will be used for registration. Required if registering with the `-remote` option.
`-proxy <proxyHost>`	The network proxy to use for access to the Sun online registration service. Required if registering with the `-remote` option and your network is configured to use a proxy to reach external Internet addresses.
`-port <proxyPortNumber>`	The port on the network proxy to use for access to the Sun online registration service. Required if registering with the `-remote` option and your network is configured to use a proxy to reach external Internet addresses.
`-help | -?`	Print help for this command to the console.

Registering Identity Manager from the Administrator Interface

If you do not need to create a local service tag, register Identity Manager from the Administrator interface.

To register Identity Manager from the Administrator interface, follow these steps:

1. In the Administrator interface, click **Configure**.
2. In the secondary menu, click **Product Registration**.

   The Product Registration page opens.
3. Complete the form and click **Register Now**. Click the i-Helps for information about individual form fields.

NOTE If your application server is not configured to allow outgoing SSL connections, you may receive the following error message:

Failed to register on Sun Connection server due to invalid Sun Online Account user/password.

To resolve this issue, add the appropriate trusted root certificate(s) to your application server's keystore. Consult your application server's documentation for details.

NOTE If old versions of `xml-apis.jar` and `xercesImpl.jar` are present in your application server's classpath, you may receive the following error message:

```
java.lang.NoSuchMethodError:org.w3c.dom.Node.getTextContent()
Ljava/lang/String;
```

To resolve this problem, modify the classpath so that only the most recent versions of `xml-apis.jar` and `xercesImpl.jar` are present.

Editing Identity Manager Configuration Objects

In the course of administering Identity Manager, you will occasionally be called upon to edit the Identity Manager system configuration object (also referred to as the *System Configuration File)*, or other similar objects.

To edit objects using the Administrator interface, follow these steps:

1. Open the Identity Manager Debug Page by typing the following URL into your browser:

   `http://<AppServerHost>:<Port>/idm/debug/session.jsp`

   The System Settings page opens.

NOTE You must have the Debug capability to view `/idm/debug/` pages.

2. Find the **List Objects** button, then select **Configuration** from the adjacent **Type** drop-down list.

   Click the **List Objects** button.

   The "List Objects of type: Configuration" page opens.

3. In the list of objects, find the object you need, then click **edit**. For example, to edit the system configuration object, find **System Configuration**, then click **edit**.

4. Edit the object as directed.

5. Click **Save**.

6. If directed to do so, restart your server (or servers).

Removing Records from the System Log

The system log captures errors generated by Identity Manager. Periodically, the system log should be truncated to keep it from growing too large. Use the System Log Maintenance Task to remove old records from the system log.

To schedule a task to remove old records from the System Log, follow these steps:

1. In the Administrator interface, click **Server Tasks > Manage Schedule**.
2. In the Tasks Available for Scheduling section, click the **System Log Maintenance Task**.

   The "Create New System Log Maintenance Task Task Schedule" page opens.
3. Complete the form and click **Save**.

Chapter 6

Administration

This chapter provides information and procedures for performing a range of administrative-level tasks in the Identity Manager system, such as creating and managing Identity Manager administrators and organizations. It also provides an understanding of how you can use roles, capabilities, and administrative roles in Identity Manager.

The information is grouped in the following topics:

Understanding Identity Manager Administration

Identity Manager administrators are users with extended Identity Manager privileges. Identity Manager administrators manage:

- User accounts
- System objects, such as roles and resources
- Organizations

Unlike users, administrators in Identity Manager are assigned *capabilities* and *controlled organizations*. These are defined as follows:

- **Capabilities**. A set of permissions granting access rights to Identity Manager users, organizations, roles, and resources.
- **Controlled organizations**. Once assigned to control an organization, the administrator can manage the objects in that organization, as well as any organizations that are descended from it in the hierarchy.

Delegated Administration

In most companies, employees who perform administrative tasks hold specific responsibilities. Consequently, the account management tasks that these administrators can perform are limited in scope.

For example, an administrator might be responsible only for creating Identity Manager user accounts. With that limited scope of responsibility, the administrator likely does not need specific information about the resources on which user accounts are created, or about the roles or organizations that exist within the system.

Identity Manager can also restrict administrators to a specific tasks within a specific, defined scope.

Identity Manager supports the separation of responsibilities and a delegated administration model as follows:

- Assigned **capabilities** limit administrators to specific job duties
- Assigned **controlled organizations** restrict administrators to controlling only specific organizations (and the objects within those organizations)
- Filtered views of the *Create User* and *Edit User* pages prevent administrators from viewing information that is not relevant to their job duties

You can specify delegations for a user from the Create User page when you set up a new user account, or when you edit a user account.

You can also delegate work items, such as requests for approvals, from the Work Items tab. For more information on delegations, see "Delegating Work Items" on page 257 for details.

Creating Administrators

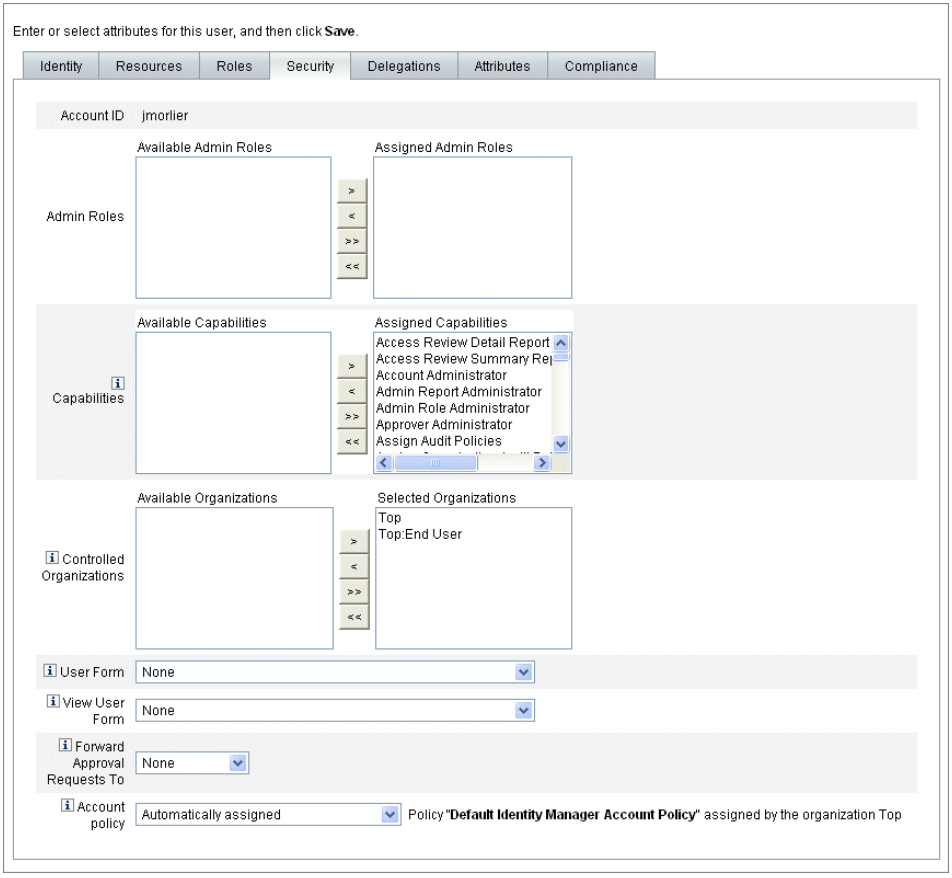
To create an administrator, assign one or more capabilities to a user and designate the organization(s) to which the capabilities will apply.

To create an administrator, follow these steps:

1. In the Administrator interface, click **Accounts** in the menu bar. The User List page opens.
2. To give an existing user administrative privileges, click the user name (the Edit User page opens), then click the **Security** tab.

   If a new user account needs to be created, see "Creating Users" on page 76.
3. Make the selections as needed to establish administrative control:
   - **Capabilities** — Select one or more capabilities that should be assigned to this administrator. This information is required. For more information, see "Understanding and Managing Capabilities" on page 238.
   - **Controlled Organizations** — Select one or more organizations that should be assigned to the administrator. The administrator will control objects in the assigned organization and in any organizations beneath it in the hierarchy. This information is required. For more information, see "Understanding Identity Manager Organizations" on page 228.
   - **User Form** — Select the user form that this administrator will use when creating and editing Identity Manager users (if that capability is assigned). If you do not directly assign a user form, the administrator will inherit the user form assigned to the organization he belongs to. The form selected here supersedes any form selected within this administrator's organization.
   - **Forward Approval Requests To** — Select a user to forward all current pending approval requests to that user. This administrator setting also can be set from the Approvals page.
   - **Delegate Work Items To** — If available, use this option to specify delegations for this user account. You can specify the administrator's manager, one or more selected users, or use a delegate approvers rule.

Figure 6-1 User Account Security page: Specifying Administrator privileges



Filtering Administrator Views

By assigning user forms to organizations and administrators, you establish specific administrator views of user information. Access to user information is set at two levels:

- **Organization** — When you create an organization, you assign the user form that all administrators in that organization will use when creating and editing Identity Manager users. Any form set at the administrator level overrides the form set here. If no form is selected for the administrator or the organization, Identity Manager inherits the form selected for the parent organization. If no form is set there, Identity Manager uses the default form set in the system configuration.
- **Administrator** — When you assign a user administrative capabilities, you can directly assign a user form to the administrator. If you do not assign a form, the administrator inherits the form assigned to his organization (or the default form set in the system configuration if no form is set for the organization).

"Understanding and Managing Capabilities" on page 238 describes built-in Identity Manager capabilities that you can assign.

Changing Administrator Passwords

Administrator passwords may be changed by an administrator with administrative password change capabilities assigned, or by the administrator-owner.

Administrators can change another administrator's password using these forms:

- **Change User Password form —** There are two ways to open this form:
  - Click **Accounts** in the menu. The User List opens. Select an administrator and then, in the **User Actions** list, select **Change Password**. The Change User Password page opens.
  - Click **Passwords** in the menu. The Change User Password page opens.
- **Tabbed User form —** Click **Accounts** in the menu. The User List opens. Select an administrator, and then, in the **User Actions** menu, select **Edit**. The "Edit User" page (Tabbed User Form) opens. On the **Identity** form tab, type a new password in the **Password** and **Confirm Password** fields.

An administrator can change his own password from the Passwords area. Click **Passwords** in the menu, then click **Change My Password**.

NOTE The Identity Manager account policy applied to the account determines password limitations, such as password expiration, reset options, and notification selections. Additional password limitations may be set by password policies set on the administrator's resources.

Challenging Administrator Actions

Identity Manager can be configured to prompt administrators for a password before processing certain account changes. If authentication fails, then the account changes will be cancelled.

There are three forms that administrators can use to change user passwords. These are the Tabbed User form, the Change User Password form, and the Reset User Password form. To ensure that administrators are required to enter their password before Identity Manager processes user account changes, be sure to update all three forms.

Enabling the Challenge Option for the Tabbed User Form

To require a password challenge on the Tabbed User form, follow these steps.

1. In the Administrator interface, open the Identity Manager debug page (page 60) by typing the following URL into your browser. (You must have the Debug capability to open this page.)

   ```
   http://<AppServerHost>:<Port>/idm/debug/session.jsp
   ```

   The "System Settings" page (Identity Manager debug page) opens.

2. Find the **List Objects** button, select **UserForm** from the drop-down menu, then click the **ListObjects** button.

   The "List Objects of type: UserForm" page opens.

3. Locate the copy of the "Tabbed User Form" that you have in production and click **edit**. (The "Tabbed User Form" distributed with Identity Manager is a template and should not be modified.)

4. Add the following code snippet inside the <Form> element:

```
<Properties>
  <Property name='RequiresChallenge'>
    <List>
      <String>password</String>
      <String>email</String>
      <String>fullname</String>
    </List>
  </Property>
</Properties>
```

   The value of the property is a list that can contain one or more of the following user view attribute names:

   - applications
   - adminRoles
   - assignedLhPolicy
   - capabilities
   - controlledOrganizations
   - email
   - firstname
   - fullname
   - lastname
   - organization
   - password
   - resources
   - roles

5. Save your changes.

Enabling the Challenge Option for the “Change User Password” and “Reset User Password” Forms

To require a password challenge on the “Change User Password” and “Reset User Password” forms, follow these steps:

1. In the Administrator interface, open the Identity Manager debug page (page 60) by typing the following URL into your browser. (You must have the Debug capability to open this page.)

   ```
   http://<AppServerHost>:<Port>/idm/debug/session.jsp
   ```

   The “System Settings” page (Identity Manager debug page) opens.

2. Locate the **List Objects** button, select **UserForm** from the drop-down menu, then click the **ListObjects** button.

   The “List Objects of type: UserForm” page opens.

3. Locate the copy of the “Change Password User Form” that you have in production and click **edit**. (The “Change Password User Form” distributed with Identity Manager is a template and should not be modified.)

4. Locate the `<Form>` element, then go to the `<Properties>` element.

5. Add the following line inside the `<Properties>` element and save your changes.

   ```
   <Property name='RequiresChallenge' value='true'/>
   ```

6. Repeat steps 3 - 5, except edit the copy of the “Reset User Password Form” that you have in production.

Changing Answers to Authentication Questions

Use the Passwords area to change the answers you have set for account authentication questions. From the menu bar, select **Passwords**, and then select **Change My Answers**.

For more information about authentication, see “User Authentication” on page 111.

Customizing Administrator Name Display in the Administrator Interface

You can display an Identity Manager administrator by attribute (such as email or fullname) rather than accountId in some Identity Manager Administrator interface pages and areas, such as the following areas:

- Edit User (forward approvals selection list)
- Role table
- Create/Edit Role
- Create/Edit Resource
- Create/Edit Organization/Directory Junction
- Approvals

To configure Identity Manager to use a display name, add to the `UserUIConfig` object:

```
<AdminDisplayAttribute>
  <String>attribute_name</String>
</AdminDisplayAttribute>
```

For example, to use the email attribute as the display name, add the following attribute name to `UserUIconfig`:

```
<AdminDisplayAttribute>
  <String>email</String>
</AdminDisplayAttribute>
```

Understanding Identity Manager Organizations

Organizations allow you to:

- Logically and securely manage user accounts and administrators
- Limit access to resources, applications, roles, and other Identity Manager objects

By creating organizations and assigning users to various locations in an organizational hierarchy, you set the stage for delegated administration. Organizations that contain one or more other organizations are called *parent organizations*.

All Identity Manager users (including administrators) are *statically assigned* to one organization. Users also can be *dynamically assigned* to additional organizations.

Identity Manager administrators are additionally assigned to *control* organizations.

Creating Organizations

Create organizations in the Identity Manager Accounts area.

To create an organization, follow these steps:

1. In the Administrator interface, click **Accounts** in the menu bar.

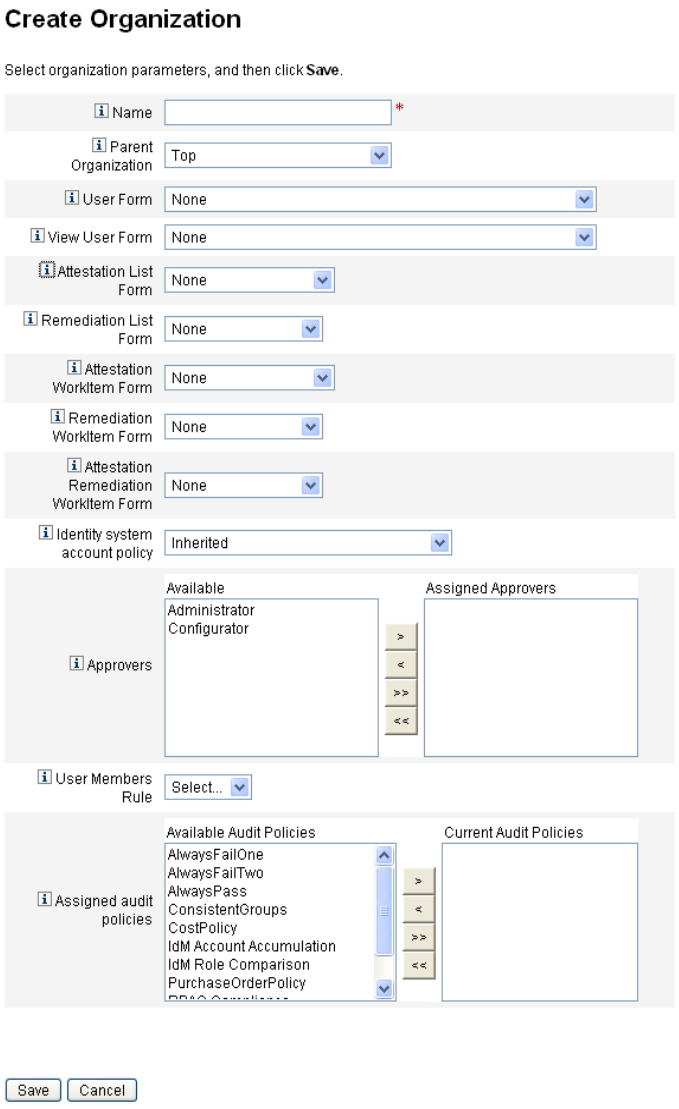
   The User List page opens.

2. In the **New Actions** menu, select **New Organization**.

TIP To create an organization at a specific location in the organizational hierarchy, select an organization in the list, and then select **New Organization** in the **New Actions** menu.

Figure 6-2 illustrates the Create Organization page.

Figure 6-2 Create Organization Page



Assigning Users to Organizations

Each user is a static member of one organization, and can be a dynamic member of more than one organization.

Organizational membership is defined as follows:

- **Direct (static) assignment** — Users are assigned directly to an organization from the Create User page or Edit User page. (Select the **Identity** form tab to display the Organizations field.) A user must be directly assigned to one organization.
- **Rule-driven (dynamic) assignment** — Users are assigned to an organization by a "User Members Rule" that is assigned to the organization. The rule, when evaluated, returns a set of member users.

  Identity Manager will evaluate the User Members Rule when:

  - Listing the users in an organization
  - Finding users (through the Find Users page) that includes searching for users that are in an organization with a user members rule
  - Requesting access to a user, provided that the current administrator controls an organization with a User Members Rule

Select a User Members Rule from the **User Members Rule** field on the Create Organization page. Figure 6-3 shows an example of a User Members Rule.

Figure 6-3 Create Organization: User Members Rule Selections

User Members Rule Example

The following example shows how you might set up a User Members Rule that can dynamically control an organization's user membership.

NOTE For information about creating and working with rules in Identity Manager, see *Identity Manager Deployment Tools*.

Key Definitions and Inclusions

- For a rule to appear in the User Members Rule option box, its `authType` must be set as `authType='UserMembersRule'`.
- The context is the currently authenticated Identity Manager user's session.
- The defined variable `(defvar) Team players` gets the distinguished name (dn) for each user that is a member of the Windows Active Directory organization unit (ou) `Pro Ball Team`.
- For each user found, the append logic will concatenate the dn of each member user of the `Pro Ball Team` ou with the name of the Identity Manager Resource prefixed by a colon (as in `:smith-AD`).
- The results returned will be a list of dn's concatenated with the Identity Manager resource name in the format *dn*`:smith-AD`.

Code Example

The following code example illustrates the syntax for a sample user member rule.

Code Example 6-1 Sample User Members Rule

```
<Rule name='Get Team Players'
     authType='UserMembersRule'>
   <defvar name='Team players'>
      <block>
         <defvar name='player names'>
            <list/>
         </defvar>
   <dolist name='users'>
      <invoke class='com.waveset.ui.FormUtil'
            name='getResourceObjects'>
         <ref>context</ref>
         <s>User</s>
         <s>singleton-AD</s>
         <map>
            <s>searchContext</s>
            <s>OU=Pro Ball Team,DC=dev-ad,DC=waveset,DC=com</s>
            <s>searchScope</s>
            <s>subtree</s>
            <s>searchAttrsToGet</s>
            <list>
               <s>distinguishedName</s>
            </list>
         </map>
      </invoke>
      <append name='player names'>
      <concat>
         <get>
            <ref>users</ref>
            <s>distinguishedName</s>
         </get>
            <s>:sampson-AD</s>
      </concat>
      </append>
   </dolist>
      <ref>player names</ref>
   </block>
   </defvar>
      <ref>Team players</ref>
</Rule>
```

Assigning Organization Control

Assign administrative control of one or more organizations from the Create User page or Edit User page. Select the **Security** form tab to display the Controlled Organizations field.

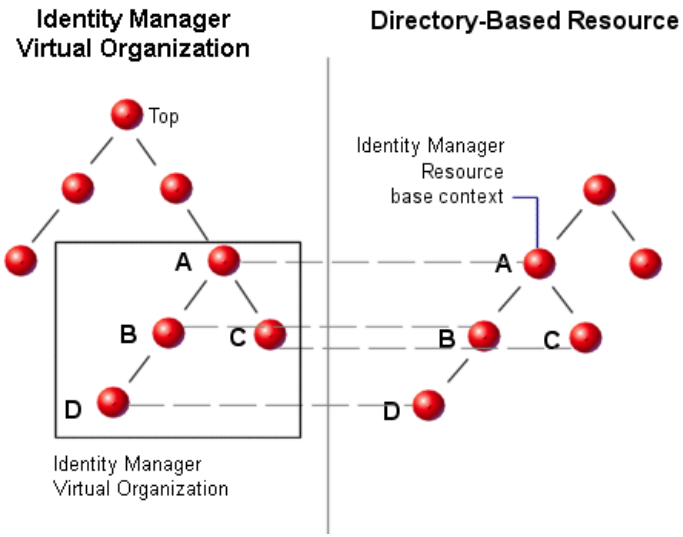
You can also assign administrative control of organizations by assigning one or more admin roles, from the Admin Roles field.

Understanding Directory Junctions and Virtual Organizations

A *directory junction* is a hierarchically related set of organizations that mirrors a directory resource's actual set of hierarchical containers. A *directory resource* is one that employs a hierarchical namespace through the use of hierarchical containers. Examples of directory resources include LDAP servers and Windows Active Directory resources.

Each organization in a directory junction is a ***virtual organization***. The top-most virtual organization in a directory junction is a mirror of the container representing the base context defined in the resource. The remaining virtual organizations in a directory junction are *direct* or *indirect* children of the top virtual organization, and also mirror one of the directory resource containers that are children of the defined resource's base context container. This structure is illustrated in Figure 6-4.

Figure 6-4 Identity Manager Virtual Organization



Directory junctions can be spliced into the existing Identity Manager organizational structure at any point. However, directory junctions cannot be spliced within or below an existing directory junction.

Once you have added a directory junction to the Identity Manager organizational tree, you can create or delete virtual organizations in the context of that directory junction. In addition, you can refresh the set of virtual organizations comprising a directory junction at any time to ensure they stay synchronized with the directory resource containers. You cannot create a non-virtual organization within a directory junction.

You can make Identity Manager objects (such as users, resource, and roles) members of, and available to, a virtual organization in the same way as an Identity Manager organization.

Setting Up Directory Junctions

To set up directory junctions, follow these steps:

1. In the Administrator interface, select **Accounts** in the menu bar.

   The User List page opens.

2. Select an Identity Manager organization in the Accounts list. The organization you select will be the parent organization of the virtual organization you set up.

   Then, in the **New Actions** menu, select **New Directory Junction**.

   Identity Manager opens the Create Directory Junction page.

3. Make selections to set up the virtual organization:

   - **Parent organization** — This field contains the organization you selected from the Accounts list; you can, however, select a different parent organization from the list.
   - **Directory resource** — Select the directory resource that manages the existing directory whose structure you want to mirror in the virtual organization.
   - **User form** — Select a user form that will apply to administrators in this organization.
   - **Identity Manager account policy** — Select a policy, or select the default option (inherited) to inherit the policy from the parent organization.
   - **Approvers** — Select administrators who can approve requests related to this organization.

Refreshing Virtual Organizations

This process refreshes and re-synchronizes the virtual organization with the associated directory resource, from the selected organization down. Select the virtual organization in the list, and then select Refresh Organization from the Organization Actions list.

Deleting Virtual Organizations

When deleting virtual organizations, you can select from two delete options:

- Delete the Identity Manager organization only — Deletes the Identity Manager directory junction only.
- Delete the Identity Manager organization and the resource container — Deletes the Identity Manager directory junction and the corresponding organization on the native resource.

Select an option, and then click **Delete**.

Understanding and Managing Capabilities

Capabilities are groups of rights in the Identity Manager system. Capabilities represent administrative job responsibilities, such as resetting passwords or administering user accounts. Each Identity Manager administrative user is assigned one or more capabilities, which provide a set of privileges without compromising data protection.

Not all Identity Manager users need capabilities assigned. Only those users who will perform one or more administrative actions through Identity Manager will require capabilities. For example, an assigned capability is not needed to enable a user to change his password, but an assigned capability is required to change another user's password.

Your assigned capabilities govern which areas of the Identity Manager Administrator Interface you can access. All Identity Manager administrative users can access certain areas of Identity Manager, including:

- **Home** and **Help** tabs
- **Passwords** tab (**Change My Password** and **Change My Answers** subtabs only)
- **Reports** (limited to types related to the administrator's specific responsibilities)

NOTE A list of Identity Manager's default task-based and functional capabilities (with definitions) is included in Appendix D, "Capabilities Definitions" on page 667. This appendix also lists the tabs and subtabs that may be accessed with each task-based capability.

Capabilities Categories

Identity Manager defines Capabilities as:

- **Task-based**. These are capabilities at their simplest task level.
- **Functional.** Functional capabilities contain one or more other functional or task-based capabilities.

Built-in capabilities (those provided with the Identity Manager system) are *protected*, meaning that you cannot edit them. You can, however, use them within capabilities that you create.

Protected (built-in) capabilities are indicated in the list with a red key (or red key and folder) icon. Capabilities that you create and can edit are indicated in the capabilities list with a green key (or green key and folder) icon.

Working with Capabilities

This section describes how to create, edit, assign, and rename capabilities. These tasks are performed using the Capabilities page.

View the Capabilities Page

The Capabilities page is found under the Security tab.

To open the Capabilities page, follow these steps:

1. In the Administrator interface, click **Security i**n the top menu.
2. Click **Capabilities** in the secondary menu.

   The Capabilities page opens and shows a list of Identity Manager capabilities.

Create a Capability

Use the following procedure to create a capability. To *clone* a capability, see "Save and Rename a Capability" on page 241.

To create a capability, follow these steps:

1. In the Administrator interface, click **Security** in the top menu.
2. Click **Capabilities** in the secondary menu.

   The Capabilities page opens and shows a list of Identity Manager capabilities.
3. Click **New**.

   The Create Capability page opens.
4. Complete the form as follows:
   a. Name the new capability.
   b. In the **Capabilities** section, use the arrow buttons to move the capabilities that should be assigned to users into the **Assigned Capabilities** box.
   c. In the **Assigners** box, select one or more users that will be allowed to assign this capability to other users. If no users are selected, the only user who will be able to assign this capability is the one that created the capability. If the user who created the capability does not have the Assign User Capability capability assigned, then one or more users must be selected in order to ensure that at least one user can assign the capability to another user.
   d. In the **Organizations** box, select one or more organizations to which this capability will be available.
   e. Click **Save**.

NOTE The set of users from which you can make assigner selections are those who have been assigned the Assign Capability right.

Edit a Capability

You can edit a non-protected capability.

To edit a non-protected capability, follow these steps:

1. In the Administrator interface, click **Security i**n the top menu.
2. Click **Capabilities** in the secondary menu.

   The Capabilities page opens and shows a list of Identity Manager capabilities.
3. Right-click the capability in the list, and then select **Edit**. The Edit Capability page opens.
4. Make your changes and click **Save**.

You cannot edit built-in capabilities. You can, however, save them with a different name in order to create your own capability. You can also use built-in capabilities in capabilities that you create.

Save and Rename a Capability

You can create a new capability by saving an existing capability with a new name. This process is known as *cloning* the capability.

To clone a capability, follow these steps:

1. In the Administrator interface, click **Security i**n the top menu.
2. Click **Capabilities** in the secondary menu.

   The Capabilities page opens and shows a list of Identity Manager capabilities.
3. Right-click the capability in the list, and then select **Save As**.

   A dialog box opens and asks you to type a name for the new capability.
4. Type a name and click **OK**.

You can now edit the new capability.

Assigning Capabilities

Use the Create User page (page 76) or the Edit User page (page 81) to assign capabilities to users. You can also assign capabilities to a user by assigning an administrator role, which you set up through the Security area in the interface. See "Understanding and Managing Admin Roles" on page 243 for more information.

NOTE A list of Identity Manager's default task-based and functional capabilities (with definitions) is included in Appendix D, "Capabilities Definitions" on page 667. This appendix also lists the tabs and subtabs that may be accessed with each task-based capability.

Understanding and Managing Admin Roles

Admin Roles define two things: a set of capabilities and a scope of control. (The term *scope of control* refers to one or more managed organizations.) Once defined, admin roles can then be assigned to one or more administrators.

NOTE Do not confuse *roles* with *admin-roles*. Roles are used to manage end-users' access to external resources, whereas admin-roles are primarily used to manage Identity Manager administrator access to Identity Manager objects.

The information presented in this section is limited to admin roles. For information about roles, see "Understanding and Managing Roles" on page 124.

Multiple admin roles can be assigned to a single administrator. This enables an administrator to have one set of capabilities in one scope of control, and a different set of capabilities in another scope of control. For example, one admin role might grant the administrator the right to create and edit users for the controlled organizations specified in that admin role. A second admin role assigned to the same administrator, however, might grant only the "change users' passwords" right in a separate set of controlled organizations as defined in that admin role.

Admin roles enable the reuse of capabilities and scope-of-control pairings. Admin roles also simplify the management of administrator privileges across a large number of users. Instead of directly assigning capabilities and controlled organizations to individual users, admin roles should be used to grant administrator privileges.

The assignment of capabilities or organizations (or both) to an admin role can be either *direct* or *dynamic* (indirect):

- **Direct** — Using this method, capabilities and/or controlled organizations are explicitly assigned to the admin role. For example, an admin role might be assigned the *User Report Administrator* capability and the controlled organization *Top*.
- **Dynamic** (indirect) — This method uses rules to assign capabilities and controlled organizations. Rules are evaluated each time an administrator assigned the admin role logs in. Once an administrator is authenticated, rules dynamically determine which set of capabilities and/or controlled organizations are assigned.

For example, when a user logs in:

- If his Active Directory (AD) user title is *manager*, then the capabilities rule might return *Account Administrator* as the capability to be assigned.
- If his Active Directory (AD) user department is *marketing*, then the controlled organizations rule might return *Marketing* as the controlled organization to be assigned.

NOTE The dynamic assignment of admin roles to users can be enabled or disabled for each login interface (for example, the User interface or Administrator interface). To do this, set the following system configuration attribute to `true` or `false`:

`security.authz.checkDynamicallyAssignedAdminRolesAtLoginTo.logininterface`

The default for all interfaces is `false`.

For instructions on editing the system configuration object, see page 214.

Admin Role Rules

Identity Manager provides sample rules that you can use to create rules for Admin Roles. These rules are available in the Identity Manager installation directory in `sample/adminRoleRules.xml`.

Table 6-1 provides the rule names and the `authType` you must specify for each rule.

Table 6-1 Admin Role Sample Rules

Rule Name	authType
Controlled Organizations Rule	ControlledOrganizationsRule
Capabilities Rule	CapabilitiesRule
User Is Assigned Admin Role Rule	UserIsAssignedAdminRoleRule

NOTE For information about the sample rules provided for service provider users admin roles, see "Delegated Administration" on page 616 in the Service Provider Administration chapter.

The User Admin Role

Identity Manager includes a built-in admin role, named *User Admin Role*. By default, it has no assigned capabilities or controlled organization assignments. It cannot be deleted. This admin role is implicitly assigned to all users (end-users and administrators) at login time, regardless of the interface they log in to (for example, user, administrator, console, or IDE).

NOTE For information about creating an admin role for service provider users, see "Delegated Administration" on page 616 in the Service Provider Administration chapter.

You can edit the User Admin Role through the Administrator interface (select **Security**, and then select **Admin Roles**).

Because any capabilities or controlled organizations that are statically assigned through this admin role are assigned to all users, it is recommended that the assignment of capabilities and controlled organizations be done through rules. This will enable different users to have different (or no) capabilities, and assignments will be scoped depending on factors such as who they are, which department they are in, or whether they are managers, which can be queried for within the context of the rules.

The User Admin Role does not deprecate or replace the use of the `authorized=true` flag used in workflows. This flag is still appropriate in cases where the user should not have access to objects accessed by the workflow, except when the workflow is executing. Essentially, this lets the user enter a *run as superuser* mode.

There may be cases, however, where a user should have specific access to one or more objects outside of (and potentially inside of) workflows. In these cases, using rules to dynamically assign capabilities and controlled organizations allows for fine-grain authorization to those objects.

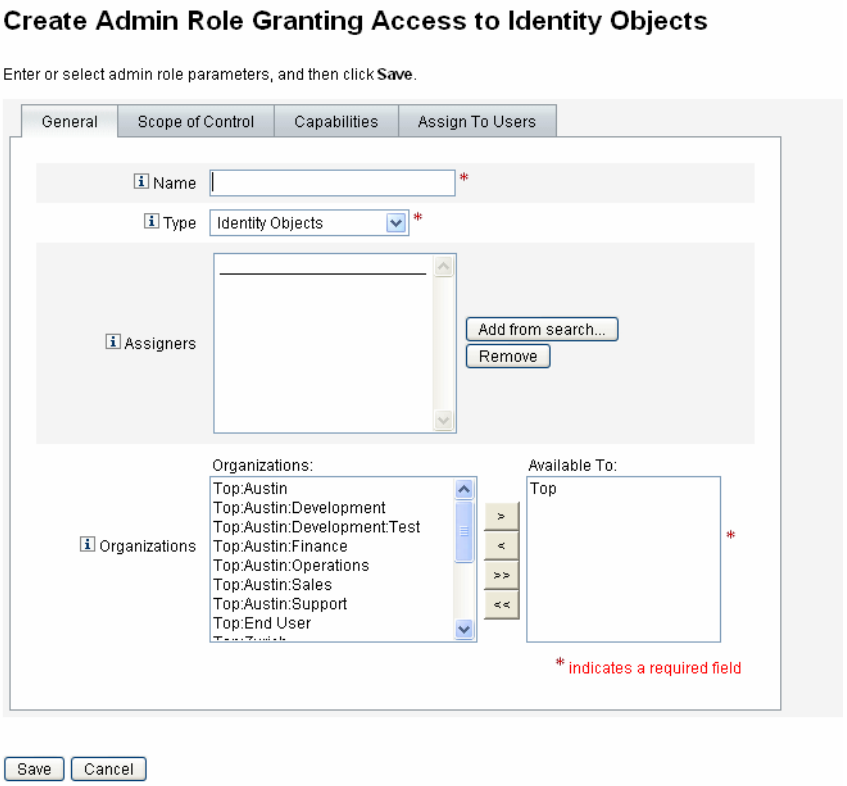
Creating and Editing Admin Roles

To create or edit an admin role, you must be assigned the Admin Role Administrator capability.

To access admin roles in the Administrator interface, click **Security**, and then click the **Admin Roles** tab. The Admin Roles list page allows you to create, edit, and delete admin roles for Identity Manager users and for service provider users.

To edit an existing admin role, click a name in the list. Click **New** to create an admin role. Identity Manager displays the Create Admin Role options (illustrated in Figure 6-5). The Create Admin Role view presents four tabs that you use to specify the general attributes, capabilities, and scope of the new admin role, as well as assignments of the role to users.

Figure 6-5 Admin Role Create Page: General Tab



General Tab

Use the General tab of the create admin role or edit admin role view to specify the following basic characteristics of the admin role:

- **Name** — A unique name for this admin role.

  For example, you might create the Finance Admin Role for users who will have administrative capabilities for users in the Finance department (or organization).

- **Type** — Select either **Identity Objects** or **Service Provider Users** for the type. This field is required.

  Select Identity Objects if you are creating an admin role for Identity Manager users (or objects). Select Service Provider Users if you are creating the admin role to grant access to service provider users.

NOTE For information about creating an admin role to grant access to service provider users, see "Delegated Administration" on page 616 in the Service Provider Administration chapter.

- **Assigners** — Select or search for users that will be allowed to assign this admin role to other users. The set of users from which you can make selections includes those who have been assigned the Assign Capability right.

  If no users are selected, the only user who will be able to assign the admin role is the one that created it. If the user who created the admin role does not have the Assign User Capabilities capability assigned, then select one or more users as Assigners to ensure that at least one user can assign the admin role to another user.

- **Organizations** — Select one or more organizations to which this admin role will be available. This field is required.

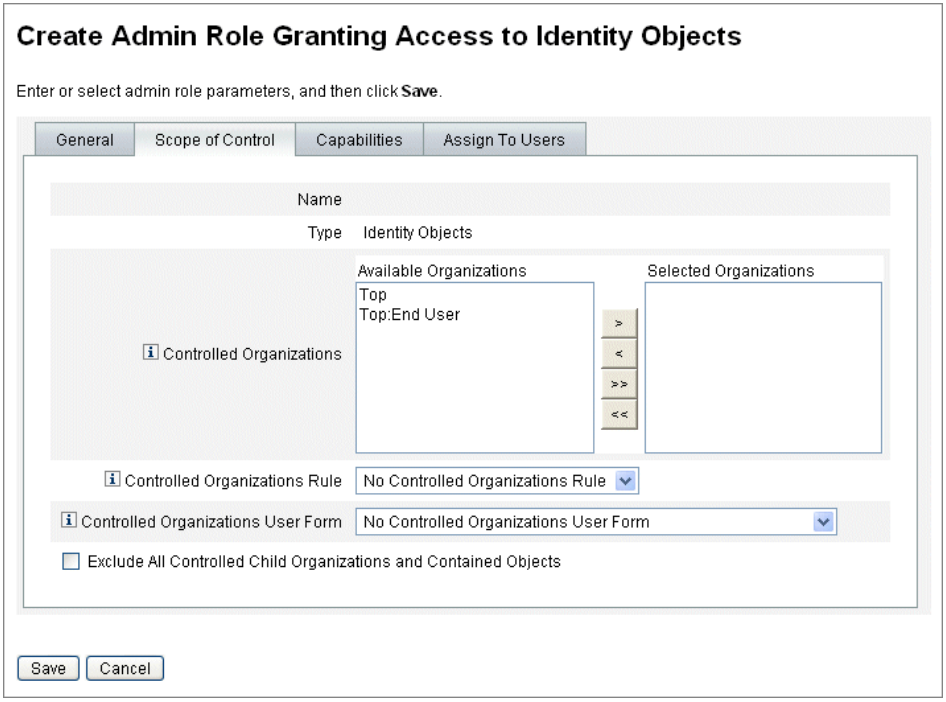
  The administrator can manage objects in the assigned organization and in any organizations below that organization in the hierarchy.

Scope of Control

Identity Manager allows you to control which users are within an end user's scope of control.

Use the Scope of Control tab (shown in Figure 6-6) to specify organizations that members of this organization can manage, or to specify the rule that determines the organizations to be managed by users of the admin role, and to select the user form for the admin role.

Figure 6-6 Create Admin Role: Scope of Control



- **Controlled Organizations** — Select from the Available Organizations list the organizations that this admin role has the rights to manage.
- **Controlled Organizations Rule** — Select a rule that will be evaluated, at user login, to zero or more organizations to be controlled by a user assigned this admin role. The selected rule must have the `ControlledOrganizationsRule` authType. By default, no controlled organization rule is selected.

NOTE You can use the `EndUserControlledOrganizations` rule to define whatever logic is necessary to ensure the right set of users are available for delegating, based on your organizational needs.

If you want the scoped list of users to be the same for administrators, whether they are logged into the Administrator interface or the End User interface, you must change the `EndUserControlledOrganizations` rule as follows:

Modify the rule to first check whether the authenticating user is an administrator, and then configure the following:

- If the user is not an administrator, return the set of organizations that should be controlled by an end user, such as the user's own organization (for example, `waveset.organization`).
- If the user is an administrator, do not return any organizations so the user only controls organizations that are assigned because that user is an administrator.

For example:

```
<Rule protectedFromDelete='true'
      authType='EndUserControlledOrganizationsRule'
      id='#ID#End User Controlled Organizations'
      name='End User Controlled Organizations'>
  <Comments>
    If the user logging in is not an Idm administrator,
    then return the organization that they are a member of.
    Otherwise, return null.
  </Comments>
  <cond>
    <and>
      <isnull><ref>waveset.adminRoles</ref></isnull>
      <isnull><ref>waveset.capabilities</ref></isnull>
      <isnull><ref>waveset.controlledOrganizations</ref></isnull>
    </and>
    <ref>waveset.organization</ref>
  </cond>
  <MemberObjectGroups>
    <ObjectRef type='ObjectGroup' id='#ID#Top' name='Top'/>
  </MemberObjectGroups>
</Rule>
```

- **Controlled Organizations User Form** — Select a user form that a user who is assigned this admin role will use when he creates or edits users who are members of this admin role's controlled organizations. By default, no Controlled Organizations User Form is selected.

  A user form assigned through an admin role overrides any user form that is inherited from the organization of which the administrator is a member. It does not override a user form that is directly assigned to the admin.

Assigning Capabilities

Capabilities assigned to the admin role determine what administrative rights users assigned the admin role have. For example, this admin role might be restricted to creating users only for the controlled organizations of the admin role. In that case, you assign the Create User capability.

On the Capabilities tab, select the following options:

- **Capabilities** — These are specific capabilities (administrative rights) that the users of the admin role will have for their controlled organizations. Select one or more capabilities from the list of available capabilities and move them to the Assigned Capabilities list.
- **Capabilities Rule** — Select a rule that when evaluated at user login, will determine the list of zero or more capabilities granted to users assigned the admin role. The selected rule must have the `CapabilitiesRule` authType.

Assigning User Forms to an Admin Role

You can specify a user form to for the members of an admin role. Use the Assign To Users tab on the create admin role or edit admin role view to specify the assignments.

The administrator assigned the admin role will use this user form when he creates or edits users in the organizations controlled by that admin role. A user form assigned through an admin role overrides any user form that is inherited from the organization of which the admin is a member. It does not override a user form that is directly assigned to the admin.

The user form that will be used when editing a user is determined in this order of precedence:

- If a user form is assigned directly to the admin, then it is used.
- If no user form is assigned directly to the admin, but the admin is assigned an admin role that:
  - controls the organization of which the user being created or edited is a member, and
  - specifies a user form

  then that user form is used.
- If no user form is assigned directly to the admin, or assigned indirectly through an admin role, then the user form assigned to the admin's member organizations (starting with the admin's member organization and going up to just below `Top`) is used.
- If none of the admin's member organizations are assigned a user form, then the default user form is used.

If an admin is assigned more than one admin role that controls the same organization but specifies different user forms, then an error is displayed when he attempts to create or edit a user in that organization. If an admin attempts to assign two or more admin roles that control the same organization but specify different user forms, then an error is displayed. Changes cannot be saved until the conflict is resolved.

The “End User” Organization

The End User organization provides a convenient way for administrators to make certain objects, such as resource and roles, available to end-users. End-users can view and potentially assign designated objects to themselves (pending an approval process) using the end-user interface (page 57).

NOTE The “End User” organization was introduced in version 7.1.1 of Identity Manager.

Previously, in order to grant end-users access to Identity Manager configuration objects, such as Roles, Resources, Tasks, and so on, administrators had to edit configuration objects and use End User Tasks, End User Resources, and End User authTypes.

Going forward, Sun recommends using the “End User” organization to give end-users access to Identity Manager configuration objects.

The End User organization is implicitly controlled by all users, and enables them to view several types of objects, including tasks, rules, roles, and resources. Initially, however, the organization has no member objects.

The End User organization is a member of `Top` and cannot have child organizations. In addition, the End User organization is not displayed in the Accounts page list. When editing objects (such as Roles, AdminRoles, Resources, Policy, Tasks, and so on), however, you can make any object available to the End User organization using the Administrator user interface.

When end-users log in to the end-user interface, the following things happen:

- End-users are granted control of the EndUser organization (ObjectGroup)
- Identity Manager evaluates the built-in “End User Controlled Organization” rule. This rule automatically gives the user control of any organization names that are returned by the rule. (This rule was added in version 7.1.1 of Identity Manager. It is described in the following section.)
- End-users are granted rights to the object types specified in the EndUser capability.

The End User Controlled Organization Rule

The input argument to the End User Controlled Organization rule is the authenticating user's view. Identity Manager expects the rule to return one or more organizations that the user logging in to the End User interface will control. Identity Manager expects the rule to return either a string (for a single organization) or a list (for multiple organizations).

To manage these objects, users need the End User Administrator capability. Users who are assigned the End User Administrator capability can view and modify the contents of the End User Controlled Organization rule. These users can also view and modify the object types specified in the EndUser capability.

The End User Administrator capability is assigned to the Configurator user by default. Any changes made to the list or to organizations returned by the evaluation of the End User Controlled Organization rule will not be reflected dynamically for logged in users. These users must log out and then log in again to see the changes.

If the End User Controlled Organization rule returns an invalid organization (for example, an organization that does not exist in Identity Manager), the problem will be logged in the System Log. To correct the problem, log in to the Administrator user interface and fix the rule.

Managing Work Items

Some workflow processes generated by tasks in Identity Manager create action items or *work items*. These work items might be a request for approval or some other action request assigned to an Identity Manager account.

Identity Manager groups all work items in the Work Items area of the interface, enabling you to view and respond to all pending requests from one location.

Work Item Types

A work item might be one of the following types:

- **Approvals** — Requests for approvals of new accounts or changes to accounts.
- **Attestations** — Requests to review and approve user entitlements.
- **Remediations** — Requests to remediate or mitigate user account policy violations.
- **Other** — Action item request for other than one of the standard types. This might be an action request generated from a customized workflow.

To view pending work items for each work item type, click **Work Items** in the menu.

NOTE If you are a work item owner with pending work items (or delegated work items), then your Work Items list is displayed when you log into the Identity Manager User interface.

Working With Work Item Requests

To respond to a work item request, click one of the work item types in the Work Items area of the interface. Select items from the list of requests and then click one of the buttons available to indicate the action you want to take. The work item options vary depending on the work item type.

For more information about responding to requests, see the following topics:

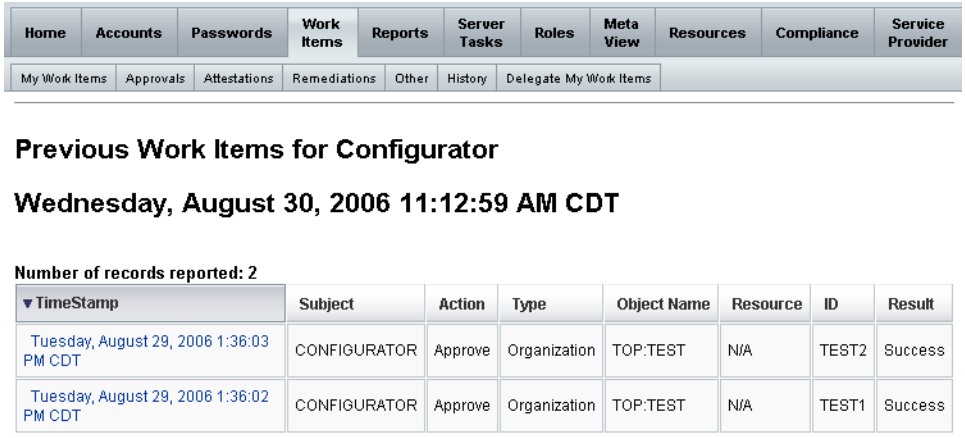
- "Approvals" on page 262
- "Managing Attestation Duties" on page 561
- "Compliance Violation Remediation and Mitigation" on page 530

Viewing Work Item History

Use the History tab in the Work Items area to view the results of previous work item actions.

Figure 6-7 displays a sample view of Work Item history.

Figure 6-7 Work Items History View



Delegating Work Items

Work item owners can manage work loads by delegating work items to other users for a specified period of time. From the main menu, you can use the **Work Items > Delegate My Work** Items page to delegate future work items (such as requests for approval) to one or more users (delegates). Users do not need approver capabilities to be delegates.

NOTE The delegation feature applies only to future work items. Existing items (those listed under My Work Items must be selectively forwarded through the forwarding feature.

There are other pages from which you can delegate work items:

- In the Administrator interface, you can delegate work items from the Create User and Edit User pages (page 69). Click the **Delegations** form tab.
- In the end-user User Interface (page 54), users can click the **Delegations** menu item.

Delegates can approve work items on a work item owner's behalf during the effective delegation period. Delegated work items include the name of the delegate.

Any user can create one or more delegations for their future work items. Administrators who can edit a user can also create a delegation on that user's behalf. An administrator cannot, however, delegate to someone that the user cannot delegate to. (With regards to delegations, the administrator's scope of control is the same as the user on whose behalf the delegation is being made.)

Audit Log Entries

Audit log entries list the delegator's name when delegated work items are approved or rejected. Changes to a user's delegate approver information are logged in the detailed changes section of the audit log entry when a user is created or modified.

Viewing Current Delegations

View delegations on the Current Delegations page.

To view current delegations, follow these steps:

1. In the Administrator interface, click **Work Items** in the main menu.
2. Click **Delegate My Work Items** in the secondary menu.

   Identity Manager displays the Current Delegations page, where you can view and edit delegations currently in effect.

Viewing Previous Delegations

View previous delegations on the Previous Delegations page.

To view previous delegations, follow these steps:

1. In the Administrator interface, click **Work Items** in the main menu.
2. Click **Delegate My Work Items** in the secondary menu.

   The Current Delegations page opens.
3. Click **Previous**.

   The Previous Delegations page opens. Previously delegated work items can be used to set up new delegations.

Creating Delegations

Create a delegation using the New Delegation page.

To create a delegation, follow these steps:

1. In the Administrator interface, click **Work Items** in the main menu.
2. Click **Delegate My Work Items**.

   The Current Delegations page opens.
3. Click **New**.

   The New Delegation page opens.
4. Complete the form as follows:

   a. Select a work item type from the **Select Work Item Type to Delegate** selection list. To delegate all of your work items, select **All Work Item Types**.

      If you are delegating a role-type, organization, or resource work-item, specify the specific role(s), organization(s), or resource(s) that should define this delegation by using the arrows to move selections from the **Available** column to the **Selected** column.

   b. **Delegate Work Items To** — Select one of:

      - **Selected Users** — Select to search for users in your scope of control (by name) to be delegates. If any one of the selected delegates has also delegated his work items, then your future work item requests will be delegated to that delegate's delegates.
      - Select one or more users in the Users Selected area. Alternatively, click **Add from Search** to open the search feature and search for users. Click **Add** to add a found user to the list. To remove a delegate from the list, select it, and then click **Remove**.
      - **My Manager** — Select to delegate work items to your manager (if assigned)
      - **DelegateWorkItemRule** — Select a rule that returns a list of Identity Manager user names to which you can delegate the selected work item type.

   c. **Start Date** — Select the date on which delegation of the work item should start. By default, the day selected begins at 12:01 a.m.

d. **End Date** — Select the date on which delegation of the work item should end. By default, the day selected ends at 11:59 p.m.

NOTE It is possible to select the same start and end dates, in order to delegate work items for a single day.

e. Click **OK** to save selections and return to the list of work items awaiting approval.

NOTE After setting up delegation, any work items created during the effective delegation period are added to the delegate's list. If you end a delegation or the delegation time period expires, then the delegated work items are returned to your list. This may result in duplicate work items on your list. However, when you approve or reject one, then the duplicate will be automatically removed from your list.

Delegations to Deleted Users

Identity Manager works as follows when a user is deleted that owns any pending work items:

- If the pending work items were delegated and the delegator has not been deleted, the pending work items will be returned to the delegator.
- If the pending work items were not delegated, or if the pending work items were delegated and the delegator has been deleted, the delete attempt will fail until the user's pending work items have either been resolved or forwarded to another user.

Ending Delegations

End one or more delegations from the Current Delegations page.

To end one or more delegations, follow these steps:

1. In the Administrator interface, click **Work Items** in the main menu.
2. Click **Delegate My Work Items** in the secondary menu.

   The Current Delegations page opens.
3. Select one or more delegations to end, and then click **End**.

   Identity Manager removes the selected delegation configurations, and returns any delegated work items of the type selected to your list of pending work items.

Approvals

When a user is added to the Identity Manager system, administrators who are assigned as *approvers* for new accounts must validate account creation.

Identity Manager supports three categories of approval:

- **Organization** — Approval is needed for the user account to be added to the organization.
- **Role** — Approval is needed for the user account to be assigned to a role.
- **Resource** — Approval is needed for the user account to be given access to a resource.

In addition, if change-approvals are enabled, and changes are made to a role, a change-approval work item is sent to designated role owners.

Identity Manager supports change-approvals as follows:

- **Role Definition** — If an administrator changes a role definition, change-approval is needed from a designated role owner. A role owner must approve the work item in order for the change to be made.

NOTE You can configure Identity Manager for digitally signed approvals. For instructions see "Configuring Digitally Signed Approvals and Actions" on page 265.

NOTE Administrators who are new to Identity Manager sometimes confuse the concept of *approvals* with the similar sounding concept of *attestation*. While the names sound similar, approvals and attestation take place in different contexts.

Approvals are concerned with validating new user accounts. When a user is added to Identity Manager, one or more approvals may be required to validate that the new account is authorized.

Attestations are concerned with verifying that existing users have only appropriate privileges on appropriate resources. As part of a Periodic Access Review process, an Identity Manager user (*the attestor*) may be called upon to certify that another user's account details (that is, the user's assigned resources) are valid and correct. This process is known as attestation.

Setting Up Account Approvers

Setting up account approvers for organization, role, and resource approvals is optional, but recommended. For each category in which approvers are set up, at least one approval is required for account creation. If one approver rejects a request for approval, the account is not created.

You can assign more than one approver to each category. Because only one approval within a category is needed, you can set up multiple approvers to help ensure workflow is not delayed or halted. If one approver is unavailable, others are available to handle requests. Approval applies only to account creation. By default, account updates and deletions do not require approval. You can, however, customize this process to require it.

You can customize workflows by using the Identity Manager IDE to change the flow of approvals, capture account deletions, and capture updates.

For information about the IDE, see "Identity Manager IDE" on page 61. For information about workflows, and an illustrated example of altering the approval workflow, see *Identity Manager Workflows, Forms, and Views.*

Identity Manager Approvers can either approve or reject an approval request.

Administrators can view and manage pending approvals from the Work Items area of the Identity Manager interface. From the Work Items page, click **My Work Items** to view pending approvals. Click the **Approvals** tab to manage approvals.

Signing Approvals

To approve a work item using a digital signature, you must first set up the digital signature as described in "Configuring Digitally Signed Approvals and Actions" on page 265.

To sign an approval, follow these steps:

1. From the Identity Manager Administrator interface, select **Work Items**.
2. Click the **Approvals** tab.
3. Select one or more approvals from the list.
4. Enter comments for the approval, and then click **Approve**.

   Identity Manager prompts you and asks whether to trust the applet.
5. Click **Always**.

   Identity Manager displays a dated summary of the approval.
6. Enter or click **Browse** to locate the keystore location (this location is set during the signed-approval configuration, as described in Step 10m in the procedure "Client-Side Configuration for Signed Approvals Using PKCS12" on page 267.).
7. Enter the keystore password (this password is set during the signed-approval configuration, as described in Step 10l of the procedure "Client-Side Configuration for Signed Approvals Using PKCS12" on page 267).
8. Click **Sign** to approve the request.

Signing Subsequent Approvals

After signing an approval, subsequent approval actions require only that you enter the keystore password and then click **Sign**. (Identity Manager should remember the keystore location from the previous approval.)

Configuring Digitally Signed Approvals and Actions

Use the following information and procedures to set up digital signing. You can digitally sign:

- Approvals (including change-approvals)
- Access review actions
- Remediations for compliance violations

The topics discussed in this section explain the server-side and client-side configuration required to add the certificate and CRL to Identity Manager for signed approvals.

Server-Side Configuration for Signed Approvals

To enable server-side configuration, follow these steps:

1. Open the system configuration object for editing and set `security.nonrepudiation.signedApprovals=true`

   For instructions on editing the system configuration object, see page 214.

   If you are using PKCS11 you must also set `security.nonrepudiation.defaultKeystoreType=PKCS11`

   If you are using a custom PKCS11 Key provider, you must also set `security.nonrepudiation.defaultPKCS11KeyProvider=<your provider name>`)

NOTE Please refer to the following items in the REF kit for more information on when you need to need to write a custom provider:

`com.sun.idm.ui.web.applet.transactionsigner.DefaultPKCS11KeyProvider (Javadoc)`

`REF/transactionsigner/SamplePKCS11KeyProvider`

The REF (Resource Extension Facility) kit is provided in the `/REF` directory on your product CD or with your install image.

2. Add your certificate authority (CA)'s certificates as trusted certificates. To do this, you must first obtain a copy of the certificates.

   For example, if you are using a Microsoft CA, follow steps similar to these:

   a. Go to `http://IPAddress/certsrv` and log in with administrative privileges.

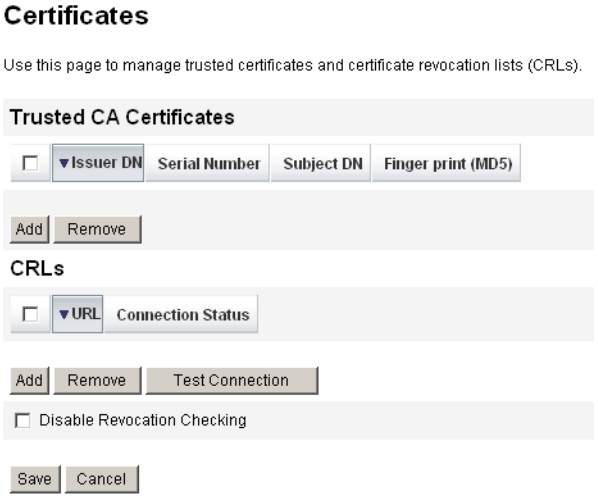
   b. Select Retrieve the CA certificate or certificate revocation list, and then click **Next**.

   c. Download and save the CA certificate.

3. Add the certificate to Identity Manager as a trusted certificate:

   a. From the Administrator interface, select **Security**, and then select **Certificates**. Identity Manager displays the Certificates page.

Figure 6-8 Certificates page



   b. In the Trusted CA Certificates area, click **Add**. Identity Manager displays the Import Certificate page.

   c. Browse to and then select the trusted certificate, and then click **Import**.

      The certificate now displays in the list of trusted certificates.

4. Add your CA's certificate revocation list (CRL):

   a. In the CRLs area of the Certificates page, click **Add**.

b. Enter the URL for the CA's CRL.

NOTE

- The certificate revocation list (CRL) is a list of certificate serial numbers that have been revoked or are not valid.
- The URL for the CA's CRL may be http or LDAP.
- Each CA has a different URL where CRLs are distributed; you can determine this by browsing the CA certificate's CRL Distribution Points extension.

5. Click **Test Connection** to verify the URL.
6. Click **Save**.
7. Sign applets/`ts2.jar` using jarsigner.

NOTE Refer to `http://java.sun.com/j2se/1.5.0/docs/tooldocs/windows/jarsigner.html` for more information. The `ts2.jar` file provided with Identity Manager is signed using a self-signed certificate, and should not be used for production systems. In production, this file should be re-signed using a code-signing certificate issued by your trusted CA.

Client-Side Configuration for Signed Approvals Using PKCS12

The following configuration information is for signed approvals using PKCS12. To enable the client-side configuration, follow these steps:

Prerequisites

We now require at least JRE 1.5.

Procedure

Obtain a certificate and private key, and then export them to a PKCS#12 keystore.

For example, if using a Microsoft CA, you would follow steps similar to these:

1. Using Internet Explorer, browse to `http://IPAddress/certsrv`, and then log in with administrative privileges.
2. Select Request a certificate, and then click **Next**.
3. Select Advanced request, and then click **Next**.

4. Click **Next**.
5. Select User for Certificate Template.
6. Select these options:
    a. Mark keys as exportable
    b. Enable strong key protection
    c. Use local machine store
7. Click **Submit**, and then click **OK**.
8. Click **Install this certificate**.
9. Select **Run —> mmc** to launch mmc.
10. Add the Certificate snap-in:
    a. Select Console—>Add/Remove Snap-in.
    b. Click **Add...**
    c. Select Computer account.
    d. Click **Next**, and then click **Finish**.
    e. Click **Close**.
    f. Click **OK**.
    g. Go to **Certificates—>Personal—>Certificates**.
    h. Right-click **Administrator All Tasks—>Export**.
    i. Click **Next**.
    j. Click **Next** to confirm exporting the private key.
    k. Click **Next**.
    l. Provide a password, and then click **Next**.
    m. File *CertificateLocation*.
    n. Click **Next**, and then click **Finish**. Click **OK** to confirm.

NOTE Note the information that you use in step 10l (password) and 10m (certificate location) of the client-side configuration. You will need this information to sign approvals.

Client-Side Configuration for Signed Approvals Using PKCS11

If you are using PKCS11 for signed approvals, refer to the following resources in the REF kit for configuration information:

`com.sun.idm.ui.web.applet.transactionsigner.DefaultPKCS11KeyProvider (Javadoc)`

`REF/transactionsigner/SamplePKCS11KeyProvider`

The REF (Resource Extension Facility) kit is provided in the `/REF` directory on your product CD or with your install image.

Viewing the Transaction Signature

Follow these steps to view the transaction signature in an Identity Manager AuditLog report:

1. From the Identity Manager Administrator interface, select **Reports**.
2. On the Run Reports page, select **AuditLog Report** from the **New...** list of options.
3. In the **Report Title** field, enter a title (for example, "Approvals").
4. In the **Organizations** selection area, select all organizations.
5. Select the **Actions** option, and then select **Approve**.
6. Click **Save** to save the report and return to the Run Reports page.
7. Click **Run** to run the Approvals report.
8. Click the details link to see transaction signature information, including:
   - issuer
   - subject
   - certificate serial number
   - message signed
   - signature
   - signature algorithm

Chapter 7

Data Loading and Synchronization

This chapter provides information and procedures for using Identity Manager data loading and synchronization features. You will learn how to use Identity Manager's data synchronization tools (discovery, reconciliation, and synchronization) to keep data current.

For an in-depth explanation of how data loading and synchronization works in Identity Manager, see the "Data Loading and Synchronization" chapter in the *Identity Manager Deployment Overview* book.

Data Synchronization Tools: Which to Use?

Identity Manager provides several tools that can be used to import and synchronize account data. For help selecting the correct tool for a given task, refer to Table 7-1.

NOTE For an in-depth explanation of how data loading and synchronization works in Identity Manager, see the "Data Loading and Synchronization" chapter in the *Identity Manager Deployment Overview* book.

Table 7-1 Tasks to Use with the Data Synchronization Tools

If you want to:	Then choose this feature:
Initially *pull* resource accounts into Identity Manager, without viewing before loading	Load from Resource
Initially *pull* resource accounts into Identity Manager, optionally viewing and editing data before loading	Extract to File, Load from File
Periodically *pull* resource accounts into Identity Manager, taking action on each account according to configured policy	Reconcile with Resources
Push or *pull* resource account changes into Identity Manager	Synchronization using Active Sync adapters (multiple resource implementations)

Discovery

Identity Manager account discovery features help facilitate rapid deployment and speed account creation tasks. These features are:

- **Extract to File** — Extracts the resource accounts returned by a resource adapter to a file (in CSV or XML format). You can manipulate this file before importing the data into Identity Manager.
- **Load from File** — Reads accounts in a file (in CSV or XML format) and loads them into Identity Manager.
- **Load from Resource** — Combines the other two discovery features, extracting accounts from a resource and loading them directly into Identity Manager.

Using these tools, you can create new Identity Manager users or correlate accounts on a resource with existing Identity Manager user accounts.

NOTE The pages in this section focus on how to use Identity Manager's Discovery features. To learn about data loading and synchronization in depth, see the "Data Loading and Synchronization" chapter in the *Identity Manager Deployment Overview* book.

Extract to File

Use this feature to extract resource accounts from a resource to an XML or CSV text file. Doing this allows you to view and make changes to extracted data before importing it into Identity Manager.

To extract accounts, follow these steps:

1. From the menu bar, select **Accounts**, and then select **Extract to File**.
2. Select a resource from which to extract accounts.
3. Select a file format for the output account information. You can extract data to an XML file, or to a text file with account attributes arranged in comma-separated value (CSV) format.
4. Click **Download**. Identity Manager displays a File Download dialog, in which you may choose to save or view the extracted file.

If you choose to open the file, you might have to select a program to view it.

Load from File

Use this feature to load resource accounts — either those extracted from a resource through Identity Manager, or from another file source — into Identity Manager. A file created by the Identity Manager Extract to File feature is in XML format. If you are loading a list of new users, the data file typically is in CSV format.

About CSV File Format

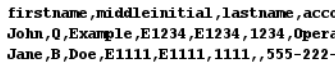
Often, accounts to be loaded are listed in a spreadsheet and saved in comma-separated-value (CSV) format for loading into Identity Manager. CSV file contents must follow these format guidelines:

- **Line 1** — Lists column headings or schema attributes for each field, separated by commas.
- **Lines 2 to end** — Lists values for each attribute defined in line 1, separated by commas. If data does not exist for a field value, that field must be represented by adjacent commas.

  For example, the first three lines of a file might look like the file entries in the following figure:

```
firstname,middleinitial,lastname,accountId,asciipassword,EmployeeID,Depart
ment,Phone
John,Q,Example,E1234,E1234,1234,Operations,555-222-1111
Jane,B,Doe,E1111,E1111,1111,,555-222-4444
```

Figure 7-1 Example of Properly Formatted CSV File for Loading Data



In this example, the second user (Jane Doe) does not have a department. The missing value is represented by adjacent commas (,,).

To load accounts, follow these steps:

1. In the Administrator interface, click **Accounts** in the menu, then click **Load from File.**

   Identity Manager displays the Load Accounts from File page.

2. Specify the following load options on the Load Accounts from File page:
   - **User Form** — When load creates an Identity Manager user, the user form assigns an organization as well as roles, resources, and other attributes. Select the user form to apply to each resource account.

- **Account Correlation Rule** — An account correlation rule selects Identity Manager users that might own each unowned resource account. Given the attributes of an unowned resource account, a correlation rule returns a list of names or a list of attribute conditions that will be used to select potential owners. Select a rule to look for Identity Manager users that may own each unowned resource account.
- **Account Confirmation Rule** — An account confirmation rule eliminates any non-owner from the list of potential owners that the correlation rule selects. Given the full View of an Identity Manager user and the attributes of an unowned resource account, a confirmation rule returns true if the user owns the account, and false otherwise. Select a rule to test each potential owner of a resource account. If you select **No Confirmation Rule**, Identity Manager accepts all potential owners without confirmation.

NOTE	In your environment, if the correlation rule will select at most one owner for each account, then you do not need a confirmation rule.

- **Load Only Matching** — Select to load into Identity Manager only those accounts that match an existing Identity Manager user. If you select this option, load will discard any unmatched resource account.
- **Update Attributes** — Select to replace the current Identity Manager user attribute values with the attribute values from the account being loaded.
- **Merge Attributes** — Enter one or more attribute names, separated by commas, for which values should be combined (eliminating duplicates) rather than overwritten. Use this option only for list-type attributes, such as groups and mailing lists. You must also select the Update Attributes option.
- **Result Level** — Select a threshold at which the load process will record an individual result for an account:
  - **Errors only** — Record an individual result only when loading an account produces an error message.
  - **Warnings and errors** — Record an individual result when loading an account produces a warning or an error message.
  - **Informational and above** — Record an individual result for every account. This causes the load process to run more slowly.

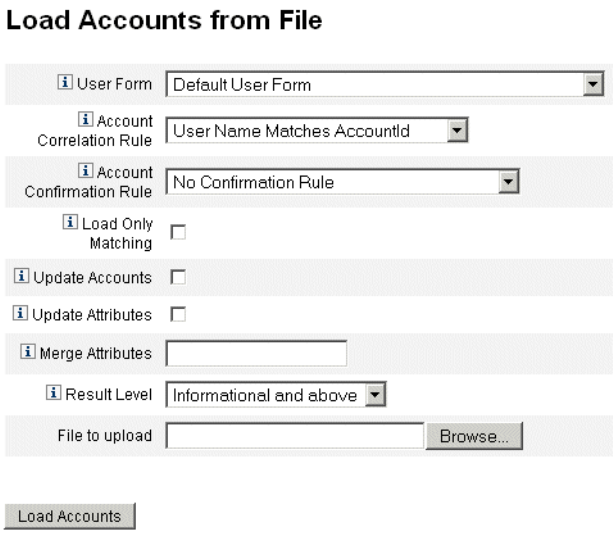
3. In the File to Upload field, specify a file to load, and then click **Load Accounts**.

NOTE

- If the input file does not contain a user column, you must select a confirmation rule for the load to proceed correctly.
- The task instance name associated with the load process is based on the input file name; therefore, if you re-use a file name, then the task instance associated with the latest load process will overwrite any previous task instances.

Figure 7-2 illustrates the fields and options available in the Load from File screen.

Figure 7-2 Load from File



If an account matches (or correlates with) an existing user, the load process will merge the account into the user. The process will also create a new Identity Manager user from any input account that does not correlate (unless Correlation Required is specified).

The `bulkAction.maxParseErrors` configuration variable sets a limit on the number of errors that can be found when a file is loaded. By default, the limit is 10 errors. If the `maxParseErrors` number of errors is found, then parsing stops.

Load from Resource

Use this feature to directly extract and import accounts into Identity Manager according to the load options you specify.

To import accounts, follow these steps:

1. In the Administrator interface, click **Accounts** in the menu, then click **Load from Resource**.

   The "Load Accounts from Resource" page opens.

2. Specify the load options on the "Load Accounts from Resource" page.

   The load options for this page are the same as those on the "Load from File" page (page 273).

Reconciliation

Use the reconciliation feature to periodically compare resource accounts in Identity Manager with the accounts actually present on the resources. Reconciliation correlates account data and highlights differences.

NOTE The pages in this section focus on how to perform reconciliation tasks using the Administrator interface. To learn about reconciliation in depth, see the "Data Loading and Synchronization" chapter in the *Identity Manager Deployment Overview* book.

Reconciliation in a Nutshell

Because reconciliation is designed for ongoing comparison, it has the following characteristics:

- Diagnoses account situations more specifically and supports a wider range of responses than the discovery process
- Can be scheduled (discovery cannot)
- Offers an incremental mode (discovery is always full mode)
- Can detect native changes (discovery cannot)

You can also configure reconciliation to launch an arbitrary workflow at each of the following points in processing a resource:

- Before reconciling any account
- For each account
- After reconciling all accounts

Access Identity Manager reconciliation features from the Resources area. The Resources list shows when each resource was last reconciled and its current reconciliation status.

NOTE Reconciliation is carried out by Identity Manager's reconciler component. For information about reconciler configuration settings, see "Reconciler Settings" on page 203.

About Reconciliation Policies

Reconciliation policies allow you to establish a set of responses, by resource, for each reconciliation task. Within a policy, you select the server to run reconciliation, determine how often and when reconciliation takes place, and set responses to each situation encountered during reconciliation. You can also configure reconciliation to detect changes made natively (not made through Identity Manager) to account attributes.

Editing Reconciliation Policies

To edit a reconciliation policy, follow these steps:

1. In the Administrator interface, click **Resources** in the menu.
2. Select a resource in the **Resource List**.
3. In the **Resource Actions** list, select **Edit Reconciliation Policy**.

Identity Manager displays the Edit Reconciliation Policy page, where you can make these policy selections:

- **Reconciliation Servers** — In a clustered environment, each server may run reconciliation. Specify which Identity Manager server will run reconciliation against resources in the policy.
- **Reconciliation Modes** — Reconciliation can be performed in different modes, which optimize different qualities:
  - **Full reconciliation** — Optimizes for thoroughness at a cost of speed.
  - **Incremental reconciliation** — Optimizes for speed at the expense of some thoroughness.

  Select the mode in which Identity Manager should run reconciliation against resources in the policy. Select **Do not reconcile** to disable reconciliation for targeted resources.
- **Full Reconciliation Schedule** — If full mode reconciliation is enabled, it is performed automatically on a fixed schedule. Specify how frequently full reconciliation should be run against resources in the policy.
  - Select the **Inherit default policy** option to inherit the indicated schedule from a higher-level policy.

- Clear the **Inherit default policy** option to specify a schedule. Use the fields provided to establish a recurring schedule, or, to create a custom adjustment to the reconciliation schedule, use a Task Schedule Repetition rule. For information on creating a Task Schedule Repetition rule, see "Using Task Schedule Repetition Rules" on page 288.

- **Incremental Reconciliation Schedule** — If incremental mode reconciliation is enabled, it is performed automatically on a fixed schedule.
  - Select the **Inherit default policy** option to inherit the schedule from a higher-level policy.
  - Clear the **Inherit default policy** option to specify a schedule. Use the fields provided to establish a recurring schedule, or, to create a custom adjustment to the reconciliation schedule, use a Task Schedule Repetition rule. For information on creating a Task Schedule Repetition rule, see "Using Task Schedule Repetition Rules" on page 288.

NOTE Not all resources support incremental reconciliation.

- **Attribute-level Reconciliation** — Reconciliation can be configured to detect changes made natively (that is, not made through Identity Manager) to account attributes. Specify whether reconciliation should detect native changes to the attributes specified in **Reconciled Account Attributes**.
- **Account Correlation Rule** — An account correlation rule selects Identity Manager users that might own each unowned resource account. Given the attributes of an unowned resource account, a correlation rule returns a list of names or a list of attribute conditions that will be used to select potential owners. Select a rule to look for Identity Manager users that may own each unowned resource account.
- **Account Confirmation Rule** — An account confirmation rule eliminates any non-owner from the list of potential owners that the correlation rule selects. Given the full View of an Identity Manager user and the attributes of an unowned resource account, a confirmation rule returns true if the user owns the account and false otherwise. Select a rule to test each potential owner of a resource account. If you select **No Confirmation Rule**, Identity Manager accepts all potential owners without confirmation.

NOTE In your environment, if the correlation rule will select at most one owner for each account, then you do not need a confirmation rule.

- **Proxy Administrator** — Specify the administrator to use when reconciliation responses are performed. The reconciliation can perform only those actions that the designated proxy administrator is permitted to do. The response will use the user form (if needed) that is associated with this administrator.

  You can also select the **No Proxy Administrator** option. When selected, reconciliation results are available to view, but no response actions or workflows are run.

- **Situation Options** (and Response)— Reconciliation recognizes several types of situations. Situations are described below. Specify in the **Response** column any action reconciliation should take.

  - **CONFIRMED** — The expected account exists.

    To be marked as CONFIRMED, the following must be true:

    - Identity Manager *expects* the account to exist.
    - The account exists on the resource.

  - **DELETED** — The expected account does not exist.

    To be marked as DELETED, the following must be true:

    - Identity Manager *expects* the account to exist.
    - The account *does not* exist on the resource.

  - **FOUND** — The reconciliation process found a matching account on an assigned resource.

    To be marked as FOUND, the following must be true:

    - Identity Manager expects that the account *may or may not* exist. (An account may or may not exist on a resource if the resource has been assigned to the user, but has not yet been provisioned.)
    - The account exists on the resource.

  - **MISSING** — No matching account exists on a resource assigned to the user.

    To be marked as MISSING, the following must be true:

    - Identity Manager expects that the account *may or may not* exist. (An account may or may not exist on a resource if the resource has been assigned to the user, but has not yet been provisioned.)
    - The account *does not* exist on the resource.

- **COLLISION** — Two or more Identity Manager users are assigned the same account on a resource.
- **UNASSIGNED** — The reconciliation process found a matching account on a resource not assigned to the user.

  To be marked as UNASSIGNED, the following must be true:

  - Identity Manager *does not expect* the account to exist. (Identity Manager does not expect an account to exist if that resource is not assigned to the user.)
  - The account exists on the resource.
- **UNMATCHED** — The resource account does not match any users.
- **DISPUTED** — The resource account matches more than one user.

Select from one of these response options (available options vary by situation):

- **Create new Identity Manager user based on resource account** — Runs the user form on the resource account attributes to create a new user. The resource account is not updated as a result of any changes.
- **Create resource account for Identity Manager user** — Recreates the missing resource account, using the user form to regenerate the resource account attributes.
- **Delete resource account and Disable resource account** — Deletes/disables the account on the resource.
- **Link resource account to Identity Manager user and Unlink resource account from Identity Manager user** — Adds or removes the resource account assignment to or from the user. No form processing is performed.
- **Do nothing** — Select this option if you do not want reconciliation to perform repairs.

  You can manually repair any account situation discovered by reconciliation. In the menu click **Resources > Examine Account Index**. From there you can browse the recorded situation for all accounts which have been reconciled. Right-click on an account and you will see a list of valid repair options. See "Examining the Account Index" on page 287 for more information.

- **Pre-reconciliation Workflow** — Reconciliation can be configured to run a user-specified workflow prior to reconciling a resource. Specify the workflow that reconciliation should run. Select Do not run workflow if no workflow should be run.
- **Per-account Workflow** — Reconciliation can be configured to run a user-specified workflow after responding to the situation of a resource account. Specify the workflow that reconciliation should run. Select Do not run workflow if no workflow should be run.
- **Post-reconciliation Workflow** — Reconciliation can be configured to run a user-specified workflow after completing reconciliation for a resource. Specify the workflow that reconciliation should run. Select **Do not run workflow** if no workflow should be run.
- **Explain Situation** — If enabled, reconciliation will record additional information explaining how it classified account situations. By default, this option is disabled. Recording explanations will cause the reconciliation process to run longer.
- **Error Limit** — If enabled, reconciliation will automatically terminate once the specified number of errors have occurred during processing. A value of 0 indicates that there is no limit on errors. De-select the Inherit default policy option to display the Maximum errors allowed field and enter a value.
- **Maximum Natively Removed Accounts** — This option is a safe-guard that evaluates the number of missing accounts on the resource and, if a threshold is exceeded, prevents the reconciler from unlinking them.

  To enable this feature, clear the **Inherit default policy** checkbox and specify a percentage in the **Maximum natively removed accounts allowed** field. The threshold must be set to a whole percentage from 0 to 100. (0 turns this feature off.)

  If the percentage of removed accounts exceeds the threshold, reconciliation continues all processing not related to the missing accounts and completes with an error.

Click **Save** to save policy changes.

Starting Reconciliation

Two options are available for starting reconciliation tasks:

- **Reconciliation schedule** — To run reconciliation at regular intervals, set a reconciliation schedule on the Edit Reconciliation Policy page.

  To open the Edit Reconciliation Policy page, see "Editing Reconciliation Policies" on page 279 and follow the steps.

  Reconciliation will run according to the parameters you have set in the policy.

- **Immediate reconciliation** — To run reconciliation immediately, follow these steps:

  a. In the Administrator interface, click **Resources** in the menu.

  b. Select a resource in the **Resource List**.

  c. In the **Resource Actions** list, select one of the following:

     - Full Reconcile Now
     - Incremental Reconcile Now

  Reconciliation will run according to the parameters you have set in the policy. If the policy has a regular schedule set for reconciliation, it will continue to run as specified.

Canceling Reconciliation

To cancel reconciliation, follow these steps:

1. In the Administrator interface, click **Resources** in the menu.
2. Select the resource in the **Resource List** for which you want to cancel reconciliation.
3. Locate the **Resource Actions** list and select **Cancel Reconciliation**.

Viewing Reconciliation Status

There are two main ways to view reconciliation status. To view detailed reconciliation status, open the Reconciliation Summary Results page for a specific resource. Limited reconciliation status is also available directly in the Resource List.

Viewing Detailed Reconciliation Status

View detailed reconciliation status using the Reconciliation Summary Results page.

To view detailed reconciliation status, follow these steps:

1. In the Administrator interface, click **Resources** in the menu.
2. Select the resource in the **Resource List** for which you want to view reconciliation status.
3. Locate the **Resource Actions** list and select **View Reconciliation Status**.

   The Reconciliation Summary Results page for the resource opens.

Viewing Reconciliation Status in the Resource List

Reconciliation status can also be obtained by viewing the Resource List. (To display the Resource List, open the Administrator interface and click **Resources** in the menu.)

The **Status** column reports the following reconciliation status conditions:

- **unknown** — Status is not known. Results for the latest reconciliation task are not available.
- **disabled** — Reconciliation is disabled.
- **failed** — The latest reconciliation failed to complete.
- **success** — The latest reconciliation completed successfully.
- **completed with errors** — The latest reconciliation completed, but with errors.

NOTE You must refresh this page to view changes to status. (The information does not automatically refresh.)

Working with the Account Index

The Account Index records the last known state of each resource account known to Identity Manager. It is primarily maintained by reconciliation, but other Identity Manager functions will also update the Account Index, as needed.

Discovery tools do not update the Account Index.

Searching the Account Index

Search the account index to view the last known state of a given resource account.

To search the account index, follow these steps:

1. In the Administrator interface, click **Resources** in the menu.
2. Select the resource in the **Resource List** for which you want to search the account index.
3. Locate the **Resource Actions** list and select **Search Account Index**.

   The Search Account Index page opens.
4. Select a search type, and then enter or select search attributes.
   - **Resource account name** — Select this option, select one of the modifiers (starts with, contains, or is), and then enter part or all of an account name.
   - **Resource is one of** — Select this option, and then select one or more resources from the list to find reconciled accounts that reside on the specified resources.
   - **Owner** — Select this option, select one of the modifiers (starts with, contains, or is), and then enter part or all of an owner name. To search for unowned accounts, search for accounts in the UNMATCHED or DISPUTED situation.
   - **Situation is one of** — Select this option, and then select one or more situations from the list to find reconciled accounts in the specified situations.
5. Click **Search** to search for accounts according to your search parameters. To limit the results of the search, optionally specify a number in the **Limit results to** first field. The default limit is the first 1000 accounts found.

   Click **Reset Query** to clear the page and make new selections.

Examining the Account Index

It is also possible to view all Identity Manager user accounts and optionally reconcile them on a per-user basis.

To examine the account index, follow these steps:

1. In the Administrator interface, click **Resources** in the menu.
2. Click **Examine Account Index** in the secondary menu.

   The Examine Account Index page opens.

The table displays all of the resource accounts that Identity Manager knows about (whether or not an Identity Manager user owns the account). This information is grouped by resource or by Identity Manager organization. To change this view, make a selection from the **Change index view** list.

Working with Accounts

To work with the accounts on a resource, select the **Group by resource** index view. Identity Manager displays folders for each type of resource. Navigate to a specific resource by expanding a folder. Click **+** or **-** next to the resource to display all resource accounts that Identity Manager knows about.

Accounts that have been added directly to the resource since the last reconciliation on that resource are not displayed.

Depending on the current situation of a given account, you may be able to perform several actions. Right-click on an account and you will see a list of valid repair options. You can also view account details or choose to reconcile that one account.

Working with Users

To work with Identity Manager users, select the **Group by user** index view. In this view, Identity Manager users and organizations are displayed in a hierarchy similar to the Accounts List page. To see accounts currently assigned to a user in Identity Manager, navigate to the user and click the indicator next to the user name. The user's accounts and the current status of those accounts that Identity Manager knows about are displayed under the user name.

Depending on the current situation of a given account, you may be able to perform several actions. You can also view account details or choose to reconcile that one account.

Using Task Schedule Repetition Rules

Use Task Schedule Repetition Rules to make adjustments to a reconciliation schedule. For example, if you want to push reconciliations scheduled for Saturday to the following Monday, use a Task Schedule Repetition Rule.

Task Schedule Repetition Rules can be used to adjust schedules for both full and incremental reconciliations.

For information on how to select Task Schedule Repetition rules, see "Editing Reconciliation Policies" on page 279.

How Reconciliation Run Times are Scheduled

Upon completing a reconciliation job, the reconciler component checks for its next scheduled run time.

First, the reconciler looks at the default schedule to obtain its next run time. Next, the reconciler runs all applicable Task Schedule Repetition Rules to see if schedule adjustments needs to be made. If an adjustment is needed, the rule schedule overrides the default schedule for that reconciliation.

NOTE Task Schedule Repetition Rules cannot overwrite the default schedule. They can only *override* scheduled start times on a per-job basis.

The "Accept All Dates" Sample Rule

This section describes the built-in sample rule named "Accept All Dates."

To view the "Accept All Dates" sample rule, follow these steps:

1. In a text editor, open `ReconRules.xml`, which is located in Identity Manager's `sample` directory.
2. Search for the rule named `SCHEDULING_RULE_ACCEPT_ALL_DATES`.

In order for a rule to be listed in the "TaskSchedule Repetition Rule" drop-down menu (on the Edit Reconciliation Policy page), the rule's `subtype` attribute must be set to `SUBTYPE_TASKSCHEDULE_REPETITION_RULE`:

```
<Rule subtype='SUBTYPE_TASKSCHEDULE_REPETITION_RULE'
name='SCHEDULING_RULE_ACCEPT_ALL_DATES'>
```

As noted previously, Task Schedule Repetition rules can modify the default reconciliation schedule.

The variable `calculatedNextDate` can either accept the next date, which is calculated in the default manner, or return a different date. As it is written in the sample rule, `calculatedNextDate` unconditionally accepts the default date:

Code Example 7-1 `SCHEDULING_RULE_ACCEPT_ALL_DATES` Rule Logic (Excerpt)

```
<RuleArgument name='calculatedNextDate'/>
<block>
  <ref>calculatedNextDate</ref>
</block>
```

To create a custom schedule, replace the rule logic in between the `<block>` elements. For example, to change the reconciliation start time to 10:00 AM on Saturdays, include the following JavaScript in between the `<block>` elements:

Code Example 7-2 Sample TaskSchedule Repetition Rule Logic

```
<block>
  <script>
     var calculatedNextDate = env.get('calculatedNextDate');

    // Test to see if this task is scheduled for a Saturday
    // (Note that 6 is used to denote Saturday in JavaScript)
    if(calculatedNextDate.getDay() == 6) {
      // If so, set the time to 10:00:00
      calculatedNextDate.setHours(10);
      calculatedNextDate.setMinutes(0);
      calculatedNextDate.setSeconds(0);
    }
    // Return the modified date
    calculatedNextDate;
  </script>
</block>
```

In Code Example 7-2, `calculatedNextDate` is initially set to the default scheduled time. If the next scheduled run date is a Saturday, then the rule schedules reconciliation to start at 10:00. If the next scheduled run date *is not* a Saturday, Code Example 7-2 returns `calculatedNextDate` without making any time adjustments, and the default schedule is used.

For more information about creating custom rules for use in Identity Manager, see the "Working with Rules" chapter in *Identity Manager Deployment Tools*.

Active Sync Adapters

The Identity Manager Active Sync feature allows information that is stored in an *authoritative external resource* (such as an application or database) to synchronize with Identity Manager user data. Configuring synchronization for an Identity Manager resource enables it to *listen* or poll for changes to the authoritative resource.

You can configure how resource attribute changes are flowed into Identity Manager by specifying the Input Form in the resource's synchronization policy (for the appropriate target object type).

NOTE The pages in this chapter focus on how to perform Active Sync tasks using the Administrator interface. To learn about Active Sync in depth, see the "Data Loading and Synchronization" chapter in the *Identity Manager Deployment Overview* book.

Configuring Synchronization

Identity Manager uses a synchronization policy to enable synchronization for resources.

Editing the Synchronization Policy

Each resource has its own synchronization policy.

To edit or configure synchronization, follow these steps:

1. In the Administrator interface, click **Resources** in the menu.
2. Select the resource in the **Resource List** for which you want to configure synchronization.
3. Find the **Resource Actions** list and select **Edit Synchronization Policy**.

   The Edit Synchronization page for the resource opens.

Specify the following options in the Edit Synchronization Policy page to configure synchronization:

- **Target Object Type** — Select the type of users to which the policy applies, either Identity Manager Users or Service Provider Users.

  NOTE In a Service Provider implementation you must configure a synchronization policy (with Service Provider Users specified as the object type) to enable synchronization of data for those users. For more information about service provider users, see Chapter 17, "Service Provider Administration."

- **Scheduling Settings** — Use this section to specify the startup method and polling schedule.

  Startup Type can be Manual, Automatic, Automatic with Failover, or Disabled:

  - **Automatic or Automatic with failover** — Starts the authoritative source when the Identity system is started.
  - **Manual** — Requires that an administrator start the authoritative source.
  - **Disabled** — Disables the resource.

  Use the **Start Date** and **Start Time** options to specify when polling begins. Specify the polling cycles by selecting an interval and entering a value for the interval (seconds, minutes, hours, days, weeks, months).

  If you set a polling start date and time that is in the future, polling will begin when specified. If you set a polling start date and time that is in the past, Identity Manager determines when to begin polling based on this information and the polling interval. For example:

  - You configure active synchronization for the resource on July 18, 2005 (Tuesday)
  - You set the resource to poll weekly, with a start date of July 4, 2005 (Monday) and time of 9:00 a.m.

  In this case, the resource will begin polling on July 25, 2005 (the following Monday).

If you do not specify a start date or time, then the resource will poll immediately. If you take this approach, each time the application server is restarted, all resources configured for active synchronization will begin polling immediately. The typical approach, is to set a start date and time.

- **Synchronization Servers** — In a clustered environment, each server can run synchronization. Select an option to specify which servers will be used to run synchronization for the resource.
  - Select **Use any available server** if it does not matter where synchronization runs. A server will be chosen from the set of possible servers when synchronization starts.
  - Select **Use the settings in waveset.properties** to use servers specified there to run synchronization. (This feature is deprecated.)
  - Select **Use specified servers**, and then select one or more available servers from the Synchronization Servers list, to select specific servers to run synchronization.
- **Resource Specific Settings** — Use this section to specify how synchronization will determine the data to be processed for the resource.
- **Common Settings** — Specify the following general settings for data synchronization activities:
  - **Proxy Administrator** — Select the administrator who will process updates. All actions will be authorized through capabilities assigned to this administrator. You should select a proxy administrator with an empty user form.
  - **Input Form** — Select an input form that will process data updates. This optional configuration item allows attributes to be transformed before they are saved on the accounts.
  - **Rules —** You have the option of specifying rules to use during the data synchronization process:
    - **Process Rule** — Select this rule to specify a process rule to run for each incoming account. This selection overrides all other options. If you specify a process rule, the process will be run for every row, regardless of other settings on the resource. It can be either a process name, or a rule evaluating to a process name.
    - **Correlation Rule** — Select a correlation rule to override the correlation rule specified in the resource's reconciliation policy. Correlation rules correlate resource accounts to Identity system accounts.

- **Confirmation Rule** — Select a confirmation rule to override the confirmation rule specified in the resource's reconciliation policy.
- **Resolve Process Rule** — Select this rule to specify the name of a Task Definition to run in case of multiple matches to a record in the data feed. This should be a process that prompts an administrator for manual action. It can be a process name or a rule evaluating to a process name.
- **Delete Rule** — Select a rule, which returns true or false, that will be evaluated for each incoming user update to determine if a delete operation should occur.

- **Create Unmatched Accounts** — When this option is enabled (true), the adapter will attempt to create accounts that it does not find in the Identity Manager system. If not enabled, the adapter will run the account through the process returned by the Resolve Process Rule.
- **Logging Settings** — Specify a value for the following logging options:
  - **Maximum Log Archives** — If greater than zero, retain the latest N log files. If zero, then a single log file is re-used. If -1, then log files are never discarded.
  - **Maximum Active Log Age** — After this period of time has elapsed, the active log will be archived. If the time is zero, then no time-based archival will occur. If Maximum Log Archives is zero, then the active log will instead be truncated and re-used after this time period. This age criteria is evaluated independently of the time criteria specified by Maximum Log File Size.

    Enter a number, and then select the unit of time (Days, Hours, Minutes, Months, Seconds, or Weeks). Days is the default unit.
  - **Log File Path** — Enter the path to the directory in which to create the active and archived log files. Log file names begin with the resource name.
  - **Maximum Log file Size** — Enter the maximum size, in bytes, of the active log file. The active log file will be archived when it reaches maximum size. If Maximum Log Archives is zero, then the active log will instead be truncated and re-used after this time period. This size criteria is evaluated independently of the age criteria specified by Maximum Active Log Age.
  - **Log Level** — Enter the level of logging:
    - 0 — no logging
    - 1 — error

- 2 — information
- 3 — verbose
- 4 — debug

Click **Save** to save the policy settings for the resource.

Editing Active Sync Adapters

Before editing an Active Sync adapter, stop synchronization.

To stop synchronization, follow these steps:

1. Open the Edit Synchronization page. (For instructions, see "Editing the Synchronization Policy" on page 290.)
2. Under **Scheduling Settings**, locate **Startup Type** and select **Disabled**.

   For Service Provider users deselect the **Enable Synchronization** option.

   A warning message will appear to indicate that active synchronization is disabled.
3. Click **Save**.

   Disabling synchronization for a resource will result in stopping the synchronization task when the changes are saved.

Tuning Active Sync Adapter Performance

Because synchronization is a background task, Active Sync adapter configuration can affect server performance. Tuning Active Sync adapter performance involves these tasks:

- Changing Polling Intervals
- Specifying the Host Where the Adapter Will Run
- Starting and Stopping
- Adapter Logging

Manage Active Sync adapters through the resources list. Select an Active Sync adapter, and then access start, stop, and status refresh controls actions from the *Synchronization* section of the Resource Actions list.

Changing Polling Intervals

The polling interval determines when the Active Sync adapter will start processing new information. Polling intervals should be determined based on the type of activity being performed. For example, if the adapter reads in a large list of users from a database and updates all users in Identity Manager each time, consider running this process daily in the early morning hours. Some adapters may have a quick search for new items to process and could be set to run every minute.

Specifying the Host Where the Adapter Will Run

To specify the host where the adapters will run, edit the `waveset.properties` file. Edit the `sources.hosts` property to either of the following options:

- Set `sources.hosts=`*hostname1,hostname2,hostname3*. This lists the host names of machines to run Active Sync adapters. The adapter will run on the first available host listed in this field.

  NOTE The *hostname* you enter must match an entry in the Identity Manager list of servers. View the list of servers from the Configure tab.

  or

- Set `sources.hosts=localhost`. With this setting the adapter will run on the first Identity Manager server that attempts to start Active Sync for the resource.

NOTE In a cluster you should use the first option if you need to specify a specific server.

This property setting applies only to Identity Manager user synchronization. Host configuration for Service Provider user synchronization is determined by the Synchronization Policy.

Active Sync adapters that require more memory and CPU cycles can be configured to run on dedicated servers to help load balance the systems.

Starting and Stopping

Active Sync adapters can be disabled, manually started, or automatically started. You must have the appropriate administrator capability to change Active Sync resources in order to start or stop Active Sync adapters. For information about administrator capabilities, see "Capabilities Categories" on page 239.

When an adapter is set to automatic, the adapter restarts when the application server does. When you start an adapter, it will run immediately and execute at the specified polling interval. When you stop an adapter, the next time the adapter checks for the stop flag, it will stop.

Adapter Logging

Adapter logs capture information about the adapter currently processing. The amount of detail that the log captures depends upon the logging level of the logging you have set. Adapter logs are useful for debugging problems and watching the adapter process progress.

Each adapter has its own log file, path, and log level. You specify these values in the Logging section of the Synchronization Policy for the appropriate user type (Identity Manager or Service Provider).

Deleting Adapter Logs

Adapter logs should be deleted only when the adapter has been stopped. In most cases, make a copy of the log for archive purposes before deleting a log.

Chapter 8

Reporting

Identity Manager reports on automated and manual system activities. A robust set of reporting features lets you capture and view important access information and statistics on Identity Manager users at any time.

In this chapter, you will learn about the Identity Manager report types, how to create, run, and email reports, and how to download report information.

This chapter is organized in the following sections:

Working with Reports

In Identity Manager, reports are considered a special category of task. As a result, you work with reports in two areas of the Identity Manager Administrator interface:

- **Reports (Run Reports)** — Use the Run Reports area to define, run, delete, and download reports. Only administrators with sufficient capabilities can define, run, delete, and download reports. See Appendix D, "Capabilities Definitions" on page 667 for more information.
- **Server Tasks** — After you define reports, go to the Scheduled Tasks area **(Server Tasks > Manage Schedule)** to schedule and modify report tasks. TaskDefinition objects must contain `visibility=schedule` in order to be scheduled. Use the debug pages to make this change. See "Editing Identity Manager Configuration Objects" on page 214 for more information.

Report Types

Reports are organized into two categories:

- Identity Manager Reports - Includes a variety of report types, including real-time, summary, audit log, system log, and usage reports.
- Auditor Reports - Provides information that helps you manage user compliance based on criteria defined in audit policies.

Within these two categories, reports are further divided into a variety of report types. Report types are discussed in greater detail later in this chapter. Identity Manager reports are discussed starting on page 305 and Auditor reports on page 316.

For instructions on how to view Identity Manager Reports and Auditor Reports, see "Viewing Reports" on page 300.

Running Reports

To run a report, follow these steps:

1. In the Administrator interface, click **Reports** in the main menu.

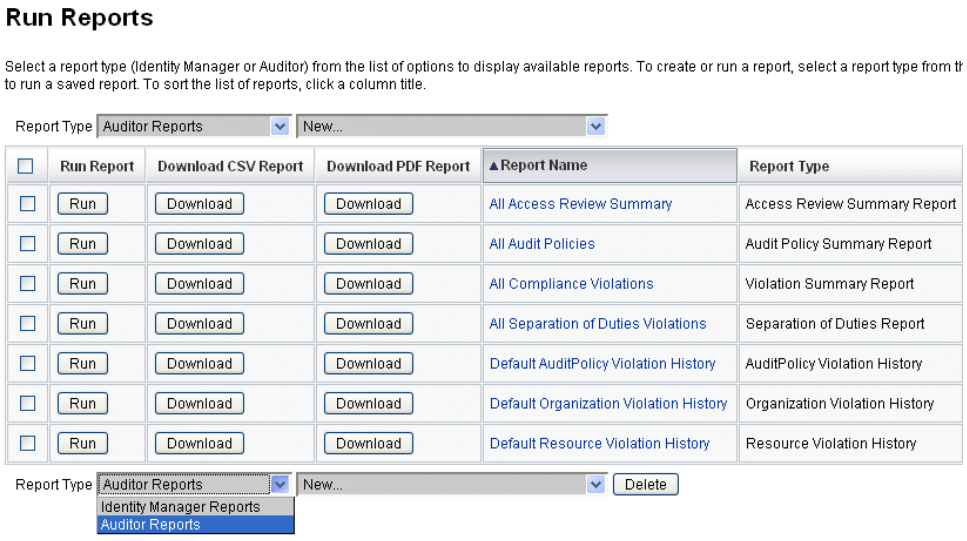
   The Run Reports page opens.

2. To view a list of available Identity Manager Reports, select **Identity Manager Reports** in the **Report Type** drop-down menu. (This option is selected by default.)

   To view a list of available Auditor Reports, select **Auditor Reports** in the **Report Type** drop-down menu. See "Working with Auditor Reports" on page 525 for more information.

   Figure 8-1 shows an example of the Run Reports page. Auditor Reports are selected in the **Report Type** drop-down menu.

Figure 8-1 Run Reports Selection



3. Click **Run** to run a report.

NOTE To allow multiple instances of the same report to run at the same time, edit the report and select the **Allow Reports to Execute Concurrently** option. Enabling this option allows multiple administrators to run the same report at the same time.

If two or more instances of the same report run concurrently, each report will have the administrator's ID followed by a timestamp appended to the report name.

Viewing Reports

After running a report from the Run Reports page, you can view the output immediately or at a later time.

To view a report, follow these steps:

1. In the Administrator interface, click **Reports** in the main menu.

   The Run Reports page opens.

2. Click the **View Reports** tab.

   The View Reports page opens.

3. Click a report to view it.

Creating Reports

To modify an existing report and save it with a new name, see Editing and Cloning Reports in the next section.

To create a new Identity Manager report or Auditor report *not based on an existing report*, use the following steps:

1. In the Administrator interface, click **Reports** in the main menu.

   The Run Reports page opens.

2. Use the **Report Type** drop-down menu to select a report category. There are two report categories:

   - **Identity Manager Reports**
   - **Auditor Reports**

3. Use the next drop-down menu to select a specific report type to create. (This menu says **New...** at the top.)

Identity Manager displays the Define a Report page, where you choose options to create the report, run it, or save it.

After entering and selecting report criteria, you can:

- Run the report without saving — Click **Run** to run the report. Identity Manager does not save the report (if you defined a new report) or the changed report criteria (if you edited an existing report).
- Save the report — Click **Save** to save the report. Once saved, you can run the report from the Run Reports page (the list of reports).

For more information on running reports, see "Running Reports" on page 299.

Editing and Cloning Reports

To clone a report, modify an existing report and save it with a new name,

To edit or clone a report, follow these steps:

1. In the Administrator interface, click **Reports** in the main menu.

   The Run Reports page opens.

2. Use the **Report Type** drop-down menu to select a report category. There are two report categories:

   - **Identity Manager Reports**
   - **Auditor Reports**

   The table of reports shows the existing reports in the category selected.

3. Click a report name to edit it.

4. To edit a report, adjust the report parameters as needed and click **Save**.

   To clone a report, enter a new report name. adjust the report parameters as needed, and click **Save** to save it with the new name.

Emailing Reports

When creating or editing a report, you can select an option to email the report results to one or more email recipients. When you select this option, the page refreshes and prompts for email recipients. Enter one or more recipients, separating addresses with a comma.

You also can choose the format of the report to be attached to the email:

- **Attach CSV Format** — Attaches report results in comma-separated value (CSV) format.
- **Attach PDF Format** — Attaches report results in Portable Document Format (PDF).

Scheduling Reports

Depending on whether you want to immediately run a report or schedule it to run at regular intervals, you make different selections:

- **Reports > Run Reports** — Allows you to run saved reports immediately. From the list of reports, click **Run**. Identity Manager runs the report and then displays the results in summary and detailed formats.
- **Server Tasks > Manage Schedule** — Schedules report tasks to be run. After selecting a report task, you can set report frequency and options. You also can adjust specific report details (as in the Define a Report page in the Reports area).

  In order for a report TaskDefinition to show up in this list, the `visibility` attribute in the TaskDefinition object must be set to `schedule`

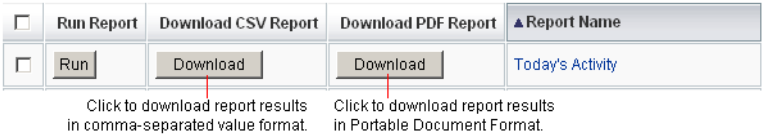
Downloading Report Data

From the Run Reports page you can download report information for use in another application, such as Acrobat Reader or StarOffice.

Open the Run Reports page and click **Download** in one of these columns:

- **Download CSV Report** — Downloads report output in CSV format. Once saved, you can open and work with the report in another application, such as StarOffice.
- **Download PDF Report** — Downloads report output in Portable Document Format, which can be viewed with Adobe Reader.

Figure 8-2 Download Reports



Configuring Report Output

To configure report output, click **Reports**, and then select **Configure Reports**.

These selections are available on the Configure Reports page:

- **PDF Report Options**

  For reports generated in portable document format (PDF), you can make selections to determine the fonts to be used in the report.

  - **PDF Font Name** — Select the font to use when generating PDF reports. By default, only fonts available to all PDF viewers are shown. However, additional fonts (such as those needed to support Asian languages) can be added to the system by copying font definition files into the product's fonts/ directory and restarting the server.

    Accepted font definition formats include .ttf, .ttc, .otf, and .afm. If you select one of these fonts, then it must be available at the computer system where the report is viewed. Alternatively select the Embed Font in PDF Documents option.

  - **Embed Font in PDF Documents** — Select this option to embed the font definition in the generated PDF report. This ensures that the report is viewable in any PDF viewer.

NOTE Embedding the font can greatly increase the size of the document.

- **CSV Report Options**

  - **Character Set Name** — Select the character set to use when generating CSV reports. Not all applications that import CSV files support the default UTF-8 encoding. Select another character set as needed.

- **Tracked Event Configuration**

  - **Enable event collection** — This option is used to configure reports for system monitoring and does not apply to customizing report formatting. For more information, see "Tracked Event Configuration" on page 327.

Click **Save** to save report configuration options.

Identity Manager Reports

Identity Manager report types can be grouped into six report type categories:

- AuditLog
- Individual User AuditLog
- Real Time
- Summary
- SystemLog
- Usage
- Workflow

AuditLog Reports

AuditLog reports are based on events captured in the system audit log. These reports provide information about generated accounts, approved requests, failed access attempts, password changes and resets, self-provisioning activities, policy violations, and service provider (extranet) users, among others.

NOTE Before running audit logs, you must specify the types of Identity Manager events you want to capture. To do this, select **Configure** from the menu bar, and then select **Audit**. Select one or more audit group names to record successful and failed events for each group. For more information about setting up audit configuration groups, see "Configuring Audit Groups and Audit Events" on page 201.

To define an AuditLog report, follow these steps:

1. Follow the instructions for Creating a Report on page 301.

   Select **Identity Manager Reports** from the first **Report Type** menu, and select **AuditLog Report** from the second menu.

   The Define a Report page opens.

2. Complete the form and click **Save**.

   Click **Help** if you have questions about the form.

Once you have set and saved report parameters, run the report from the Run Reports page. Click **Run** to produce a report of all results that match the saved criteria. Included in the report are the date an event occurred, the action performed, and the result of the action.

Individual User AuditLog Reports

As with the AuditLog reports, the Individual User AuditLog report is based on events captured in the system audit log. This report, however, prompts you for a user to report on, and returns a list of activities that have been performed on that user. To maximize results, this report searches both the `AccountId` and `ObjectDesc` fields in the audit log for the matching user name.

This report can either return a fixed set of columns, or you can select a custom set of columns. Columns are defined in `reporttasks.xml` and `defaultreports.xml`. Both files can be found in the `sample` directory (located in your Identity Manager installation directory).

To define an Individual User AuditLog report, follow these steps:

1. Follow the instructions for Creating a Report on page 301.

   Select **Identity Manager Reports** from the first **Report Type** menu, and select **Individual User AuditLog Report** from the second menu.

   The Define a Report page opens.

2. Complete the form and click **Save**.

   Click **Help** if you have questions about the form.

Real Time Reports

Real time reports poll resources directly to report real-time information. Real time reports include:

- **Resource Group Report** — Summarizes group attributes, including user memberships.
- **Resource Status Report** — Tests the connection status of one or more specified resources by executing the testConnection method against each resource.
- **Resource User Report** — Lists user resource accounts and account attributes.

To define a real-time report, follow these steps:

1. Follow the instructions for Creating a Report on page 301.

   Select **Identity Manager Reports** from the first **Report Type** menu, and select **Resource Group Report**, **Resource Status Report**, or **Resource User Report** from the second menu.

   The Define a Report page opens.

2. Complete the form and click **Save**.

   Click **Help** if you have questions about the form.

Once you have set and saved report parameters, run the report from the Run Reports list page. Click **Run** to produce a report of all results that match the saved criteria.

Summary Reports

Summary report types include the following reports available from the **Identity Manager Reports** list:

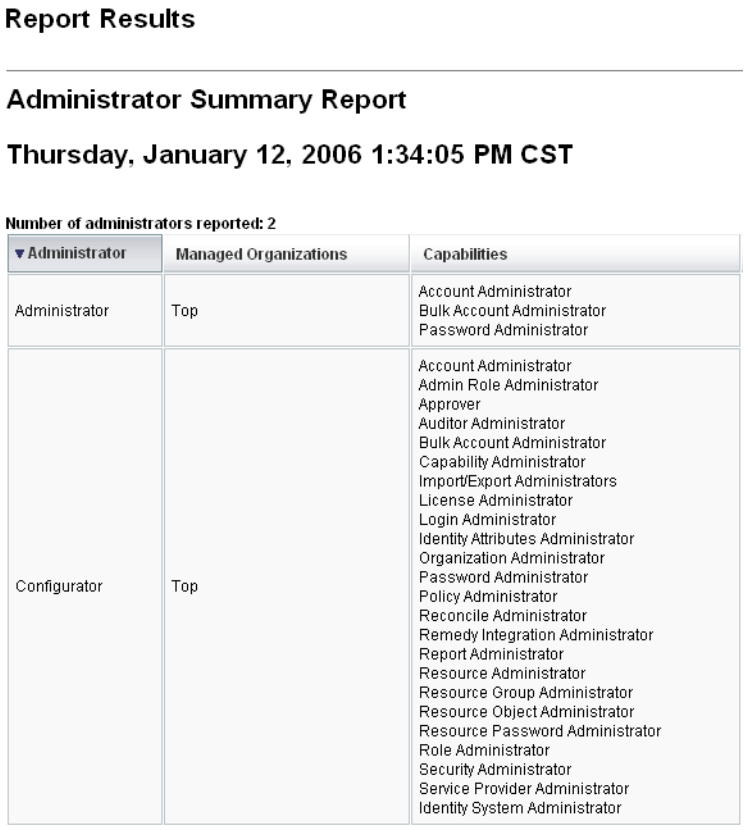
- **Account Index Report** – Report on selected resource accounts according to reconciliation situation.
- **Administrator Report** – View Identity Manager administrators, the organizations they manage, and assigned capabilities. When defining an administrator report, you can select administrators to include by organization.
- **Admin Role Report** – List users assigned to admin roles.
- **Role Report** – Report on all aspects of roles and associated resources.
- **Task Report** – Report on pending and finished tasks. You determine the depth of information to include by selecting from a list of attributes such as approver, description, expiration date, owner, start date, and state.
- **User Report** – View users, the roles to which they are assigned, and the resources they can access. When defining a user report, you can select which users to include by name, assigned manager, role, organization, or resource assignment.
- **User Question Report** – Allows administrators to find users who have not answered the minimum number of authentication questions, as specified by their account policy requirements. The results indicate user name, account policy, the interface associated with the policy, and the minimum number of questions that require answers.

NOTE By default, the following reports are run on the set of organizations controlled by the logged-in administrator, unless overridden by selecting one or more organizations against which the report will be run.

- Admin Role Summary
- Administrator Summary
- Role Summary
- User Questions Summary
- User Summary

As shown in Figure 8-3 the Administrator Report lists Identity Manager administrators, the organizations they manage, and their assigned capabilities and admin roles.

Figure 8-3 Administrator Summary Report



Report Results

Administrator Summary Report

Thursday, January 12, 2006 1:34:05 PM CST

Number of administrators reported: 2

▼Administrator	Managed Organizations	Capabilities
Administrator	Top	Account Administrator Bulk Account Administrator Password Administrator
Configurator	Top	Account Administrator Admin Role Administrator Approver Auditor Administrator Bulk Account Administrator Capability Administrator Import/Export Administrators License Administrator Login Administrator Identity Attributes Administrator Organization Administrator Password Administrator Policy Administrator Reconcile Administrator Remedy Integration Administrator Report Administrator Resource Administrator Resource Group Administrator Resource Object Administrator Resource Password Administrator Role Administrator Security Administrator Service Provider Administrator Identity System Administrator

To define a Summary report, follow these steps:

1. Follow the instructions for Creating a Report on page 301.

   Select one of the Summary report types (listed above) from the second menu.

   The Define a Report page opens.

2. Complete the form and click **Save**.

   Click **Help** if you have questions about the form.

SystemLog Report

A SystemLog report shows system messages and errors that are recorded in the repository. When setting up this report, you can specify to include or exclude the following items:

- System components (such as Provisioner, Scheduler, or Server)
- Error codes
- Severity levels (error, fatal, or warning)

You also set the maximum number of records you want to display (by default, 3000), and whether you want to display the oldest or newest records if available records exceed the specified maximum.

When running a SystemLog Report, specific Syslog entries can be retrieved by specifying the syslog ID of the target entry. For example, to view specific entries in the Recent Systems Messages report, edit the report and select the **Event** field. Then enter the requested syslog ID and click **Run**.

NOTE You also can run the `lh syslog` command to extract records from the system log. For detailed command options, read "syslog command" in Appendix A, "lh Reference."

To define a SystemLog report, follow these steps:

1. Follow the instructions for Creating a Report on page 301.

   Select **Identity Manager Reports** from the first **Report Type** menu, and select **SystemLog Report** from the second menu.

   The Define a Report page opens.

2. Complete the form and click **Save**.

   Click **Help** if you have questions about the form.

Once you have set and saved report parameters, run the report from the Run Reports list page.

Usage Reports

Create and run usage reports to view graphical and/or tabular summaries of system events related to Identity Manager objects such as administrators, users, roles, or resources. Usage reports display data in a table, and you can also choose to display data in a bar chart, pie chart, or line chart format.

To define a usage report, follow these steps:

1. Follow the instructions for Creating a Report on page 301.

   Select **Identity Manager Reports** from the first **Report Type** menu, and select **Usage Report** from the second menu.

   The Define a Report page opens.

2. Complete the form and click **Save**.

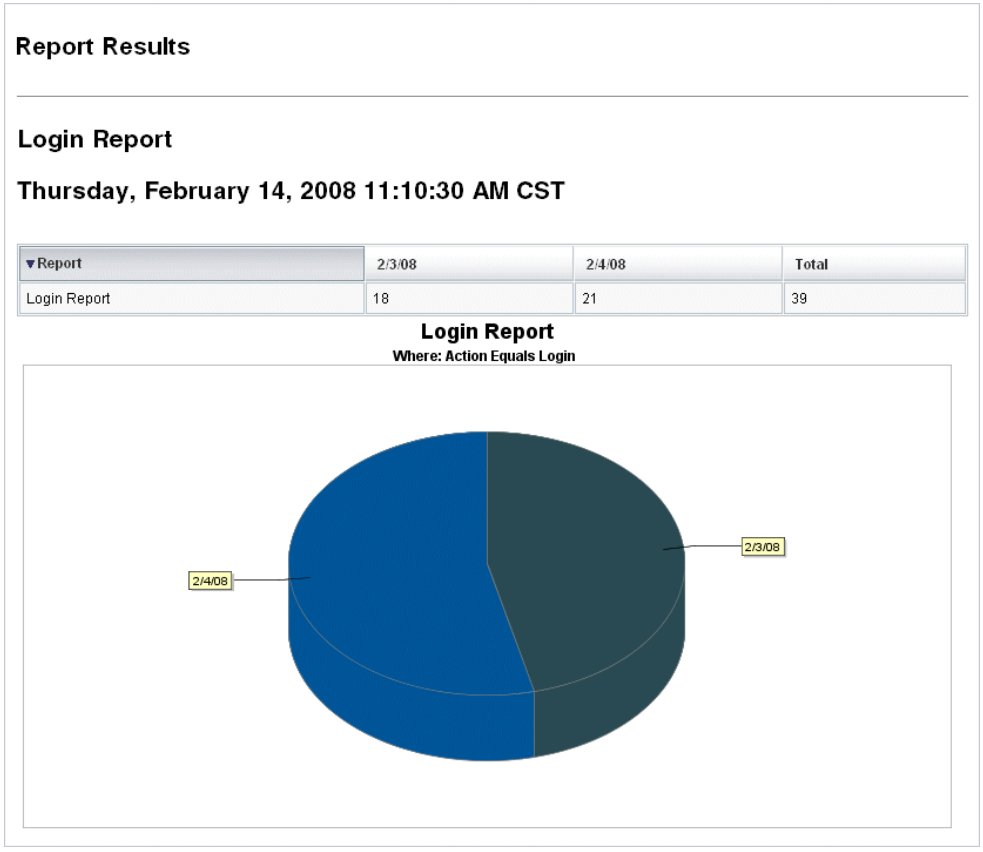
   Click **Help** if you have questions about the form.

Once you have set and saved report parameters, run the report from the Run Reports list page.

Usage Report Charts

In Figure 8-4, the table at the top shows events comprising the report and the chart below shows the same information in graphical format.

Figure 8-4 Usage Report (Generated User Accounts)



Workflow Report

This report lists workflows by name and provides the following information:

- The average time the workflow took to complete
- The number of times the workflow was requested
- The number of workflow requests that were completed

In addition, clicking the workflow name opens a detailed view of the workflow, which will show each activity that was instrumented within the workflow, and its average time to complete.

Workflow Reports are especially useful for capturing performance metrics that can help establish whether Service Level Agreement (SLA) targets are being met.

Identity Manager must be configured to capture workflow timing metrics as a prerequisite to running Workflow Reports. See the next section for more information.

Configuring Workflows to Capture Audit Timing Events

Before you can run Workflow Reports, you must first turn on workflow auditing for each workflow type that you want to report on.

NOTE Auditing workflows degrades performance. Consequently, you should only enable workflow auditing for those workflows that you plan to use with Workflow Reports.

Turn on workflow auditing as follows:

- For workflows that you can configure in the Administrator interface using task templates, select the **Audit entire workflow** checkbox on the **Audit** tab of the task template configuration form. See "Configuring the Audit Tab" on page 365 for instructions.
- For workflows that do not have task templates, refer to "Modifying Workflows to Log Timing Audit Events" on page 385.

Specifying Attributes to Store for the Workflow Report

While it is not necessary to define attributes, to get the most out of Workflow Reports it is important to store attributes that you later plan to filter your reports on.

To define the set of attributes that you want to store for each workflow type, use the Administrator interface's tabbed task template configuration form. The **Audit** tab contains an **Audit Attributes** section, which is located below the **Audit entire workflow** checkbox. See "Configuring the Audit Tab" on page 365 for instructions.

Defining the Workflow Report

To define a Workflow report, follow these steps:

1. Follow the instructions for creating a report on page 301.

   Select **Identity Manager Reports** from the first **Report Type** menu, and select **Workflow Report** from the second menu.

   The Define a Report page opens.

2. Complete the form and click **Save**. You can define time parameters as well as add any of the attributes that you elected to audit. (See "Specifying Attributes to Store for the Workflow Report" in the previous section.)

   To narrow your results, specify an attribute name (for example, `user.global.state`), select a condition, and enter an attribute value. You can enter as many attributes as you need.

   Click **Help** if you have questions about the form.

Once you have set and saved report parameters, run the report from the Run Reports page. Click **Run** to produce a report of all results that match the saved criteria.

The report will return workflows by name, along with their average time to complete, the number of times the workflow was requested, and how many of those requests were completed.

Click the workflow name to open a detailed view of the workflow, which will show each activity that was instrumented in the workflow. Because processes can have the same named activities, the activities are scoped by process.

Auditor Reports

Auditor reports provide information that help you manage user compliance based on criteria defined in audit policies.

Identity Manager provides the following auditor reports:

- Access Review Coverage Report
- Access Review Detail Report
- Access Review Summary Report
- Access Scan User Scope Coverage Report
- Audit Policy Summary Report
- Audited Attribute Report
- AuditPolicy Violation History
- User Access Report
- Organization Violation History
- Resource Violation History
- Separation of Duties Report
- Violation Summary Report

To define an auditor report, follow the steps in "Creating Reports" on page 301.

For more information about auditor reports, see "Working with Auditor Reports" on page 525.

Working with Graphs

You can perform the following activities related to graphs:

- Viewing Defined Graphs
- Creating Graphs
- Editing Graphs
- Deleting Graphs

Viewing Defined Graphs

Identity Manager provides some sample graphs. Some use sample data and some do not. You are encouraged to create additional graphs that are applicable to your deployment.

You should remove the sample graphs and sample dashboards before moving a deployment into production. Some of the sample graphs that do not use sample data might appear blank if no applicable data has been collected.

To view a defined graph, follow these steps:

1. In the Administrator interface, click **Reports** in the main menu.
2. Click **Dashboard Graphs** in the secondary menu.
3. Select a category of dashboard graphs from the **Select Dashboard Graph Type** list of options.

   All graphs in the selected category display in the graphs list.
4. Click a graph name.
5. If desired, click **Pause refresh** to pause the dashboard refresh. Click **Resume** to renew the view.

NOTE For dashboards containing many graphs, it is sometimes helpful to pause the refresh until all of the graphs are initially loaded.

6. If desired, click **Refresh now** to force an immediate refresh.
7. Click **Done** to return to the Dashboard Graphs list page.

NOTE If any of the graphs show an error message, open the system configuration object for editing (page 214) and set `dashboard.debug=true`. Once this property is set, return to the graph that generated the error and use the **Please include this text script if reporting a problem** link to retrieve the graph script. This graph script should be included when reporting the problem.

Creating Graphs

To create a dashboard graph, follow these steps:

1. In the Administrator interface, click **Reports** in the main menu.
2. Click **Dashboard Graphs** in the secondary menu.
3. Select a category of dashboard graphs from the Select Dashboard Graph Type list of options.

   All graphs in the selected category display in the graphs list.
4. Click **New** to display the Create Dashboard Graph page.
5. Enter a **Graph Name**. Choose a unique, meaningful name because graphs are added to dashboards by name.
6. Select a **Registry**: IDM or SAMPLE.

   The sample data selection is provided for you to familiarize yourself with the system. As sample data is not available for all tracked events, this selection is most useful for demos and when experimenting with the various graph options. Delete sample data prior to going to a production environment.

NOTE The set of tracked events that use sample data differs from the events that are actually tracked.

7. Select the desired type of **Tracked Event** from the list.

   An event is a system characteristic, such as memory usage, or an aggregation of events, such as resource operations, whose historical values are tracked and displayed visually as graphs or charts.

   Tracked events for the IDM registry are:

   - **Provisioner Execution Counts** — Tracks how many provisioner operations occurred (by operation type).
   - **Provisioner Execution Duration** — Tracks the duration of each provisioner operation (by operation type).
   - **Resource Operation Count** — Tracks the number of resource operations.
   - **Resource Operation Duration** — Tracks the duration of a resource operation.
   - **Workflow Duration** — Tracks how long it takes to execute a workflow.
   - **Workflow Execution Count** — Tracks the number of times each workflow is executed.

8. Select a **Time Scale** from the list.

   This controls how often data is aggregated (for example, one hour) and how often it is retained (for example, one month). The system stores tracked event data for progressively larger time scales to allow both a detailed, current view of the system as well as an understanding of historical trends.

9. Select a **Metric** from the list. A default one is selected, either count or average depending on the selected tracked event.

   Each graph displays a single metric. The available metrics depend on the selected tracked event. Possible metrics are:

   - Count - the total number of times the event occurred in the time interval
   - Average - the arithmetic mean of the event values for the time interval
   - Maximum - the maximum event value for the time interval
   - Minimum - the minimum event value for the time interval
   - Histogram - separate counts for discrete ranges of event values for the time interval

10. Select **Show count as** from the list.

    The graph count is shown either as a raw total or scaled by various time scales.

11. Select a **Graph Type** from the list.

    This controls how the tracked event data is displayed. The available graph types depend on the selected tracked event and can include line graphs, bar charts, and pie charts.

12. **Base Dimension:** If desired, select the following from the list:

    - **Resource Name**. If selected, all values for the dimension are included in the graph. Deselect this option to choose individual values of the dimension to include in the graph.
    - **Server Instance**. If selected, all values for the dimension are included in the graph. Deselect this option to choose individual values of the dimension to include in the graph.
    - **Operation Type**. If selected, all values for the dimension are included in the graph. Deselect this option to choose individual values of the dimension to include in the graph.

    After you select the dimension, the page refreshes to display a graph.

13. **Graph Options:** If desired, enter a **Graph Subtitle**

    This produces a subtitle under the main title of the graph.

14. **Advanced Graph Options**: If desired, select **Advanced Graph Options**. Select this if you wish to set the following:

    - **Grid Lines**
    - **Font**
    - **Color Palette**

15. Click **Save to create the graph**.

Editing Graphs

To edit a dashboard graph, follow these steps:

1. In the Administrator interface, click **Reports** in the main menu.
2. Click **Dashboard Graphs** in the secondary menu.

   The Dashboard Graphs page opens.
3. From the **Select Dashboard Graph Type** drop-down menu, select a category.

   A table listing dashboard graphs opens.
4. Click a graph name to edit it.

   The graph attributes you can edit vary depending on the graph selected. One or more of the following characteristics are available for editing:

   - **Graph Name** - Graphs are added to a dashboard by name.
   - **Registry** — Specifies the *tracked event description* defined in the registry. The current selection includes: SAMPLE, Service Provider, and IDM.
   - **Tracked Event** - A system characteristic, such as memory usage, or an aggregation of events, such as resource operations, whose historical values are tracked and displayed visually as graphs or charts.
   - **Time Scale** - Controls how often data is aggregated and how often it is retained.
   - **Metric** - Each graph displays a single metric. The available metrics depend on the selected tracked event. Other options may be available for the metric selected.
   - **Graph type** - Controls how the tracked event data is displayed (for example, line graph or bar graph).
   - **Included Dimension Values** - If selected, all values for the dimensions are included in the graph.
   - **Graph Subtitle** - If desired, enter a subtitle under the main title of the graph.
   - **Advanced Graph Options** - select this if you wish to set the following:
     - **Grid Lines**
     - **Font**
     - **Color Palette**

5. Click **Save**.

Deleting Graphs

To delete a defined graph, follow these steps:

1. In the Administrator interface, click **Reports** in the main menu.
2. Click **Dashboard Graphs** in the secondary menu.
3. Select a category of dashboard graphs from the **Select Dashboard Graph Type** list of options.

   All graphs in the selected category display in the graphs list.
4. Use the checkboxes to select the graphs to delete and then click **Delete**.

NOTE Graphs are deleted without warning from all dashboards that included it.

Working with Dashboards

A dashboard is a collection of related graphs that are viewed on a single page. As with graphs, Identity Manager provides a set of sample dashboards that administrators are encouraged to customize to their own deployment. See "Creating Dashboards" on page 324 for instructions.

To view Dashboards, follow these steps:

1. In the Administrator interface, click **Reports** in the main menu.
2. Click **View Dashboards** in the secondary menu to view currently defined Dashboards.

   The Dashboards page opens.
3. Click **Display** next to the dashboard you wish to view

NOTE For dashboards containing many graphs, it's sometimes helpful to pause the refresh until all of the graphs are initially loaded.

Click **Pause** to pause dashboard refresh, or **Refresh** to renew the view.

The following sections provide procedures for working with dashboards:

- Creating Dashboards
- Editing Dashboards
- Deleting Dashboards

Creating Dashboards

To create dashboards, follow these steps:

1. In the Administrator interface, click **Reports** in the main menu.
2. Click **View Dashboards** in the secondary menu.
3. Click **New.**
4. Enter a name for the new dashboard.
5. Enter a summary describing the new dashboard.
6. Select a refresh rate in either seconds, minutes, or hours, from the list.

NOTE Setting a refresh rate of less than 30 seconds can cause problems with dashboards that contain several graphs.

7. To associate a graph style to the dashboard, select the appropriate entry from the list.

NOTE A single graph can be used in multiple dashboards.

8. To remove a dashboard graph, select the appropriate entry from the list and click **Remove Graphs**.
9. Click **Save**.

Editing Dashboards

Use the procedure described in creating a dashboard to edit a dashboard, except instead of selecting New, select the dashboard you want to modify and edit the following attributes:

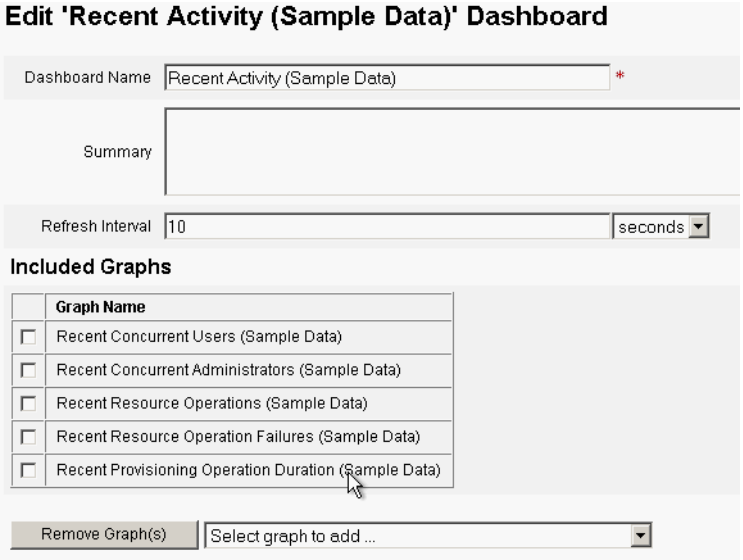
- The name for the dashboard.
- The summary describing the new dashboard.
- The refresh rate in either seconds, minutes, or hours from the list.
- Add or remove graphs associated with a dashboard.

NOTE Removing a graph from a dashboard does not delete the graph. The graph is still available for use with other dashboards.

A single graph can be used in multiple dashboards.

Figure 8-5 illustrates a sample dashboard edit page.

Figure 8-5 Edit Dashboards



Deleting Dashboards

To delete Service Provider dashboards, from the Service Provider area click **Manage Dashboards**, then select the desired dashboard and click **delete**.

NOTE The graphs included in the dashboard are not removed using this procedure. Delete graphs using the Manage Dashboard Graphs page (see Deleting Graphs).

System Monitoring

You can set up Identity Manager to track events in real-time and monitor the events by viewing them in dashboard graphs. The dashboards allow you to quickly assess system resources and spot abnormalities, to understand historical performance trends (based on time of day, day of week, and so on), and to interactively isolate problems before looking at audit logs. They do not provide as much detail as the audit logs, but they do provide you with hints about where to look for problems in the logs.

You can create graphic dashboard displays to track automated and manual activities at a high level. Identity Manager provides sample *resource operations* dashboard graphs. The *resource operations* dashboard graphs enable you to quickly monitor system resources to maintain an acceptable level of service.

You can view sample data for these graphs in the Resource Operations Dashboard. For more information about using dashboards, see "Working with Dashboards" on page 323.

Statistics are collected and aggregated at various levels to present a real-time view based on your specifications.

Tracked Event Configuration

From the Tracked Event Configuration area of the Configure Reports page, you can determine if statistics collection for tracked events is currently enabled, and enable it. Click **Enable event collection** to enable the tracked event configuration.

Specify the following options for event collection:

- **Time Zone** — This option sets the time zone to use for recording tracked events. This primarily determines when day boundaries occur.

  Alternatively, you can set the time zone to the default time zone set on the server.

- **Time Scales to collect** — This option specifies the time intervals for which the data is aggregated (in other words, how often it is collected and persisted). For example, if a one-minute interval is selected, data is collected and persisted every minute.

The system stores tracked event data for progressively larger time scales to allow a detailed, current view of the system, as well as an understanding of historical trends.

The following time scales are available. All are selected by default. Clear the selections for the intervals you do not want to collect.

- 10 Second Intervals
- 1 Minute Intervals
- 1 Hour Intervals
- 1 Day Intervals
- 1 Week Intervals
- 1 Month Intervals

After configuring tracked events, use the dashboards to monitor the tracked events. Where present, use the sliders to zoom in on a section of the chart.

Risk Analysis

Identity Manager risk analysis features let you report on user accounts whose profiles fall outside certain security constraints. Risk analysis reports scan the physical resource to gather data and show, by resource, details about disabled accounts, locked accounts, and accounts with no owners. They also provide details about expired passwords. Report details vary depending on the resource type.

NOTE Standard reports are available for AIX, HP, Solaris, NetWare NDS, and Windows Active Directory resources.

Risk analysis pages are controlled by a form and can be configured for your environment. You can find a list of forms under the RiskReportTask object on the `idm\debug` page (page 60), and modify these by using the Identity Manager IDE (page 61). See *Identity Manager Workflows, Forms, and Views* for more information about configuring Identity Manager forms.

Creating Risk Analysis Reports

To create a Risk Analysis report, use the following steps:

1. In the Administrator interface, click **Reports** in the main menu.
2. Click **Run Risk Analysis** in the secondary menu.
3. In the **New...** drop-down menu, select a report to create.

   A Risk Analysis Report Settings page opens.
4. Complete the form.

   You can limit the report to scan selected resources and, depending on the resource type, you can scan for accounts that meet these criteria:

   - Accounts that are disabled, expired, inactive, or locked
   - Accounts that have never been used
   - Accounts that do not have a fullname or password
   - Accounts that do not require a password
   - Accounts with passwords that have expired or have not changed for a specified number of days

5. Click **Save**.

Scheduling Risk Analysis Reports

Once defined, you can schedule risk analysis reports to run at specified intervals.

To schedule risk analysis reports, follow these steps:

1. In the Administrator interface, click **Server Tasks** in the main menu.
2. Click **Manage Schedule** in the secondary menu.

   The Scheduled Tasks page opens.
3. Select a risk analysis report to schedule.

   The Create New Risk Analysis Task Schedule page opens.
4. Enter a name and schedule information, and then optionally adjust other risk analysis selections.
5. Click **Save** to save the schedule.

Chapter 9

Task Templates

Identity Manager's *task templates* enable you to use the Administrator interface to configure certain workflow behaviors as an alternative to writing customized workflows.

This chapter is organized into the following sections:

- Enabling the Task Templates — Describes how to make the task templates available to your system
- Configuring the Task Templates — Describes how to use task templates to configure workflow behaviors

Enabling the Task Templates

Identity Manager provides these task templates that you can configure:

- **Create User Template** — Configures properties for the create user task.
- **Delete User Template** — Configures properties for the delete user task.
- **Update User Template** — Configures properties for the update user task.

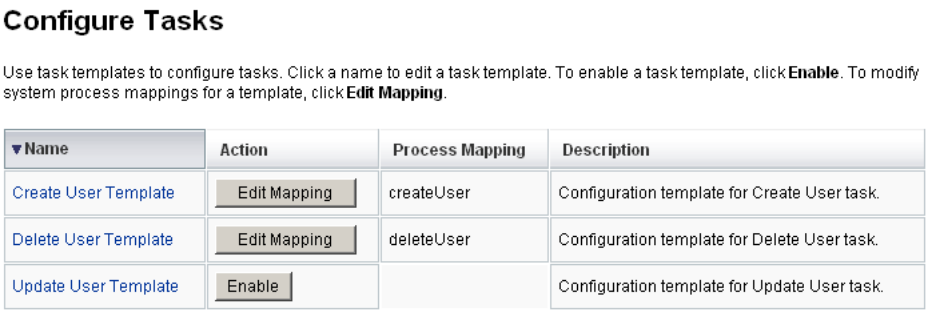
Before using the task templates, you must map the task template's processes.

To map process types, follow these steps:

1. In the Administrator interface, select **Server Tasks** from the menu, and then select **Configure Tasks**.

   Figure 9-1 illustrates the Configure Tasks page.

Figure 9-1 Configure Tasks



   The Configure Tasks page contains a table with the following columns:

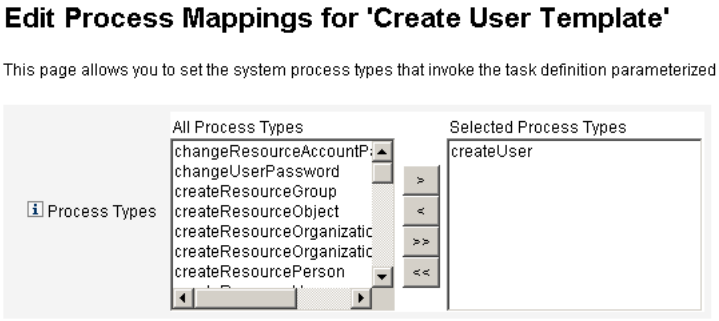
   - **Name** – Provides links to the Create User, Delete User, and Update User Templates.
   - **Action** – Contains one of the following buttons:
     - **Enable** – Displays if you have not enabled a template yet.
     - **Edit Mapping** – Displays after you enable a template.

     The procedure for enabling and editing process mappings is the same.
   - **Process Mapping** – Lists the process type mapped for each template.
   - **Description** – Provides a short description of each template.

2. Click **Enable** to open the Edit Process Mappings page for a template.

   For example, the following page (Figure 9-2) displays for the Create User Template:

Figure 9-2 Edit Process Mappings Page



NOTE The default process type (in this case, `createUser`) automatically displays in the Selected Process Types list. If necessary, you can select a different process type from the menu.

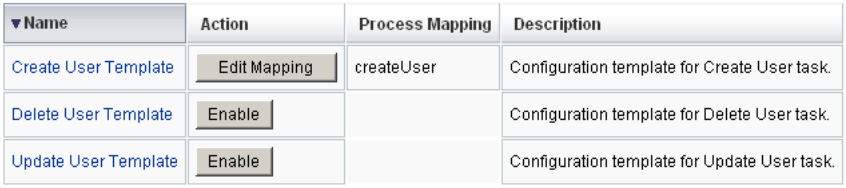
- Generally, you do not map more than one process type for each template.
- If you remove the process type from the Selected Process Types list and do not select a replacement, a Required Process Mappings section displays instructing you to select a new task mapping.

Figure 9-3 Required Process Mappings Section

3. Click **Save** to map the selected process type and return to the Configure Tasks page.

NOTE When the Configure Tasks page redisplays, an **Edit Mapping** button replaces the **Enable** button and the process name is listed in the Process Mapping column.

Figure 9-4 Updated Configure Tasks Table



Name	Action	Process Mapping	Description
Create User Template	Edit Mapping	createUser	Configuration template for Create User task.
Delete User Template	Enable		Configuration template for Delete User task.
Update User Template	Enable		Configuration template for Update User task.

4. Repeat the mapping process for each of the remaining templates.

NOTES

- You can verify the mappings by selecting **Configure > Form and Process Mappings**. When the Configure Form and Process Mappings page appears, scroll down to the Process Mappings table and verify that the following Process Types are mapped to the Process Name Mapped To entries shown in the table.

Process Type	Process Name Mapped To
createUser	Create User Template
deleteUser	Delete User Template
updateUser	Update User Template

  If the templates were enabled successfully, Process Name Mapped To entries should all include the word *Template*.

- You can also map these process types directly from the Form and Process Mapping page if you type **`Template`** into the **Process Name Mapped To** column as shown in the table.

Configuring the Task Templates

After mapping the template process types (page 332), you can configure the task templates.

To configure a task template, follow these steps:

1. In the Administrator interface, click **Server Tasks** in the main menu, then click **Configure Tasks.**

   The Configure Tasks page opens.

2. Select a link in the **Name** column. One of the following pages displays:

   - **Edit Task Template 'Create User Template'** — Open to edit the template used to create a new user account.
   - **Edit Task Template 'Delete User Template'** — Open to edit the template used to delete or deprovision a user's account.
   - **Edit Task Template 'Update User Template'** — Open to edit the template used to update an existing user's information.

   Each Edit Task Template page contains a set of tabs that represent a major configuration area for the user workflow.

   The following table describes each tab, its purpose, and which templates use that tab.

Table 9-1 Task Template Tabs (Page 1 of 2)

Tab Name	Purpose	Template
General (*default tab*)	Allows you to define how a task name displays in the task bar located on the Home and Account pages, and in the task instance table on the Tasks page.	Create User and Update User Task Templates only
	Allows you to specify how user accounts are deleted/deprovisioned	Delete User Template only
Notification	Allows you to configure email notifications sent to administrators and users when Identity Manager invokes a process.	All Templates
Approvals	Allows you to enable or disable approvals by type, designate additional approvers, and specify attributes from account data before Identity Manager executes certain tasks.	All Templates

Table 9-1 Task Template Tabs (Page 2 of 2)

Tab Name	Purpose	Template
Audit	Allows you to enable and configure auditing for the workflow. Use this tab to configure a workflow to capture information for Workflow Reports.	All Templates
Provisioning	Allows you to run a task in the background and to allow Identity Manager to retry a task if the task fails.	Create User Task Template and Update User Task Templates only
Sunrise and Sunset	Allows you to suspend a creation task until a specified date/time (sunrise) or to suspend a deletion task until a specified date/time (sunset).	Create User Task Template
Data Transformations	Allows you to configure how user data is transformed during provisioning.	Create User and Update User Task Templates only

3. Select one of the tabs to configure workflow features for the template.

   Instructions for configuring these tabs are provided in the following sections:

   - "Configuring the General Tab" on page 337
   - "Configuring the Notification Tab" on page 340
   - "Configuring the Approvals Tab" on page 346
   - "Configuring the Audit Tab" on page 365
   - "Configuring the Provisioning Tab" on page 367
   - "Configuring the Sunrise and Sunset Tab" on page 368
   - "Configuring the Data Transformations Tab" on page 374

4. When you are finished configuring the templates, click the **Save** button to save your changes.

Configuring the General Tab

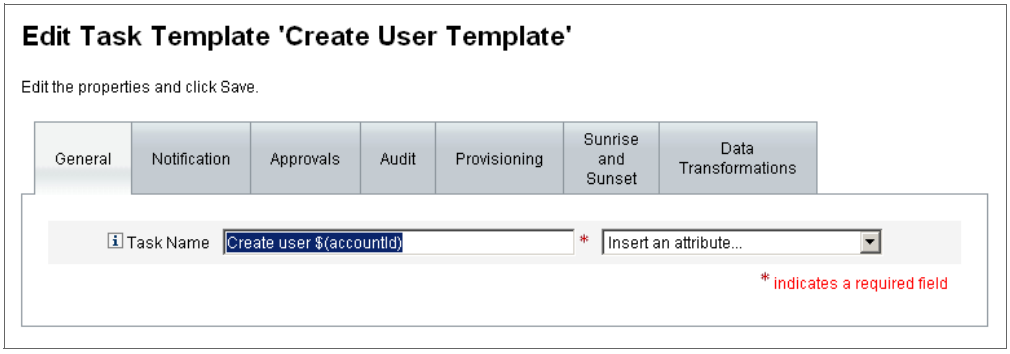
This section provides instructions for configuring the **General** tab, which is available as part of the task template configuration process. For instructions on how to start the configuration process see page 335.

NOTE In the Administrator interface, the pages for editing the Create User Template and Update User Template are identical, so configuration instructions are provided in one section.

For the Create User or Update User Templates

When you open either the *Edit Task Template 'Create User Template'* form or the *Edit Task Template 'Update User Template'* form, the **General** tab page displays by default. This page consists of a **Task Name** text field and a **Insert an attribute** menu, as shown in Figure 9-5. For instructions on how to start the configuration process see page 335.

Figure 9-5 General Tab: Create User Template



Task names can contain literal text and/or attribute references that are resolved during task execution.

To change the default task name, follow these steps:

1. Type a name into the **Task Name** field.

   You can edit or completely replace the default task name.

2. The **Task Name** menu provides a list of attributes that are currently defined for the view associated with the task configured by this template. Select an attribute from the menu (*optional*).

   Identity Manager appends the attribute name to the entry in the Task Name field. For example:

   ```
   Create user $(accountId) $(user.global.email)
   ```

3. When you are finished, you can
   - Select a different tab to continue editing the templates.
   - Click **Save** to save your changes and return to the Configure Tasks page.
   - The new task name will display in the Identity Manager task bar, located at the bottom of the **Home** and **Accounts** tabs.
   - Click **Cancel** to discard your changes and return to the Configure Tasks page.

For the Delete User Template

When you open the *Edit Task Template 'Delete User Template'* page the **General** tab page displays by default. (For instructions on how to start the configuration process see page 335.)

To specify how user accounts are deleted/deprovisioned, follow these steps:

1. Use the **Delete Identity Manager Account** buttons to specify whether an Identity Manager account can be deleted during a delete operation, as follows:
   - **Never** — Select to prevent accounts from being deleted.
   - **Only if user has no linked accounts after deprovisioning** — Select to allow user account deletions only if there are no linked resource accounts after deprovisioning.
   - **Always** — Select to always allow user account deletions — even if there are still resource accounts assigned.
2. Use the **Resource Accounts Deprovisioning** boxes to control resource account deprovisioning for *all* resource accounts, as follows:
   - **Delete All** — Enable this box to delete all accounts representing the user on all assigned resources.
   - **Unassign All** — Enable this box to unassign all resource accounts from the user. The resource accounts will not be deleted.

- **Unlink All** — Enable this box to break all links from the Identity Manager system to the resource accounts. Users with accounts that are assigned but not linked will display with a badge to indicate that an update is required.

NOTE These controls override the behaviors in the Individual Resource Accounts Deprovisioning table.

3. Use the **Individual Resource Accounts Deprovisioning** boxes to allow a more fine-grained approach to user deprovisioning (compared to Resource Accounts Deprovisioning) as follows:

   - **Delete** — Enable this box to delete the account that represents the user on the resource.
   - **Unassign** — Enable this box and the user will no longer be assigned directly to the resource. The resource account will not be deleted.
   - **Unlink** — Enable this box to break the link from the Identity Manager system to the resource accounts. Users with accounts that are assigned but not linked will display with a badge to indicate that an update is required.

NOTE The **Individual Resource Accounts Deprovisioning** options are useful if you want to specify a separate deprovisioning policy for different resources. For example, most customers do not want to delete Active Directory users because each user has a global identifier that can never be re-created following deletion.

However, in environments where new resources are added, you might not want to use this option because the deprovisioning configuration would have to be updated every time you add a new resource.

Configuring the Notification Tab

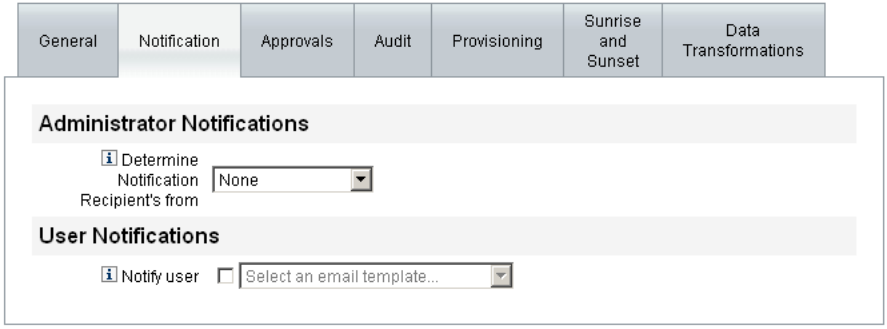
This section provides instructions for configuring the **Notification** tab, which is available as part of the task template configuration process. For instructions on how to start the configuration process see page 335.

All of the Task Templates support sending email notifications to administrators and users when Identity Manager invokes a process — usually after the process has completed. You can use the Notification tab to configure these notifications.

NOTE Identity Manager uses email templates to deliver information and requests for action to administrators, approvers, and users. For more information about Identity Manager email templates, see the section titled Understanding Email Templates in this guide.

Figure 9-6 shows the **Notification** page for the Create User Template.

Figure 9-6 Notification Tab: Create User Template



Configuring User Notifications

When specifying users to be notified, you must also specify the name of an email template to be used to generate the email used for notification.

To notify the user being created, updated, or deleted enable the **Notify user** checkbox, as shown in Figure 9-7, and then select an email template from the list.

Figure 9-7 Specifying an Email Template

Configuring Administrator Notifications

To specify how Identity Manager determines administrator notification recipients, select an option from the **Determine Notification Recipients from** menu.

The available options are:

- **None** (default) — No administrators will be notified.
- **Attribute** — Select to derive notification recipients' account IDs from a specified attribute in the user view. For more information see "Specifying Administrator Notification Recipients by Attribute" on page 342.
- **Rule** — Select to derive notification recipients' account IDs by evaluating a specified rule. For more information see "Specifying Administrator Notification Recipients by Rule" on page 343.
- **Query** — Select to derive notification recipients' account IDs by formulating a query to a particular resource. For more information see "Specifying Administrator Notification Recipients by Query" on page 344.
- **Administrator List** — Select to choose notification recipients' explicitly from a list. For more information see "Specifying Administrator Notification Recipients from the Administrator List" on page 345.

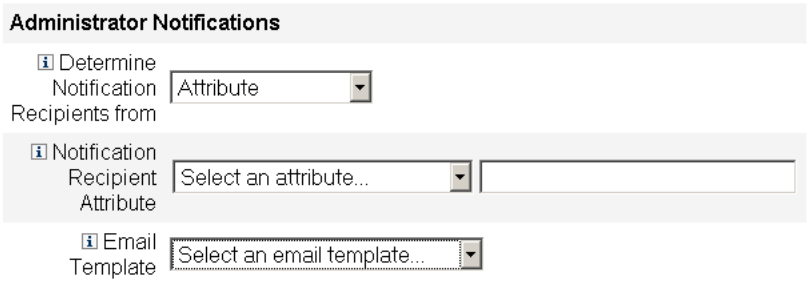
Specifying Administrator Notification Recipients by Attribute

To derive notification recipients' account IDs from a specified attribute, follow these steps:

NOTE The attribute must resolve to a string that represents a single account ID or to a list in which the elements are account IDs.

1. Select **Attribute** from the **Determine Notification Recipients from** menu and the following new options are displayed:

Figure 9-8 Administrator Notifications: Attribute



   - **Notification Recipient Attribute** — Provides a list of attributes (currently defined for the view associated with the task configured by this template) used to determine recipient account IDs.
   - **Email Template** — Provides a list of email templates.

2. Select an attribute from the **Notification Recipient Attribute** menu.

   The attribute name displays in the text field adjacent to the menu.

3. Select a template from the **Email Template** menu to specify a format for the administrators' notification email.

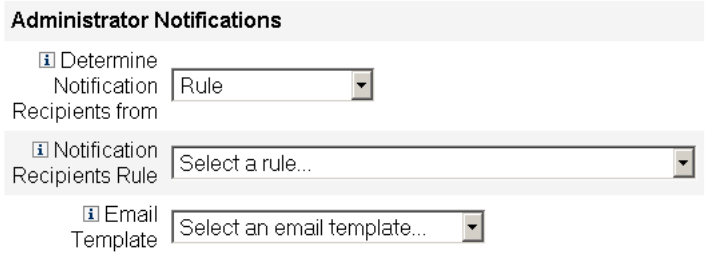
Specifying Administrator Notification Recipients by Rule

To derive notification recipients' account IDs from a specified rule, follow these steps:

NOTE When evaluated, the rule must return a string that represents a single account ID or to a list in which the elements are account IDs.

1. Select **Rule** from the **Determine Notification Recipients from** menu and the following new options display in the Notification form:

Figure 9-9 Administrator Notifications: Rule



   - **Notification Recipient Rule** — Provides a list of rules (currently defined for your system) that, when evaluated, returns the recipients' account IDs.
   - **Email Template** — Provides a list of email templates.

2. Select a rule from the **Notification Recipient Rule** menu.
3. Select a template from the **Email Template** menu to specify a format for the administrators' notification email.

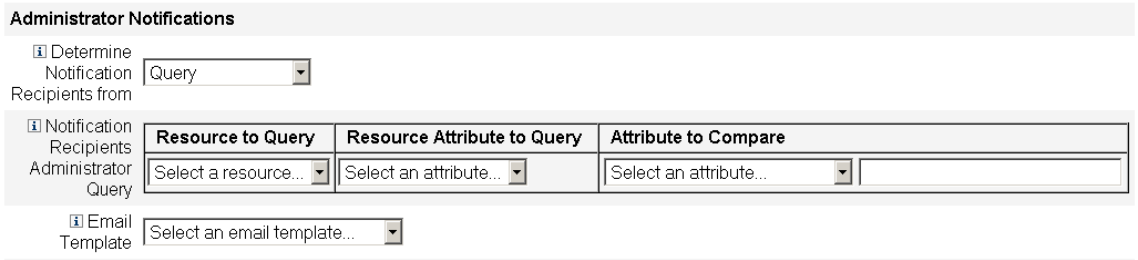
Specifying Administrator Notification Recipients by Query

To derive notification recipients' account IDs by querying a specified resource, follow these steps:

NOTE Only LDAP and Active Directory resource queries are supported at this time.

1. Select **Query** from the **Determine Notification Recipients from** menu and the following new options display in the Notification form, as illustrated in Figure 9-10:

Figure 9-10 Administrator Notifications: Query



Notification Recipient Administrator Query — Provides a table consisting of the following menus, which you can use to construct a query:

- **Resource to Query** — Provides a list of resources currently defined for your system.
- **Resource Attribute to Query** — Provides a list of resource attributes currently defined for your system.
- **Attribute to Compare** — Provides a list of attributes currently defined for your system.
- **Email Template** — Provides a list of email templates.

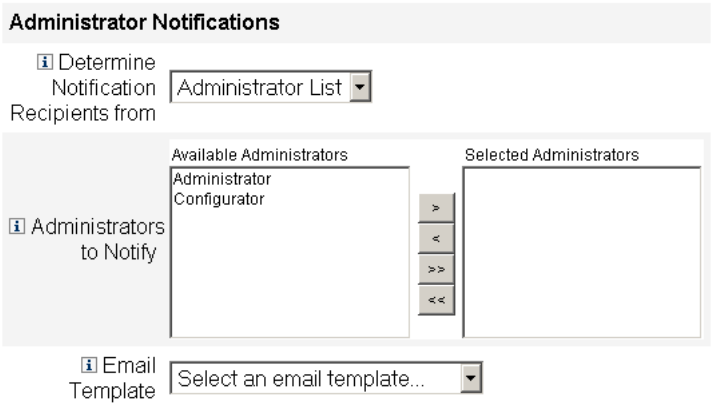
2. Select a resource, resource attribute, and an attribute to compare from these menus to construct the query.
3. Select a template from the **Email Template** menu to specify a format for the administrators' notification email.

Specifying Administrator Notification Recipients from the Administrator List

To specify administrator notification recipients from the Administrator List, follow these steps:

1. Select **Administrator List** from the **Determine Notification Recipients from** menu and the following new options display in the Notification form:

Figure 9-11 Administrator Notifications: Administrators List



   - **Administrators to Notify** — Provides a selection tool with a list of available administrators.
   - **Email Template** — Provides a list of email templates.

2. Select one or more administrators in the Available Administrators list and move them to the Selected Administrators list.
3. Select a template from the **Email Template** menu to specify a format for the administrators' notification email.

Configuring the Approvals Tab

This section provides instructions for configuring the **Approvals** tab, which is available as part of the task template configuration process. For instructions on how to start the configuration process see page 335.

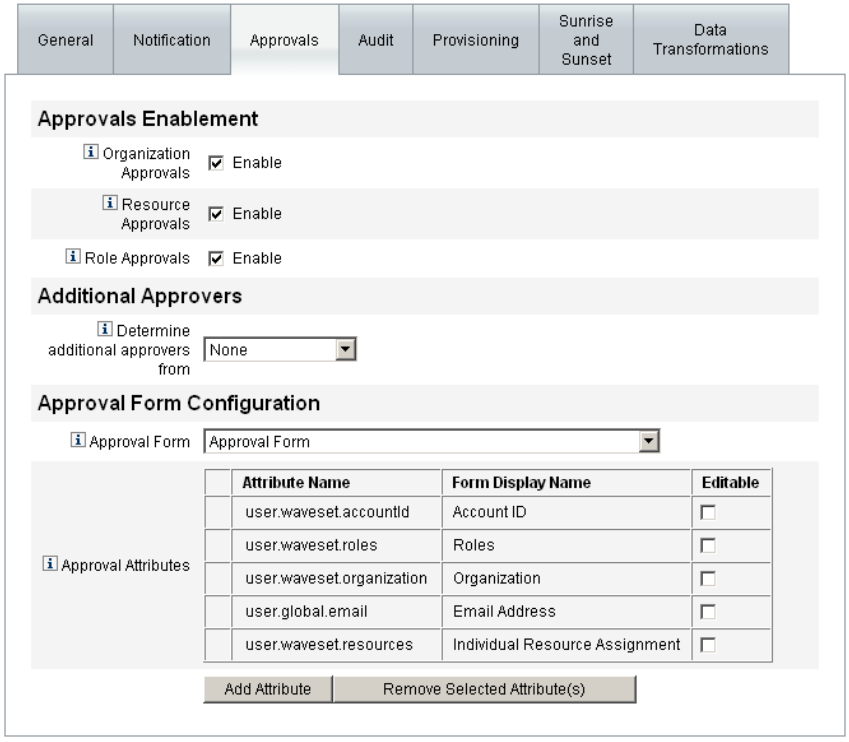
You can use the Approvals tab to designate additional approvers and to specify attributes for the task approval form before Identity Manager executes the create, delete, or update user tasks.

Traditionally, administrators who are associated with a particular organization, resource, or role are required to approve certain tasks before execution. Identity Manager also allows you to designate *additional approvers* — additional administrators who will be required to approve the task.

NOTE If you configure Additional Approvers for a workflow, you are requiring approval from the traditional approvers *and* from any additional approvers specified in the template.

Figure 9-12 illustrates the initial Approvals page Administrator user interface.

Figure 9-12 Approvals Tab: Create User Template



To configure approvals, use the following process:

1. Complete the Approvals Enablement section (see "Enabling Approvals (Approvals Tab, "Approvals Enablement" Section)" on page 348).
2. Complete the Additional Approvers section (see "Specifying Additional Approvers (Approvals Tab, "Additional Approvers" Section)" on page 349).
3. Complete the Approval Form Configuration section for the Create User and Update User Templates only (see "Configuring the Approval Form (Approvals Tab, "Approval Form Configuration" Section)" on page 361).
4. When you are finished configuring the Approvals tab, you can
   - Select a different tab to continue editing the templates.
   - Click **Save** to save your changes and return to the Configure Tasks page.
   - Click **Cancel** to discard your changes and return to the Configure Tasks page.

Enabling Approvals (Approvals Tab, “Approvals Enablement” Section)

Use the following **Approvals Enablement** checkboxes to require approvals before the create user, delete user, or update user tasks can proceed.

NOTE By default, these checkboxes are enabled for the Create User and Update User Templates, but they are *disabled* for the Delete User Template.

- **Organization Approvals** — Enable this checkbox to require approvals from any configured organizational approvers.
- **Resource Approvals** — Enable this checkbox to require approvals from any configured resource approvers.
- **Role Approvals** — Enable this checkbox to require approvals from any configured role approvers.

Specifying Additional Approvers (Approvals Tab, “Additional Approvers” Section)

Use the **Determine additional approvers from** menu to specify how Identity Manager will determine additional approvers for the create user, delete user, or update user tasks.

The options on this menu are listed in Table 9-2.

Table 9-2 “Determine additional approvers from” menu options

Option	Description
None (default)	No additional approvers are required for task execution.
Attribute	Approvers’ account IDs are derived from within an attribute specified in the user’s view.
Rule	Approvers’ account IDs are derived by evaluating a specified rule.
Query	Approvers’ account IDs are derived by querying a particular resource.
Administrator List	Approvers are chosen explicitly from a list.

When you select any of these options (except **None**), additional options display in the Administrator user interface.

Use the instructions provided in the following sections to specify a method for determining additional approvers.

- From Attributes (page 350)
- From Rules (page 351)
- From a Query (page 352)
- From the Administrators List (page 354)

Determine Additional Approvers From Attributes

To determine additional approvers from an attribute, follow these steps.

1. Select **Attribute** from the **Determine additional approvers from** menu.

NOTE The attribute must resolve to a string that represents a single account ID or to a list in which the elements are account IDs.

The following new options display:

Figure 9-13 Additional Approvers: Attribute

- **Approver Attribute** — Provides a list of attributes (currently defined for the view associated with the task configured by this template) used to determine approvers' account IDs.
- **Approval times out after** — Provides a method for specifying when the approval will time out.

NOTE The **Approval times out after** setting affects both initial approvals and escalated approvals.

2. Use the **Approver Attribute** menu to select an attribute.

   The selected attribute displays in the adjacent text field.

3. Decide whether you want the approval request to timeout after a specified period of time.
   - If you want to specify a timeout period, continue to "Configuring Approval Timeouts ("Approval times out after" section)" on page 355 for instructions.

- If you do not want to specify a timeout period, you can continue to "Configuring the Approval Form (Approvals Tab, "Approval Form Configuration" Section)" on page 361 or save your changes and go on to configure a different tab.

Determine Additional Approvers From Rules

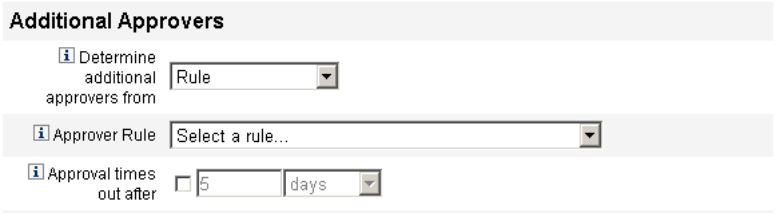
To derive the approvers' account IDs from a specified rule, follow these steps:

1. Select **Rule** from the **Determine additional approvers from** menu.

NOTE When evaluated, the rule must return a string that represents a single account ID or to a list in which the elements are account IDs.

The following new options display.

Figure 9-14 Additional Approvers: Rule



- **Approver Rule** — Provides a list of rules (currently defined for your system) that, when evaluated, returns the recipients' account IDs.
- **Approval times out after** — Provides a method for specifying when the approval will time out.

NOTE The **Approval times out after** setting affects both initial approvals and escalated approvals.

2. Select a rule from the **Approver Rule** menu.

3. Decide whether you want the approval request to timeout after a specified period of time.

   - If you want to specify a timeout period, continue to "Configuring Approval Timeouts ("Approval times out after" section)" on page 355 for instructions.
   - If you do not want to specify a timeout period, you can continue to "Configuring the Approval Form (Approvals Tab, "Approval Form Configuration" Section)" on page 361 or save your changes and go on to configure a different tab.

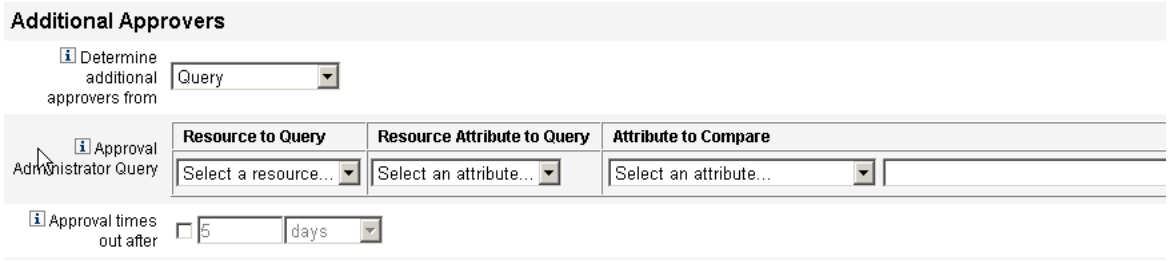
Determine Additional Approvers From a Query

NOTE Only LDAP and Active Directory resource queries are supported at this time.

To derive approvers account IDs by querying a specified resource, follow these steps:

1. Select **Query** from the **Determine additional approvers from** menu and the following new options display:

Figure 9-15 Additional Approvers: Query



   - **Approval Administrator Query** — Provides a table consisting of the following menus, which you can use to construct a query:
     - **Resource to Query** — Provides a list of resources currently defined for your system.
     - **Resource Attribute to Query** — Provides a list of resource attributes currently defined for your system.

- **Attribute to Compare** — Provides a list of attributes currently defined for your system.

- **Approval times out after** — Provides a method for specifying when the approval will time out.

NOTE The **Approval times out after** setting affects both initial approvals and escalated approvals.

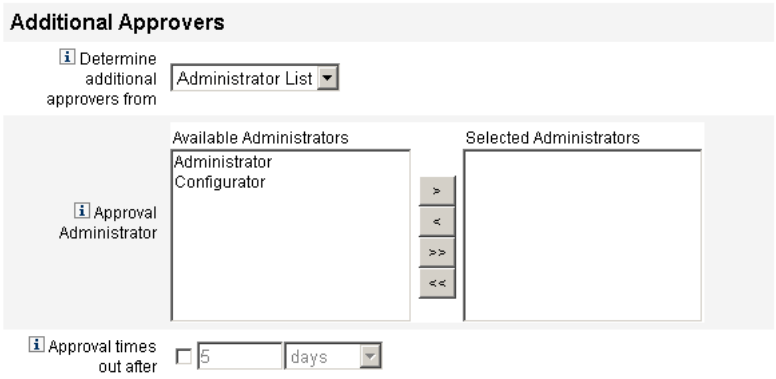
2. Construct a query as follows:
   a. Select a resource from the **Resource to Query** menu.
   b. Select attributes from the **Resource Attribute to Query** and **Attribute to Compare** menus.
3. Decide whether you want the approval request to timeout after a specified period of time.
   - If you want to specify a timeout period, continue to "Configuring Approval Timeouts ("Approval times out after" section)" on page 355 for instructions.
   - If you do not want to specify a timeout period, you can continue to "Configuring the Approval Form (Approvals Tab, "Approval Form Configuration" Section)" on page 361 or save your changes and go on to configure a different tab.

Determine Additional Approvers From the Administrator List

To explicitly choose additional approvers from the Administrators List, follow these steps:

1. Select **Administrator List** from the **Determine additional approvers from** menu and the following new options display:

Figure 9-16 Additional Approvers: Administrators List



- **Administrators to Notify** — Provides a selection tool with a list of available administrators.
- **Approval Form** — Provides a list of user forms additional approvers can use to approve or reject an approval request.
- **Approval times out after** — Provides a method for specifying when the approval will time out.

NOTE The **Approval times out after** setting affects both initial approvals and escalated approvals.

2. Select one or more administrators in the Available Administrators list and move the selected names to the Selected Administrators list.
3. Decide whether you want the approval request to timeout after a specified period of time.
   - If you want to specify a timeout period, continue to "Configuring Approval Timeouts ("Approval times out after" section)" on page 355 for instructions.

- If you do not want to specify a timeout period, you can continue to "Configuring the Approval Form (Approvals Tab, "Approval Form Configuration" Section)" on page 361.

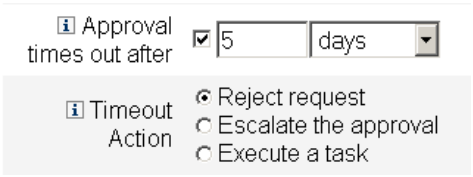
Configuring Approval Timeouts ("Approval times out after" section)

To configure approval timeouts, follow these steps:

1. Select the **Approval times out after** checkbox.

   The adjacent text field and menu become active, and the **Timeout Action** options display, as shown in the following figure.

Figure 9-17 Approval Timeout Options



2. Use the **Approval times out after** text field and menu to specify a timeout period as follows:

   a. Select **seconds**, **minutes**, **hours**, or **days** from the menu.

   b. Enter a number in the text field to indicate how many seconds, minutes, hours, or days you want to specify for the timeout.

NOTE The **Approval times out after** setting affects both initial approvals and escalated approvals.

3. Select one of the following **Timeout Action** buttons to specify what happens when the approval request times out:

   - **Reject Request** — Identity Manager automatically rejects the request if it is not approved before the specified timeout period.

- **Escalate the approval** — Identity Manager automatically escalates the request to another approver if the request is not approved before the specified timeout period.

  When you enable this button, new options display because you must specify how Identity Manager will determine approvers for an escalated approval. Continue to "Configuring the "Determine escalation approvers from" section" on page 357 for instructions.

- **Execute a task** — Identity Manager automatically executes an alternate task if the approval request is not approved before the specified timeout period.

  Enable this button and the **Approval Timeout Task** menu displays so you can specify a task to execute if the approval request times out. Continue to "Configuring the "Approval Timeout Task" section" on page 360 for instructions.

Configuring the "Determine escalation approvers from" section

When you select **Escalate the approval** in the **Timeout Action** section (page 355), the **Determine escalation approvers from** menu displays (Figure 9-18):

Figure 9-18 Determine Escalation Approvers From Menu

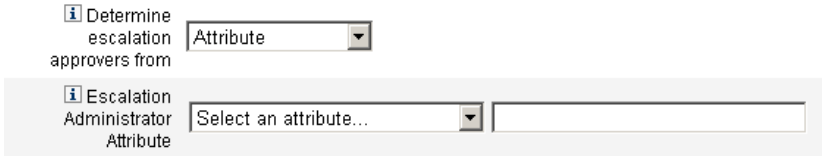
Select one of the following options from this menu to specify how approvers are determined for an escalated approval.

- **Attribute** — Determine approver account IDs from within an attribute specified in the new user's view.

  NOTE The attribute must resolve to a string that represents a single account ID or to a list in which the elements are account IDs.

  When the **Escalation Administrator Attribute** menu displays (Figure 9-19), select an attribute from the list. The selected attribute displays in the adjacent text field.

  Figure 9-19 Escalation Administrator Attribute Menu

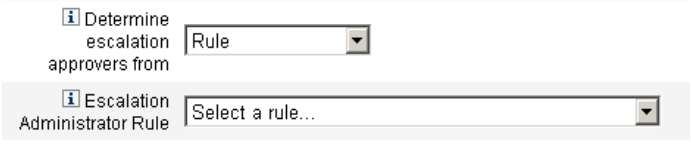


- **Rule** — Determine approver account IDs by evaluating a specified rule.

NOTE When evaluated, the rule must return a string that represents a single account ID or to a list in which the elements are account IDs.

When the **Escalation Administrator Rule** menu displays (Figure 9-20), select a rule from the list.

Figure 9-20 Escalation Administrator Rule Menu



- **Query** — Determine approvers account IDs by querying a particular resource.

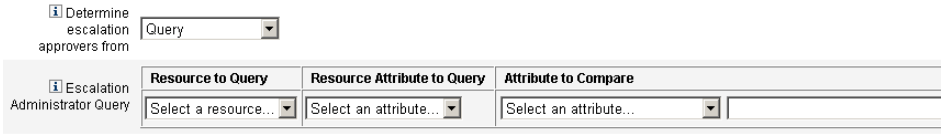
  When the **Escalation Administrator Query** menus display (Figure 9-21), build your query as follows:

  a. Select a resource from the **Resource to Query** menu.

  b. Select an attribute from the **Resource Attribute to Query** menu.

  c. Select an attribute from the **Attribute to Compare** menu.

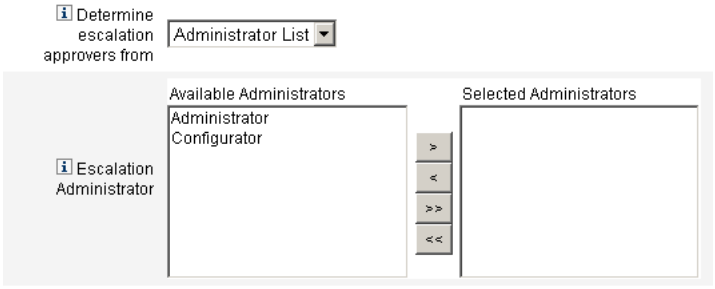
Figure 9-21 Escalation Administrator Query Menu



- **Administrator List** (default) — Choose approvers explicitly from a list.

  When the **Escalation Administrator** selection tool displays (Figure 9-22), select approvers as follows:

Figure 9-22 Escalation Administrator Selection Tool



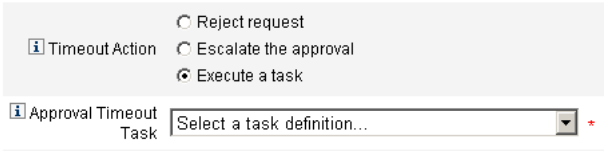
  a. Select one or more administrator names from the **Available Administrators** list.

  b. Move the selected names to the **Selected Administrators** list.

Configuring the "Approval Timeout Task" section

When you select the **Execute a task** option in the **Timeout Action** section (page 355), the **Approval Timeout Task** menu displays (Figure 9-23):

Figure 9-23 Approval Timeout Task Menu



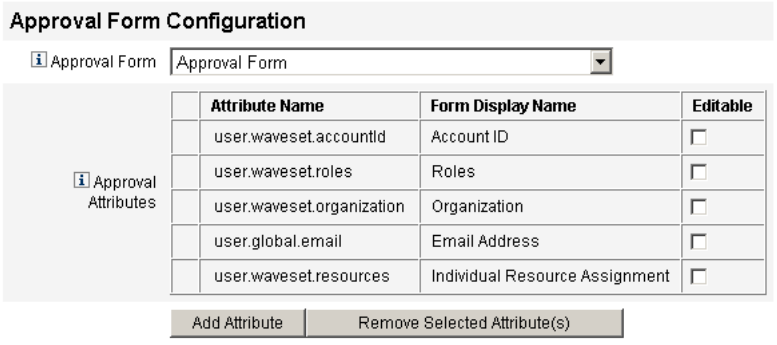
Specify a task to execute if the approval request times out. For example, you might allow the requester to submit a help desk request or send a report to the Administrator.

Configuring the Approval Form (Approvals Tab, “Approval Form Configuration” Section)

NOTE The Delete User Template does not contain an Approval Form Configuration section. You can configure this section for Create User and Update User Templates only.

You can use features in the Approval Form Configuration section to select an approval form, and add attributes to (or remove attributes from) the approval form.

Figure 9-24 Approval Form Configuration



By default, the Approval Attributes table contains the following standard attributes:

- `user.waveset.accountId`
- `user.waveset.roles`
- `user.waveset.organization`
- `user.global.email`
- `user.waveset.resources`

NOTE The default approval form was instrumented to allow approval attributes to display. If you are using an approval form other than the default form, you must instrument your form to display the approval attributes specified in the Approval Attributes table.

To configure an Approval form for additional approvers, follow these steps:

1. Select a form from the **Approval Form** menu.

   Approvers will use this form to approve or reject an approval request.

2. Enable checkboxes in the **Editable** column of the **Approval Attributes** table to allow approvers to edit the attribute value.

   For example, if you enable the `user.waveset.accountId` checkbox the approver can change the user's account ID.

NOTE If you modify any account-specific attribute values in the approval form, you will also override any global attribute values with the same name when the user is actually provisioned.

For example, if resource `R1` exists in your system with a `description` schema attribute, and you add `user.accounts[R1].description` attribute to the approval form as an editable attribute, any changes to the `description` attribute value in the approval form will override the value propagated from `global.description` for resource `R1` only.

3. Click the **Add Attribute or Remove Selected Attributes** buttons to specify attributes from the new user's account data to display in the approval form.

   - To add attributes to the form, see "Adding Attributes" on page 363.
   - To remove attributes from the form, see "Removing Attributes" on page 364.

NOTE You cannot remove the default attributes from an approval form unless you modify the XML file.

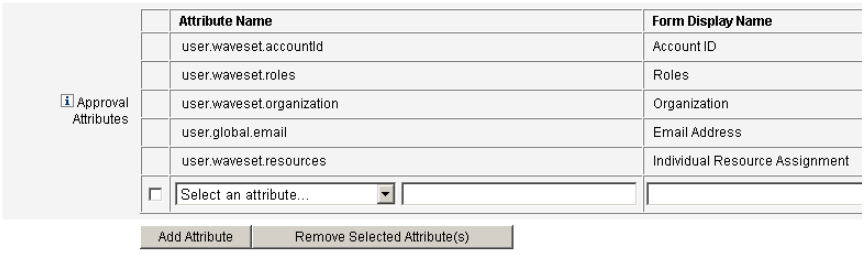
Adding Attributes

To add attributes to the approval form, follow these steps:

1. Click the **Add Attribute** button located under the Approval Attributes table.

   The **Attribute name** menu becomes active in the Approval Attributes table, as shown in the following figure:

   Figure 9-25 Adding Approval Attributes



2. Select an attribute from the menu.

   The selected attribute name displays in the adjacent text field and the attribute's default display name displays in the Form Display Name column.

   For example, if you select the `user.waveset.organization` attribute, the table will contain the following information:

   - If necessary, you can change the default attribute name or the default Form Display Name by typing a new name into the appropriate text field.
   - Enable the **Editable** checkbox if you want to allow the approver to change the attribute's value.

     For example, the approver may want to override information such as the user's email address.

3. Repeat these steps to specify additional attributes.

Removing Attributes

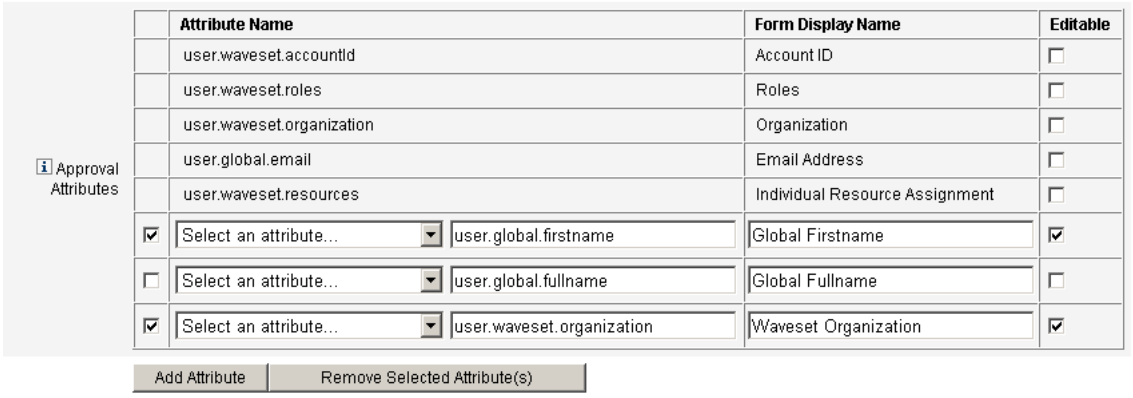
NOTE You cannot remove the default attributes from an approval form unless you modify the XML file.

To remove attributes from the approval form, follow these steps:

1. Enable one or more checkboxes in the leftmost column of the **Approval Attributes** table.
2. Click the **Remove Selected Attributes** button to immediately remove the selected attributes from the **Approval Attributes** table.

   For example, `user.global.firstname` and `user.waveset.organization` would be removed from the following table when you clicked the **Remove Selected Attributes** button.

Figure 9-26 Removing Approval Attributes

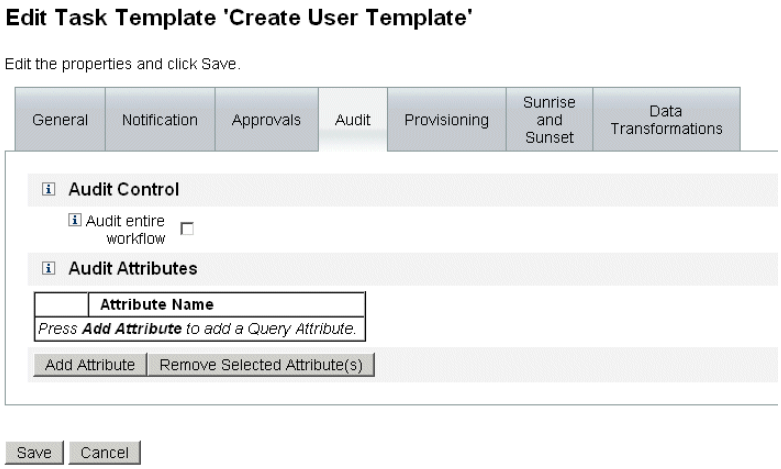


Configuring the Audit Tab

This section provides instructions for configuring the **Audit** tab, which is available as part of the task template configuration process. For instructions on how to start the configuration process see page 335.

All of the configurable Task Templates support configuring workflows to audit certain tasks. Specifically, you can configure the Audit tab to control whether workflow events will be audited and specify which attributes will be stored for reporting purposes.

Figure 9-27 Audit Create User Template

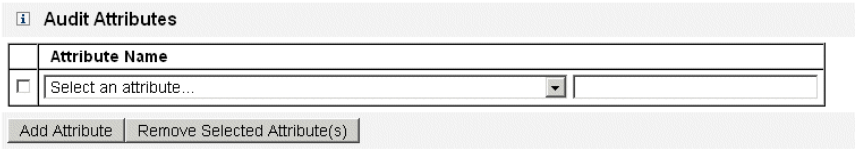


To configure auditing from the User Template's Audit tab, follow these steps:

1. Select the **Audit entire workflow** checkbox to activate the workflow auditing feature. For information on workflow auditing, see "Creating Audit Events From Workflows" on page 379. Note that auditing workflows degrades performance.
2. Click the **Add Attribute** button (located in the **Audit Attributes** section) to select attributes you want to audit for reporting purposes.
3. When the **Select an attribute...** menu displays in the **Audit Attributes** table, select an attribute from the list.

   The selected attribute name displays in the adjacent text field.

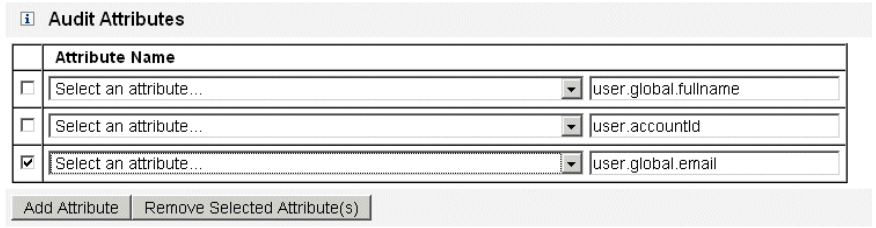
Figure 9-28 Adding an Attribute



To remove attributes from the Audit Attributes table, use the following steps:

1. Enable the checkbox adjacent to the attribute you want to remove.

Figure 9-29 Removing the `user.global.email` Attribute



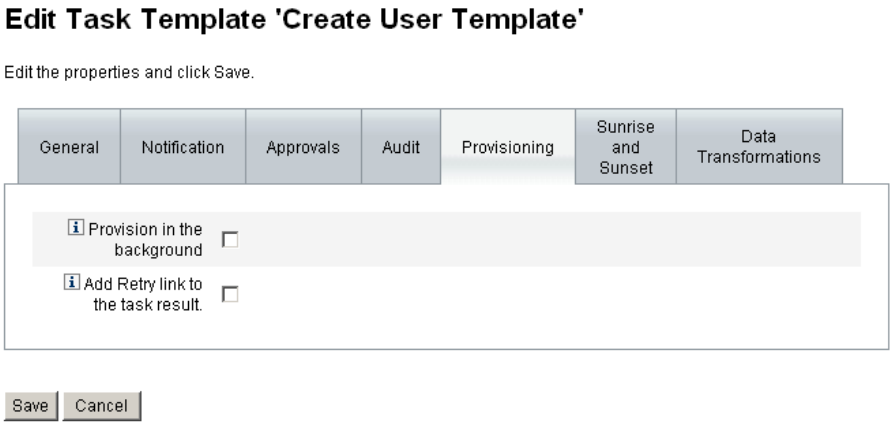
2. Click the **Remove Selected Attributes** button.

Configuring the Provisioning Tab

This section provides instructions for configuring the **Provisioning** tab, which is available as part of the task template configuration process. For instructions on how to start the configuration process see page 335.

NOTE This tab is available for the Create and Update User Templates only.

Figure 9-30 Provisioning Tab: Create User Template



You can use the Provisioning tab to configure the following options, which are related to provisioning:

- **Provision in the background** – Enable this checkbox to run a create, delete, or update task in the background instead of running the task synchronously.

  Provisioning in the background allows you to continue working in Identity Manager while the task executes.

- **Add Retry link to the task result** – Enable this checkbox to add a **Retry** link to the user interface when a provisioning error results from task execution. The **Retry** link allows the user to attempt the task again if it failed on the first attempt.

Configuring the Sunrise and Sunset Tab

This section provides instructions for configuring the **Sunrise and Sunset** tab, which is available as part of the task template configuration process. For instructions on how to start the configuration process see page 335.

NOTE This tab is available for the Create User task template only.

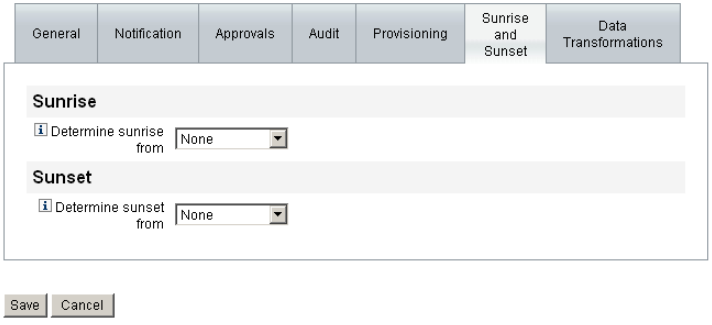
You use the Sunrise and Sunset tab to select a method for determining the time and date when the following actions will occur.

- Provisioning will take place for a new user (*sunrise*).
- Deprovisioning will take place for a new user (*sunset*).

For example, you can specify a sunset date for a temporary worker whose contract expires after six months.

Figure 9-31 illustrates the settings on the Sunrise and Sunset tab.

Figure 9-31 Sunrise and Sunset Tab: Create User Template



The topics that follow provide instructions for configuring the Sunrise and Sunset tab.

Configuring Sunrises

Configure the sunrise settings to specify the time and date provisioning will take place for a new user, and to specify the user who will own the work item for sunrise.

To configure sunrises, follow these steps:

1. Select one of the following options from the **Determine sunrise from** menu to specify how Identity Manager will determine a time and date for provisioning.
   - **Specifying a Time** — Delays provisioning until a specified time in the future. Continue to page 370 for instructions.
   - **Specifying a Date** — Delays provisioning until a specified calendar date in the future. Continue to page 370 for instructions.
   - **Specifying an Attribute** — Delays provisioning until a specified date and time based on the attribute's value in the user's view. The attribute must contain a date/time string. When specifying an attribute to contain a date/time string, you can specify a data format to which the data is expected to conform.

     Continue to page 371 for instructions.
   - **Specifying a Rule** — Delays provisioning based on a rule that, when evaluated, produces a date/time string. As when specifying an attribute, you can specify a data format to which the data is expected to conform.

     Continue to page 372 for instructions.

NOTE The **Determine sunrise from** menu defaults to the **None** option, which allows provisioning to take place immediately.

2. Select a user from the **Work Item Owner** menu to specify who will own the work item for sunrise.

NOTE Sunrise work items are available from the Approvals tab.

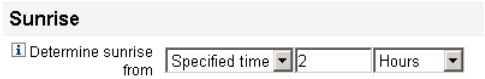
Specifying a Time

To delay provisioning until a specified time, follow these steps:

1. Select **Specified time** from the **Determine sunrise from** menu.
2. When a new text field and menu display to the right of the **Determine sunrise from** menu, type a number into the blank text field and select a unit of time from the menu.

   For example, if you want to provision a new user in two hours, specify the following:

Figure 9-32 Provisioning a New User in Two Hours



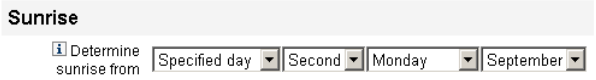
Specifying a Date

To delay provisioning until a specified calendar date, follow these steps:

1. Select **Specified day** from the **Determine sunrise from** menu.
2. Use the menu options that appear to specify which week in the month, which day of the week, and which month the provisioning should occur.

   For example, if you want to provision a new user on the second Monday in September, specify the following:

Figure 9-33 Provisioning a New User by Date



Specifying an Attribute

To determine the provisioning date and time based on the value of an attribute in the users account data, follow these steps:

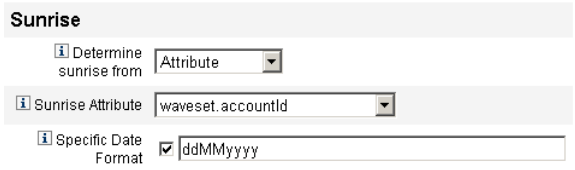
1. Select **Attribute** from the **Determine sunrise from** menu and the following options become active:
   - **Sunrise Attribute** menu – Provides a list of attributes currently defined for the view associated with the task configured by this template.
   - **Specific Date Format** checkbox and menu – Enables you to specify a date format string for the attribute value (if necessary).

NOTE If you do not enable the **Specific Date Format** checkbox, date strings must conform to a format that is acceptable to the `FormUtil` method's `convertDateToString`. Consult the product documentation for a complete list of supported date formats.

2. Select an attribute from the **Sunrise Attribute** menu.
3. If necessary, enable the **Specific Date Format** checkbox and when the **Specific Date Format** field becomes active, enter a date format string.

   For example, to provision a new user based on their `waveset.accountId` attribute value using a day, month, and year format specify the following:

Figure 9-34 Provisioning a New User by Attribute



Specifying a Rule

To determine the provisioning date and time by evaluating a specified rule, follow these steps:

1. Select **Rule** from the **Determine sunrise from** menu and the following options become active:
   - **Sunrise Rule** menu – Provides a list of rules currently defined for your system.
   - **Specific Date Format** checkbox and menu – Enables you to specify a date format string for the rule's returned value (if necessary).

NOTE If you do not enable the **Specific Date Format** checkbox, date strings must conform to a format that is acceptable to the `FormUtil` method's `convertDateToString`. Consult the product documentation for a complete list of supported date formats.

2. Select a rule from the **Sunrise Rule** menu.
3. If necessary, enable the **Specific Date Format** checkbox and when the **Specific Date Format** field becomes active, enter a date format string.

For example, to provision a new user based on the Email rule using a year, month, day, hours, minutes, and seconds format specify the following:

Figure 9-35 Provisioning a New User by Rule

Configuring Sunsets

The options and procedures for configuring sunsets (deprovisioning) are essentially the same as those provided for sunrises (provisioning) in the Configuring Sunrises section.

The only difference is that the Sunset section also provides a **Sunset Task** menu because you must specify a task to deprovision the user on the specified date and time.

To configure a sunset, follow these steps:

1. Use the **Determine sunset from** menu to specify the method for determining when deprovisioning will take place:

NOTE The **Determine sunset from** menu defaults to the **None** option, which allows deprovisioning to take place immediately.

   - **Specified time** – Delays deprovisioning until a specified time in the future. Review "Specifying a Time" on page 370 for instructions.
   - **Specified date** – Delays deprovisioning until a specified calendar date in the future. Review "Specifying a Date" on page 370 for instructions.
   - **Attribute** – Delays deprovisioning until a specified date and time based on the attribute's value in the users' account data. The attribute must contain a date/time string. When specifying an attribute to contain a date/time string, you can specify a date format to which the data is expected to conform. Review "Specifying an Attribute" on page 371 for instructions.
   - **Rule** – Delays deprovisioning based on a rule that, when evaluated, produces a date/time string. As when specifying an attribute, you can specify a date format to which the data is expected to conform.

     Review "Specifying a Rule" on page 372 for instructions.

2. Use the **Sunset Task** menu to specify a task to deprovision the user on the specified date and time.

Configuring the Data Transformations Tab

This section provides instructions for configuring the **Data Transformations** tab, which is available as part of the task template configuration process. For instructions on how to start the configuration process see page 335.

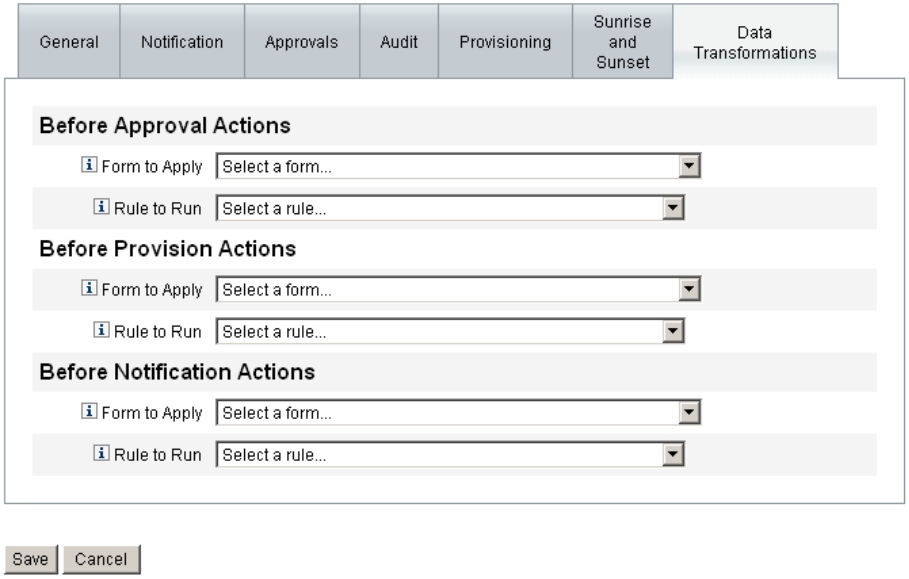
NOTE This tab is available for the Create and Update User Templates only.

If you want to alter user account data as the workflow executes, you can use the Data Transformations tab to specify how Identity Manager will transform the data during provisioning.

For example, if you want forms or rules to generate email addresses that conform to company policy, or if you want to generate sunrise or sunset dates.

When you select the Data Transformations tab, the following page displays:

Figure 9-36 Data Transformations Tab: Create User Template



This page consists of the following sections:

- **Before Approval Actions** – Configure the options in this section if you want to transform user account data before sending approval requests to specified approvers.
- **Before Provision Actions** – Configure the options in this section if you want to transform user account data before a provisioning action.
- **Before Notification Actions** – Configure the options in this section if you want to transform user account data before notifications are sent to specified recipients.

You can configure the following options in each section:

- **Form to Apply** menus – Provide a list of the forms currently configured for your system. Use these menus to specify forms that will be used to transform data from the users accounts.
- **Rule to Run** menus – Provide a list of the rules currently configured for your system. Use these menus to specify rules that will be used to transform data from the users accounts.

Chapter 10

Audit Logging

This chapter describes how the auditing system records events.

This chapter is organized into the following sections:

Overview

The purpose of Identity Manager auditing is to record who did what to which Identity Manager objects, and when did they do it.

Audit events are handled by one or more *publishers*. By default, Identity Manager records audit events in the repository using the repository publisher. Filtering, with the help of audit groups, allows the administrator to select a subset of audit events for recording. Each publisher can be assigned one or more audit groups that are enabled initially.

NOTE For information about monitoring and managing user violations, see Chapter 13, "Identity Auditing: Basic Concepts."

What Does Identity Manager Audit?

Most default auditing is carried out by internal Identity Manager components. There are, however, interfaces that allow events to be generated from workflows or from Java code.

The default Identity Manager audit instrumentation focuses on four main areas:

- **Provisioner** – An internal component known as the provisioner may generate audit events.
- **View Handlers** – In the view architecture, the view handler generates audit records. A view handler should always audit when objects are created or modified.
- **Session** – The session methods (such as `checkinObject`, `createObject`, `runTask`, `login`, and `logout`) create an audit record after completing an auditable operation. Most of the instrumentation is pushed into the view handlers.
- **Workflow** – By default, only the approval workflows are instrumented to generate audit records. These generate an audit event when requests are approved or rejected. The workflow feature's interface to the audit logger is through the `com.waveset.session.WorkflowServices` application. See the next section for more information.

Creating Audit Events From Workflows

By default, only the approval workflows are instrumented to generate audit records. This section describes how to use the `com.waveset.session.WorkflowServices` application to generate extra audit events from any workflow process.

Additional audit events may be required if you need to report on custom workflows. See "Modifying Workflows to Log Standard Audit Events" on page 381 for information on adding audit events to workflows.

Special audit events can also be added to workflows in support of Workflow Reports (page 314). Workflow Reports report the amount of time it takes for workflows to complete. Special audit events are required to store the data necessary for time computations. See "Modifying Workflows to Log Timing Audit Events" on page 385 for information on adding timing audit events to workflows.

The com.waveset.session.WorkflowServices Application

The com.waveset.session.WorkflowServices application generates audit events from any workflow process. Table 10-1 describes the arguments that are available for this application.

Table 10-1 Arguments for com.waveset.session.WorkflowServices

Argument	Type	Description
op	String	Operation for WorkflowServices. Must be set to **audit** or **auditWorkflow**. Use **audit** for standard workflow auditing. Use **auditWorkflow** to store timing audit events required for time computations. Required.
type	String	Name of the object type that is being audited. Auditable object types are listed in Table B-5 on page 654. Required to log standard audit events.
action	String	Name of the action performed. Auditable actions are listed in Table B-6 on page 656. Required.
status	String	Name of the status for the specified action. Status is listed in Table B-7 on page 659 (in the Results column). Required to log standard audit events.
name	String	Name of the object being affected by the specified action. Required to log standard audit events.
resource	String	(*Optional*) Name of the resource where the object being changed resides.
accountId	String	(*Optional*) Account ID that is being modified. This should be a native resource account name.
error	String	(*Optional*) Localized error string to accompany any failures.
reason	String	(*Optional*) Name of the ReasonDenied object, which maps to an internationalized message describing the causes of common failures.
attributes	Map	(*Optional*) Map of attribute names and values that were added or modified.
parameters	Map	(*Optional*) Maps up to five additional names or values that are relevant to an event.
organizations	List	(*Optional*) List of organization names or IDs where this event will be placed. This is used for organizational scoping of the audit log. If not present, the handler will attempt to resolve the organization based on the type and name. If the organization cannot be resolved, the event is placed in Top (the highest level of the organizations hierarchy).
originalAttributes	Map	(*Optional*) Map of old attribute values. The names should match the ones listed in the attributes argument. The values will be any previous value you wish to save in your audit log.

Modifying Workflows to Log Standard Audit Events

To create a standard audit event in a workflow, add the following <Activity> element to the workflow:

```
<Activity name='createEvent'>
```

Next, nested in the <Activity> element, include an <Action> element that references the com.waveset.session.WorkflowServices application:

```
<Action class='com.waveset.session.WorkflowServices'>
```

Nested in the <Action> element, include the required and optional <Argument> elements. See Table 10-1 on page 380 for a list of the arguments.

To log standard audit events, the op argument must be set to audit.

Code Example 10-1 shows the minimum code required to create a standard audit event.

Examples

Code Example 10-1 illustrates a simple workflow activity. It shows the generation of an event that will log a resource deletion activity named ADSIResource1, performed by ResourceAdministrator:

Code Example 10-1 Simple Workflow Activity

```
<Activity name='createEvent'>
   <Action class='com.waveset.session.WorkflowServices'>
     <Argument name='op' value='audit'/>
     <Argument name='type' value='Resource'/>
     <Argument name='action' value='Delete'/>
     <Argument name='status' value='Success'/>
     <Argument name='subject' value='ResourceAdministrator'/>
     <Argument name='name' value='ADSIResource1'/>
   </Action>
   <Transition to='end'/>
</Activity>
```

Code Example 10-2 on page 383 shows how you can add specific attributes to a workflow that tracks the changes applied by each user in an approval process to a granular level. This addition typically will follow a `ManualAction` that solicits input from a user.

`ACTUAL_APPROVER` is set in the form and in the workflow (if approving from the approvals table) based on the person who actually performed the approval. `APPROVER` identifies the person to whom it was assigned.

Code Example 10-2 Attributes Added to Track Changes in an Approval Process (Page 1 of 2)

```
<Action name='Audit the Approval'
   application='com.waveset.session.WorkflowServices'>
     <Argument name='op' value='audit'/>
     <Argument name='type' value='User'/>
     <Argument name='name' value='$(CUSTOM_DESCRIPTION)'/>
     <Argument name='action' value='approve'/>
     <Argument name='accountId' value='$(accountId)'/>
     <Argument name='status' value='success'/>
     <Argument name='resource' value='$(RESOURCE_IF_APPLICABLE)'/>
     <Argument name='loginApplication' value='$(loginApplication)'/>
     <Argument name='attributes'>
       <map>
          <s>fullname</s><ref>user.accounts[Lighthouse].fullname</ref>
          <s>jobTitle</s><ref>user.accounts[Lighthouse].jobTitle</ref>
          <s>location</s><ref>user.accounts[Lighthouse].location</ref>
          <s>team</s><ref>user.waveset.organization</ref>
          <s>agency</s><ref>user.accounts[Lighthouse].agency</ref>
       </map>
    </Argument>
    <Argument name='originalAttributes'>
      <map>
        <s>fullname</s>
        <s>User's previous fullname</s>
        <s>jobTitle</s>
        <s>User's previous job title</s>
        <s>location</s>
        <s>User's previous location</s>
        <s>team</s>
        <s>User's previous team</s>
        <s>agency</s>
        <s>User's previous agency</s>
      </map>
    </Argument>
    <Argument name='attributes'>
      <map>
         <s>firstname</s>
```

Code Example 10-2 Attributes Added to Track Changes in an Approval Process (Page 2 of 2)

```
          <s>Joe</s>
          <s>lastname</s>
          <s>New</s>
        </map>
      </Argument>
      <Argument name='subject'>
        <or>
            <ref>ACTUAL_APPROVER</ref>
            <ref>APPROVER</ref>
        </or>
      </Argument>
      <Argument name='approver' value='$(APPROVER)'/>
</Action>
```

Modifying Workflows to Log Timing Audit Events

Workflows can be modified to log timing events in support of Workflow Reports (page 314). Standard audit events only log that an event occurred; Timing audit events log when an event started and stopped, making it possible to perform time computations. In addition to timing event data, most of the information logged by standard audit events is also stored. See "What Information Do Timing Audit Events Store?" on page 387 for more information.

NOTE In order to log timing audit events, you must first activate workflow auditing for each workflow type that you plan to audit.

- For workflows that you can configure in the Administrator interface using task templates, first enable the task template that corresponds to the workflow that you want to audit. See "Enabling the Task Templates" on page 332 for instructions.

  Next, turn on workflow auditing by selecting the **Audit entire workflow** checkbox. See "Configuring the Audit Tab" on page 365 for instructions.

- For workflows that do not have task templates, instead define a variable named `auditWorkflow` and set its value to `true`.

Note that auditing workflows degrades performance.

Code Example 10-3 shows the code required to create timing audit events. To log timing audit events, the `op` argument must be set to `auditWorkflow`.

The `action` argument is also required and must be set to one of the following values:

- StartWorkflow
- EndWorkflow
- StartProcess
- EndProcess
- StartActivity
- EndActivity

Additional action arguments may be defined in `auditconfig.xml`.

Examples

Code Example 10-3 illustrates enabling timing audit events in a workflow. To instrument a workflow, `auditWorkflow` events should be added at the beginning and end of workflows, processes, and activities.

The `auditWorkflow` operation is defined in `com.waveset.session.WorkflowServices`. See page 380 for more information.

Code Example 10-3 Starting Timing Audit Events in a Workflow

```
<Action application='com.waveset.session.WorkflowServices'>
  <Argument name='op' value='auditWorkflow'/>
  <Argument name='action' value='StartWorkflow'/>
</Action>
```

To stop logging timing audit events in a workflow, add the code in Code Example 10-4 to a `pre-end` activity near the conclusion of the workflow. Note that, when instrumenting a workflow or process, you are not permitted to put anything in an `end` activity. You must create a `pre-end` activity that performs the final `auditWorkflow` event, and then unconditionally transition to the `end` event.

Code Example 10-4 Stopping Timing Audit Events in a Workflow

```
<Action application='com.waveset.session.WorkflowServices'>
  <Argument name='op' value='auditWorkflow'/>
  <Argument name='action' value='EndWorkflow'/>
</Action>
```

What Information Do Timing Audit Events Store?

By default, timing audit events log most of the information stored by regular audit events, including the following attributes:

Attribute	Description
WORKFLOW	Name of the workflow being executed
PROCESS	Name of the current process being executed
INSTANCEID	Unique instance ID of the workflow being executed
ACTIVITY	Activity in which the event is being logged
MATCH	Unique identifier within a workflow instance

The above attributes are stored in the `logattr` table and they come from `auditableAttributesList`. Identity Manager also checks whether the `workflowAuditAttrConds` attribute is defined.

It is possible to call some activities several times within a single instance of a process or a workflow. To match the audit events for a particular activity instance, Identity Manager stores a unique identifier within a workflow instance in the `logattr` table.

To store additional attributes in the `logattr` table for a workflow, you must define a `workflowAuditAttrConds` list, which is assumed to be a list of `GenericObjects`. If you define an `attrName` attribute within the `workflowAuditAttrConds` list, Identity Manager pulls `attrName` out of the object within the code, first using `attrName` as the key, and then storing the `attrName` value. All keys and values are stored as uppercase values.

Audit Configuration

Audit configuration is composed of one or more publishers and several pre-defined groups.

An audit group defines a subset of all audit events based on object types, actions, and action results. Each publisher is assigned one or more audit groups. By default, the repository publisher is assigned to all audit groups.

An audit publisher delivers audit events to a particular audit destination. The default repository publisher writes audit records into the repository. Each audit publisher may have implementation specific options. Audit publishers may have a text formatter assigned. (Text formatters provide textual representation of audit events.)

The Audit Configuration (`#ID#Configuration:AuditConfiguration`) object is defined in the `sample/auditconfig.xml` file. This configuration object has an extension that is a generic object. At the top level, it has the following attributes:

- filterConfiguration
- extendedTypes
- extendedActions
- extendedResults
- publishers

filterConfiguration

The `filterConfiguration` attribute lists *event groups*, which are used to enable one or more events to pass through the event filter. Each group listed in the `filterConfiguration` attribute contains the attributes listed in Table 10-2.

Table 10-2 filterConfiguration Attributes

Attribute	Type	Description
`groupName`	String	Event group name
`displayName`	String	Message catalog key representing the group name
`enabled`	String	Boolean flag indicating whether the entire group is enabled or disabled. This attribute is an optimization for the filtering object.
`enabledEvents`	List	List of generic objects that describe which events a group enables. An event must be listed to enable its logging. Each object listed must have these attributes: • `objectType` (String) – Name the objectType. • `actions` (List) – List of one or more actions. • `results` (List) – List of one or more results.

Code Example 10-5 illustrates the default Resource Management group.

Code Example 10-5 Default Resource Management Group

```
<Object name='Resource Management'>
  <Attribute name='enabled' value='true'/>
  <Attribute name='displayName'
             value='UI_RESOURCE_MGMT_GROUP_DISPLAYNAME'/>
  <Attribute name='enabledEvents'>
    <List>
      <Object>
        <Attribute name='objectType' value='Resource'/>
        <Attribute name='actions' value='ALL'/>
        <Attribute name='results' value='ALL'/>
      </Object>
      <Object>
        <Attribute name='objectType' value='ResourceObject'/>
        <Attribute name='actions' value='ALL'/>
        <Attribute name='results' value='ALL'/>
      </Object>
    </List>
  </Attribute>
</Object>
```

Identity Manager provides the following default audit event groups:

- Account Management
- Compliance Management
- Configuration Management
- Event Management
- Logins/Logoffs
- Password Management
- Resource Management
- Role Management
- Security Management
- Task Management
- Changes Outside Identity System
- Service Provider Edition

You can configure each group from the Audit Configuration page of the Identity Manager Administrator interface (**Configure > Audit**). See "Configuring Audit Groups and Audit Events" on page 201.

The Audit Configuration page allows you to configure successful or failed events for each group. The interface does not support adding or modifying enabled events for groups, but you can do this by using the Identity Manager debug pages (page 60).

The default event groups and the events they enable are described in the following sections.

Account Management

This group is enabled by default.

Table 10-3 Default Account Management Event Groups

Type	Actions
Encryption Key	All Actions
Identity System Account	All Actions
Resource Account	Approve, Change Password, Create, Delete, Disable, Enable, Modify, Reject, Rename, Reset Password, Unlock
Workflow Case	End Activity, End Process, End Workflow, Start Activity, Start Process, Start Workflow
User	Approve, Create, Credentials Expired, Delete, Disable, Enable, Lock, Login, Logout, Modify, Reject, Rename, Unlock, Username Recovery

Changes Outside Identity System

This group is disabled by default.

Table 10-4 Changes Outside Identity Manager Event Groups and Events

Type	Actions
ResourceAccount	NativeChange

Compliance Management

This group is enabled by default.

Table 10-5 Default Compliance Management Group Events

Type	Actions
AuditPolicy	All Actions
AccessScan	All Actions
ComplianceViolation	All Actions
Data Exporter	All Actions
UserEntitlement	Attestor Approved, Attestor Rejected, Remediation Requested, Rescan Requested, Terminate
Access Review Workflow	All Actions
Remediation Workflow	All Actions

Configuration Management

This group is enabled by default.

Table 10-6 Default Configuration Management Event Groups

Type	Actions
Configuration	All Actions
UserForm	All Actions
Rule	All Actions
EmailTemplate	All Actions
LoginConfig	All Actions
Policy	All Actions
XmlData	Import
Log	All Actions

Event Management

This group is enabled by default.

Table 10-7 Default Event Management Event Groups

Type	Actions
Email	Notify
TestNotification	Notify

Logins/Logoffs

This group is enabled by default.

Table 10-8 Default Identity Manager Logins/Logoffs Event Groups

Type	Actions
User	Credentials Expired, Lock, Login, Logout, Unlock, Username Recovery

Password Management

This group is enabled by default.

Table 10-9 Default Password Management Event Groups and Events

Type	Actions
Resource Account	Change Password, Reset Password

Resource Management

This group is enabled by default.

Table 10-10 Default Resource Management Event Groups and Events

Type	Actions
Resource	All Actions
Resource Object	All Actions
ResourceForm	All Actions
ResourceAction	All Actions
AttrParse	All Actions
Workflow Case	End Activity, End Process, End Workflow, Start Activity, Start Process, Start Workflow

Role Management

This group is disabled by default.

Table 10-11 Default Role Management Event Groups and Events

Type	Actions
Role	All Actions

Security Management

This group is enabled by default.

Table 10-12 Default Security Management Event Groups and Events

Type	Actions
Capability	All Actions
EncryptionKey	All Actions
Organization	All Actions
Admin Role	All Actions

Service Provider Edition

This group is enabled by default.

Table 10-13 Service Provider Event Groups and Events

Type	Actions
Directory User	Challenge Response, Create, Delete, Modify, Post-Operation Callout, Pre-Operation Callout, Update Authentication Answers, Username Recovery

Task Management

This group is disabled by default.

Table 10-14 Task Management Event Groups and Events

Type	Actions
TaskInstance	All Actions
TaskDefinition	All Actions
TaskSchedule	All Actions
TaskResult	All Actions
ProvisioningTask	All Actions

extendedTypes

Each new Type that you add to the `com.waveset.object.Type` class can be audited. A new Type must be assigned a unique two-character database key, which is stored in the database. All new Types are added to the various audit reporting interfaces. Each new Type to be logged to the database without being filtered must be added to an audit event groups `enabledEvents` attribute (as described with the `enabledEvents` attribute).

There may be situations in which you want to audit something that does not have an associated `com.waveset.object.Type`, or where you want to represent an existing type more granularly.

For example, the WSUser object stores all of the user's account information in the repository. Instead of marking each event as a USER type, the auditing process splits the WSUser object into two different audit types (Resource Account and Identity Manager Account). Splitting the object in this way makes it easier to find specific account information in the audit log.

Add extended audit types by adding to the extendedObjects attribute. Each extended object must have the attributes listed in the following table:

Table 10-15 Extended Object Attributes

Argument	Type	Description
name	String	The name of the type, which is used when constructing AuditEvents and during event filtering.
displayName	String	A message catalog key that represents the name of the type.
logDbKey	String	Two-character database key to use when storing this object in the Log table. See "Audit Log Database Mappings" on page 654 for reserved values.
supportedActions	List	Actions supported by the object type. This attribute will be used when creating audit queries from the user interface. If this value is null, all actions will be displayed as possible values to be queried for this object type.
mapsToType	String	(Optional) The name of the com.waveset.object.Type that maps to this type, if applicable. This attribute is used when attempting to resolve an object organizational membership if not already specified on the event.
organizationalMembership	List	(Optional) A default list of organization IDs where events of this type should be placed, if they do not already have assigned organizational membership.

All customer-specific keys should start with the # symbol to prevent duplicate keys when new internal keys are added.

Code Example 10-6 illustrates the extended-type Identity Manager Account.

Code Example 10-6 Extended Type Identity Manager Account (Page 1 of 2)

```
<Object name='LighthouseAccount'>
   <Attribute name='displayName' value='LG_LIGHTHOUSE_ACCOUNT'/>
   <Attribute name='logDbKey' value='LA'/>
   <Attribute name='mapsToType' value='User'/>
```

Code Example 10-6 Extended Type Identity Manager Account (Page 2 of 2)

```
   <Attribute name='supportedActions'>
      <List>
         <String>Disable</String>
         <String>Enable</String>
         <String>Create</String>
         <String>Modify</String>
         <String>Delete</String>
         <String>Rename</String>
      </List>
   </Attribute>
</Object>
```

extendedActions

Audit actions typically map to `com.waveset.security.Right` objects. When adding new Right objects, you must specify a unique two-character `logDbKey`, which will be stored in the database. You may encounter situations where there is no right to correspond to a particular action that must be audited. You can extend actions by adding them to the list of objects in the `extendedActions` attribute.

Each `extendedActions` object must include the attributes listed in Table 10-16.

Table 10-16 extendedAction Attributes

Attribute	Type	Description
`name`	String	The name of the action, which is used when constructing AuditEvents and during event filtering.
`displayName`	String	A message catalog key that represents the name of the action.
`logDbKey`	String	Two-character database key to use when storing this action in the Log table. See "Audit Log Database Mappings" on page 654 for reserved values.

All customer-specific keys should start with the # symbol to prevent duplicate keys when new internal keys are added.

Code Example 10-7 illustrates adding an action for Logout.

Code Example 10-7 Adding an Action for Logout

```
<Object name='Logout'>
  <Attribute name='displayName' value='LG_LOGOUT'/>
  <Attribute name='logDbKey' value='LO'/>
</Object>
```

extendedResults

In addition to extending audit types and actions, you can add results. By default, there are two results: *Success* and *Failure*. You can extend results by adding them to the list of objects in the `extendedResults` attribute.

Each `extendedResults` object must include the attributes described in Table 10-17.

Table 10-17 extendedResults Attributes

Attribute	Type	Description
`name`	String	The name of the result, which is used when setting the status on AuditEvents and during event filtering.
`displayName`	String	A message catalog key that represents the name of a result.
`logDbKey`	String	One-character database key to use when storing this result in the Log table. See the section titled Database Keys for reserved values.

All customer-specific keys should use the range 0–9 to prevent duplicate keys when new internal keys are added.

publishers

Each item in the publishers list is a generic object. Each publisher has the following attributes:

Table 10-18 publishers Attributes

Attribute	Type	Description
`class`	String	The name of the publisher class.
`displayName`	String	A message catalog key that represents the name of the publisher.
`description`	String	A description of the publisher.
`filters`	List	A list of audit groups assigned to this publisher.
`formatter`	String	The name of the text formatter (if any).
`options`	List	A list of publisher options. These options are publisher specific; each item in the list is a map representation of `PublisherOption`. See `sample/auditconfig.xml` for examples.

Database Schema

There are two tables in the Identity Manager repository that are used to store audit data:

- `waveset.log` – Stores most of the event details.
- `waveset.logattr` – Stores the IDs of the organizations to which each event belongs.

These tables are discussed first in this section.

When audit log data exceeds the column length limit(s) specified for the above tables, Identity Manager truncates the data to fit. Audit log truncation is discussed on page 404.

A few columns in the audit log have configurable column length limits. To find out about these columns and learn how to change their length limits, see "Audit Log Configuration" on page 405.

waveset.log

This section lists the various column names and data types found in the `waveset.log` table. The data types are taken from the Oracle database definition and will vary slightly from database to database. For a list of data schema values for all supported databases, see Appendix B, "Audit Log Database Schema."

A few of the column values are stored as keys in the database for space optimization. For key definitions, see the section titled "Audit Log Database Mappings" on page 654.

- `objectType` **CHAR(2)** – A two-character key that represents the object type that is being audited.
- `action` **CHAR(2)** – A two-character key that represents the action that was performed.
- `actionStatus` **CHAR(1)** – A one-character key that represents the result of the action that was performed.
- `reason` **CHAR(2)** – A two-character database key to describe a `ReasonDenied` object if there was a failure. `ReasonDenied` is a class that wraps a message catalog entry and is used for common failures such as invalid credentials and insufficient privileges.
- `actionDateTime` **VARCHAR(21)** – The date and time in which the above action took place. This value is stored in GMT time.
- `objectName` **VARCHAR(128)** – The name of the object that was acted on during an operation.
- `resourceName` **VARCHAR(128)** – The resource name that was used during an operation, if applicable. Some events do not reference resources; however, in many situations it gives greater detail to log the resource where an operation has performed.
- `accountName` **VARCHAR(255)** – The account ID being acted on, if applicable.
- `server` **VARCHAR(128)** – The server where the action was performed (automatically assigned by the event logger).
- `message` **VARCHAR(255*) or CLOB** – Any localized messages associated with an action including things like error messages. The text is stored localized so it will not be internationalized. The column length limit for this column is configurable. The default data type is VARCHAR and the default size limit is 255. See "Audit Log Configuration" on page 405 for information on how to adjust the size limit.

- `interface` **VARCHAR(50)** – The Identity Manager interface (such as the Administrator, User, IVR, or SOAP interface) from which the operation was performed.
- `acctAttrChanges` **VARCHAR(4000)** – Stores the account attributes that have changed during a create and update. The attributes changes field is always populated during a create or update for a resource account or Identity Manager account object. All of the attributes changed during an action are stored in this field as a string. The data is in `NAME=VALUE NAME2=VALUE2` format. This field can be queried by executing "`contains`" SQL statements against the name or value.

Code Example 10-8 illustrates a value in the `acctAttrChanges` column:

Code Example 10-8 Value in `acctAttrChanges` Column

```
COMPANY="COMPANY" DEPARTMENT="DEPT" DESCRIPTION="DSMITH
DESCRIPTION" FAX NUMBER="5122222222" HOME ADDRESS="12282
MOCKINGBIRD LANE" HOME CITY="AUSTIN" HOME PHONE="5122495555"
HOME STATE="TX" HOME ZIP="78729" JOB TITLE="DEVELOPER"
MOBILE PHONE="5125551212" WORK PHONE="5126855555"
EMAIL="someone@somecompany.COM" EXPIREPASSWORD="TRUE"
FIRSTNAME="DANIEL" FULLNAME="DANIEL SMITH" LASTNAME="SMITH"
```

- `acctAttr01label`-`acctAttr05label` **VARCHAR(50)** – These five additional `NAME` slots are columns that can promote up to five attribute names to be stored in their own column instead of in the big blob. You can promote an attribute from the Resource Schema Configuration page using the `"audit?"` setting, and the attribute will be available for data mining.
- `acctAttr01value`-`acctAttr05value` **VARCHAR(128)** – Five additional `VALUE` slots that can promote up to five attribute values to be stored in a separate column instead of in the blob column.
- `parm01label`-`parm05label` **VARCHAR(50)** – Five slots used to store parameters associated with an event. Examples of these are Client IP and Session ID names.
- `parm01value`-`parm05value` **VARCHAR(128*) or CLOB** – Five slots used to store parameters associated with an event. Examples of these are Client IP and Session ID values. The column length limit for these columns is configurable. The default data type is VARCHAR and the default size limit is 128. See "Audit Log Configuration" on page 405 for information on how to adjust the size limit.
- `id` **VARCHAR(50)** – Unique ID assigned to each record by the repository referenced in the `waveset.logattr` table.
- `name` **VARCHAR(128)** – Generated name assigned to each record.
- `xml`**BLOB**– Used internally by Identity Manager.

waveset.logattr

The waveset.logattr table is used to store IDs of the organizational membership for each event, which is used to scope the audit log by organization.

- id **VARCHAR(50)** – ID of the waveset.log record.
- attrname **VARCHAR(50)** – Currently, always MEMBEROBJECTGROUPS.
- attrval **VARCHAR(255)** – ID of the MemberObject group where the event belongs.

Audit Log Truncation

When one or more columns of audit log data exceed the specified column length limit(s), the column data is truncated to fit. Specifically, the data is truncated to the specified limit, less three characters. An ellipsis (...) is then appended to the column data to indicate truncation has occurred.

In addition, the NAME column of that audit record is prepended with the string #TRUNCATED# to facilitate querying of truncated records.

NOTE Identity Manager assumes UTF8 encoding when it computes where to truncate messages. If your configuration uses encoding other than UTF8, there is a chance that truncated data may still exceed the actual column size in your database. If this happens, the truncated message does not appear in the audit log and an error is written in the system log.

Audit Log Configuration

Certain columns in the Audit Log can be configured to store large amounts of data in the repository.

Resizing Column Length Limits

Several columns in the audit log have configurable column length limits. These columns are:

- the `message` column
- the `parmNNvalue` columns (where `NN` = `01, 02, 03, 04,` or `05`)
- the `xml` column

NOTE For audit log column descriptions see "Database Schema" on page 400.

Column length limits can be changed by editing the `RepositoryConfiguration` object. For instructions on editing the `RepositoryConfiguration` object, see "Editing Identity Manager Configuration Objects" on page 214.

- To change the column length limit for the `message` column, modify the `maxLogMessageLength` value.
- To change the column length limit for the `parmNNvalue` column, modify the `maxLogParmValueLength` value. The same limit value applies to all five columns. (Individual column length values cannot be defined.)
- To change the column length limit for the `xml` column, modify the `maxLogXmlLength` value.

A server restart is required in order for the new values to take effect.

The column length limit settings in the `RepositoryConfiguration` object determine the maximum amount of data that can be stored in a column. If the data to be stored exceeds these settings, Identity Manager truncates the data. See "Audit Log Truncation" on page 404 for more information.

If you increase a column length setting in the `RepositoryConfiguration` object, also verify that the column size setting in your database is at least as large as the size configured in the `RepositoryConfiguration` object.

Removing Records from the Audit Log

The audit log should be truncated periodically to keep it from growing too large. Use the AuditLog Maintenance Task to remove old records from the audit log.

To schedule a task to remove old records from the audit log, follow these steps:

1. In the Administrator interface, click **Server Tasks > Manage Schedule**.
2. In the Tasks Available for Scheduling section, click the **AuditLog Maintenance Task**.

   The "Create New AuditLog Maintenance Task Task Schedule" page opens.
3. Complete the form and click **Save**.

Preventing Audit Log Tampering

You can configure Identity Manager to prevent the following forms of audit log tampering:

- Adding or inserting audit log records
- Modifying existing audit logs records
- Deleting audit log records or the entire audit log
- Truncating audit logs

All Identity Manager audit log records have unique, per-server sequence numbers and encrypted hash of records and sequence numbers. When you create a Tamper Detection Report, it scans the audit logs per server for:

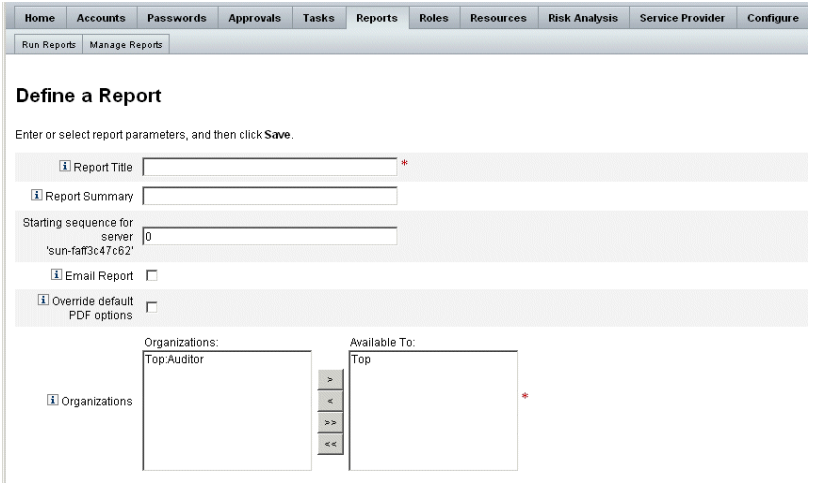
- Gaps in the sequence number (indicating a deleted record)
- Hash mismatches (indicating a modified record)
- Duplicate sequence numbers (indicating a copied record)
- Last sequence number that is less than expected (indicating a truncated log)

Configuring tamper-resistant logging

To configure tamper-resistant logging, follow these steps:

1. Create a tampering report by selecting **Reports > New > Audit Log Tampering Report**.
2. When the Define a Tampering Report page displays (see Figure 10-1), enter a title for the report and then **Save** it.

Figure 10-1 Configuring an Audit Log Tampering Report

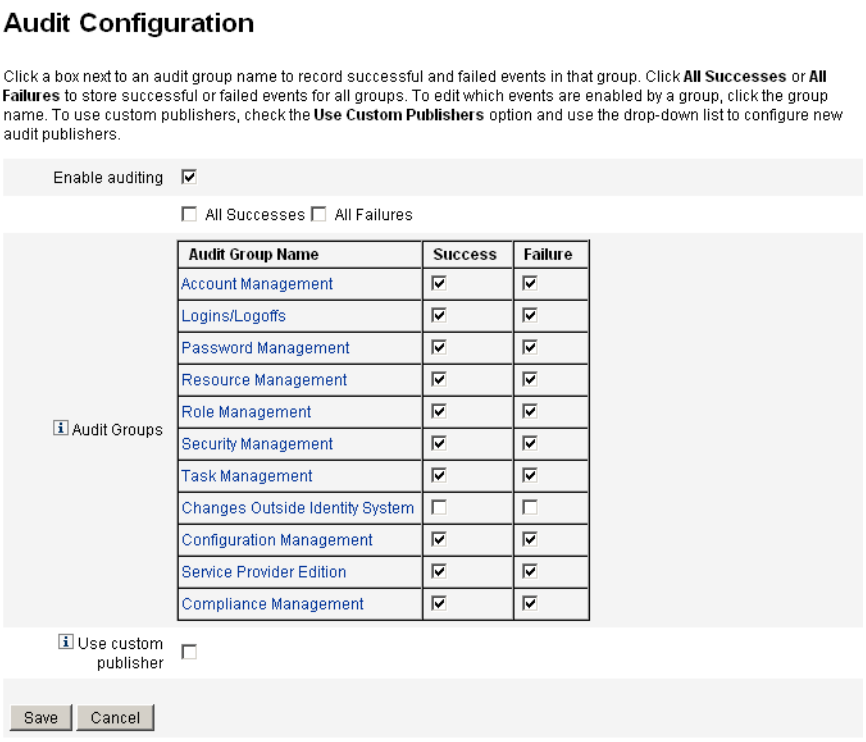


You can also specify the following optional parameters:

- **Report Summary** – Enter a descriptive summary of the report.
- **Starting sequence for server '<***server_name***>'** – Enter the starting sequence number for the server.
- This option enables you to delete old log entries without having them flagged as tampering and limits the report's scope for performance reasons.
- **Email Report** – Enable to email report results to a specified email address.
- When you select this option, the page refreshes and prompts you for email addresses. However, keep in mind that email is not safe for text content — sensitive information (such as account IDs or account history) may be exposed.
- **Override default PDF options** – Select to override the default PDF options for this report.
- **Organizations** – Select organizations that should have access to this report.

3. Next, select **Configure > Audit** to open the Audit Configuration page (shown in Figure 10-2).

Figure 10-2 Tamper-Resistant Audit Logging Configuration



4. Select **Use Custom Publisher**, and then click on the Repository publisher link.
5. Select **Enable tamper-resistant audit logs**, and then click **OK**.
6. Click **Save** to save the settings.

   You can turn this option off again, but unsigned entries will be flagged as such in the Audit Log Tampering Report, and you must reconfigure the report to ignore these entries.

Using Custom Audit Publishers

Identity Manager can submit audit events to custom audit publishers. The following custom publishers are provided:

- Console — Prints audit events to the standard output or standard error.
- File — Writes audit events to a flat file.
- JDBC — Records audit events in a JDBC datastore.
- JMS — Records audit events in a JMS queue or topic.
- JMX — Publishes audit events so that a JMX (Java Management Extensions) client can monitor Identity Manager audit log activity.
- Scripted — Allows for custom scripts to store audit events.

If you want to create your own publisher, see "Developing Custom Audit Publishers" on page 419.

Enabling Custom Audit Publishers

Custom audit publishers are enabled from the Audit Configuration page.

To enable custom audit publishers, follow these steps:

1. In the Administrator interface, click **Configure** in the main menu, then click **Audit** in the secondary menu.

   The Audit Configuration page opens.

2. Select the **Use custom publisher** option at the bottom of the page.

   A table opens listing the currently configured audit publishers.

3. To configure a new audit publisher, select the custom publisher type from the **New Publisher** drop-down menu.

   Complete the Configure New Audit Publisher form. Click **Ok**.

4. Important! Click **Save** to save the new audit publisher!

The Console, File, JDBC, & Scripted Publisher Types

To enable the Console, File, JDBC, or Scripted audit publishers, follow the steps in "Enabling Custom Audit Publishers" on page 410. Select the appropriate publisher type from the **New Publisher** drop-down menu.

Complete the Configure New Audit Publisher form. If you have questions about the form, refer to the i-Helps and online Help.

- The Console audit publisher prints audit events to either standard out or to standard error.
- The File audit publisher writes audit events to a flat file.
- The JDBC audit publisher records audit events in a JDBC datastore.
- The Scripted audit publisher allows custom scripts written in JavaScript or BeanShell to store audit events.

The JMS Publisher Type

The JMS audit log custom publisher makes it possible to publish audit event records to a JMS (Java Message Service) queue or topic.

Why Use JMS?

Publishing to JMS provides additional flexibility for correlation in environments that have multiple Identity Manager servers. In addition, JMS can be used in situations where there are restrictions on using the File audit log publisher, for example in Windows environments where the log may not be accessible to a client reporting tool while the server is running.

JMS offers several benefits for environments with multiple servers:

- The JMS message store centralizes (and simplifies) message storage and retrieval.
- The JMS architecture does not place restrictions on how many clients can access the service.
- The JMS protocol is easy to send through firewalls and other network infrastructure.

Point-to-Point or Publish-and-Subscribe?

Java Message System provides two models for messaging: the point-to-point or *queuing* model, and the publish and subscribe or *topic* model. Identity Manager supports both models.

In the point-to-point model, a *producer* posts messages to a particular queue and a *consumer* reads messages from the queue. Here, the producer knows the destination of the message and posts the message directly to the consumer's queue.

The point-to-point model has the following characteristics:

- Only one consumer will get the message.
- The producer does not have to be running at the time the receiver consumes the message, nor does the receiver need to be running at the time the message is sent.
- Every message successfully processed is acknowledged by the receiver.

The publish and subscribe model, on the other hand, supports publishing messages to a particular message *topic*. Zero or more subscribers may register interest in receiving messages on a particular message topic. In this model, neither the publisher nor the subscriber know about each other. A good metaphor for this model is the anonymous bulletin board.

The publish and subscribe model has the following characteristics:

- Multiple consumers can receive messages.
- A timing dependency exists between publishers and subscribers. The publisher has to create a subscription before clients can subscribe. Once subscribed, subscribers have to remain continuously active to receive messages, unless a durable subscription has been established. In the case of a durable subscription, messages published while the subscriber is not connected will be redistributed when the subscriber reconnects.

NOTE For more information about JMS, see `http://www.sun.com/software/products/message_queue/index.xml`

Configuring the JMS Publisher Type

The JMS publisher formats audit events into JMS TextMessages. These TextMessages are then sent to either a queue or a topic, depending on the configuration. Text messages can be formatted as XML or ULF (Universal Logging Format), depending on configuration.

To enable the JMS publisher type, follow the steps in "Enabling Custom Audit Publishers" on page 410 and select **JMS** from the **New Publisher** drop-down menu.

To configure the JMS publisher type, complete the Configure New Audit Publisher form. If you have questions about the form, refer to the i-Helps and online Help.

The JMX Publisher Type

The JMX audit log publisher publishes audit events so that a JMX (Java Management Extensions) client can monitor Identity Manager audit log activity.

What is JMX?

Java Management Extensions (JMX) is a Java technology that allows for managing and/or monitoring applications, system objects, devices, and service oriented networks. The managed/monitored entity is represented by objects called MBeans (for Managed Bean).

Identity Manager's JMX Publisher Implementation

Identity Manager's JMX audit log publisher monitors the audit log for events. When an event is detected, the JMX publisher wraps the audit event record with an MBean, and also updates a temporary history (which is kept in memory). For each event, a separate small notification is sent to the JMX client. If the event is of interest, the JMX client can query the MBean wrapping the audit event for additional information.

NOTE See the `com.waveset.object.AuditEvent` Javadoc for information about audit event records. The Javadoc is available in the REF kit, which is discussed in "Developing Custom Audit Publishers" on page 419.

In order to retrieve information from the correct MBean, a history sequence number is required. This number is included in the event notification.

Each event notification includes the following information:

- Type — A string describing the type of event. The string follows the format `AuditEvent.<ObjectType>.<Action>` where `ObjectType` and `Action` are returned from `com.waveset.AuditEvent`. For example, if an unlock event is sent, the type would be `AuditEvent.LighthouseAccount.Unlock`.

- SequenceNumber — The history buffer key used to query information from the MBean.

Configuring the JMX Publisher Type

To configure the JMX publisher type, follow these steps:

1. To enable the JMX publisher type, follow the steps in "Enabling Custom Audit Publishers" on page 410 and select **JMX** from the **New Publisher** drop-down menu.
2. To configure the JMX publisher type, complete the Configure New Audit Publisher form. If you have questions about the form, refer to the i-Helps and online Help.

   Publisher Name — Type a unique name for the JMX audit event publisher.

   History Limit — This is the number of event items that the publish should retain in memory. The default is 100. To change the limit, enter another value.
3. Click **Test** to verify that the **Publisher Name** is acceptable.
4. Click **OK**. The Configure New Audit Publisher form closes.
5. Important! Click **Save**.

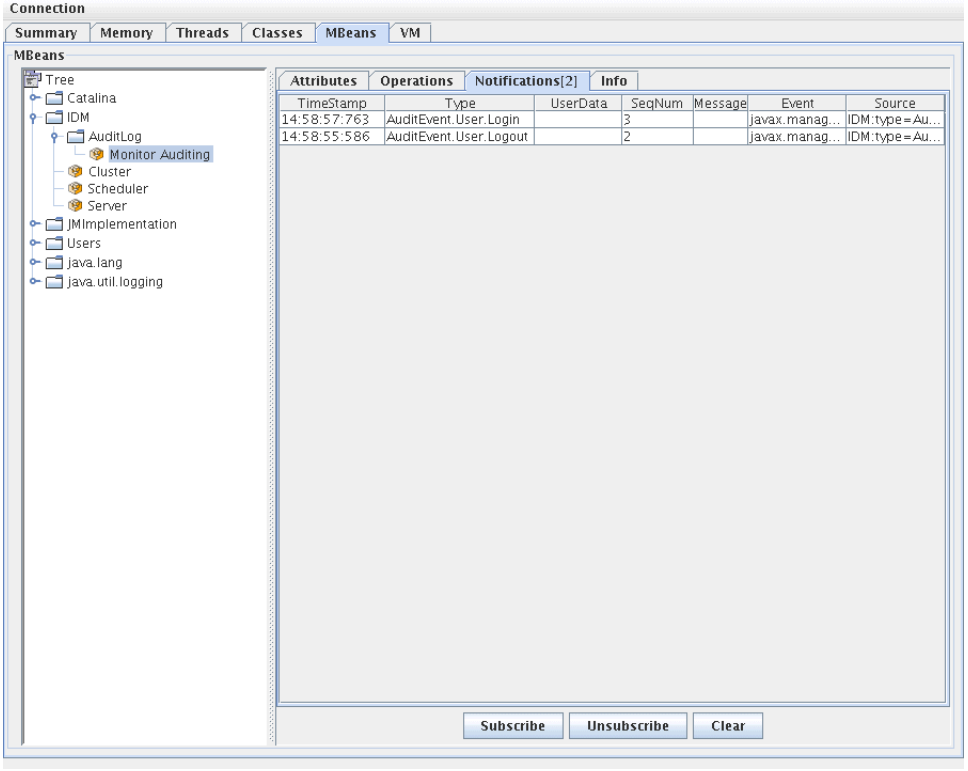
Viewing Audit Events with a JMX Client

Use a JMX client to view the JMX publisher. JConsole, which is included in the JDK 1.5, was used to create the following screen captures.

If using JConsole, choose attach to process to view the `IDM:type=AuditLog` MBean. For information on configuring JConsole for use as a JMX client, see "Viewing JMX Data" on page 207.

In JConsole, click the **Notifications** tab to view audit events. Note the sequence number in the notification. A sequence number is required when querying the MBean for additional information.

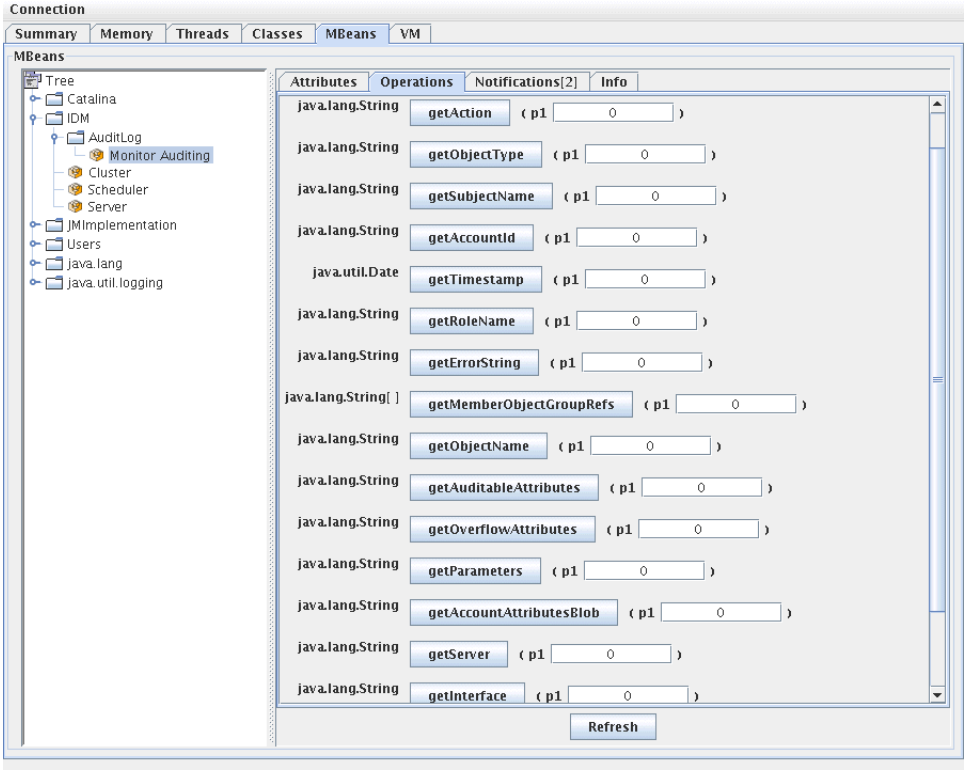
Figure 10-3 Viewing JMX Audit Event Notifications in JConsole



Querying the MBean for Additional Information

In JConsole, click the **Operations** tab. Use the sequence number in the notification to query the MBean for event details. Each of the operations are prefixed with 'get' and the only parameter is the 'sequence' number.

Figure 10-4 Querying the MBean for Additional Information in JConsole



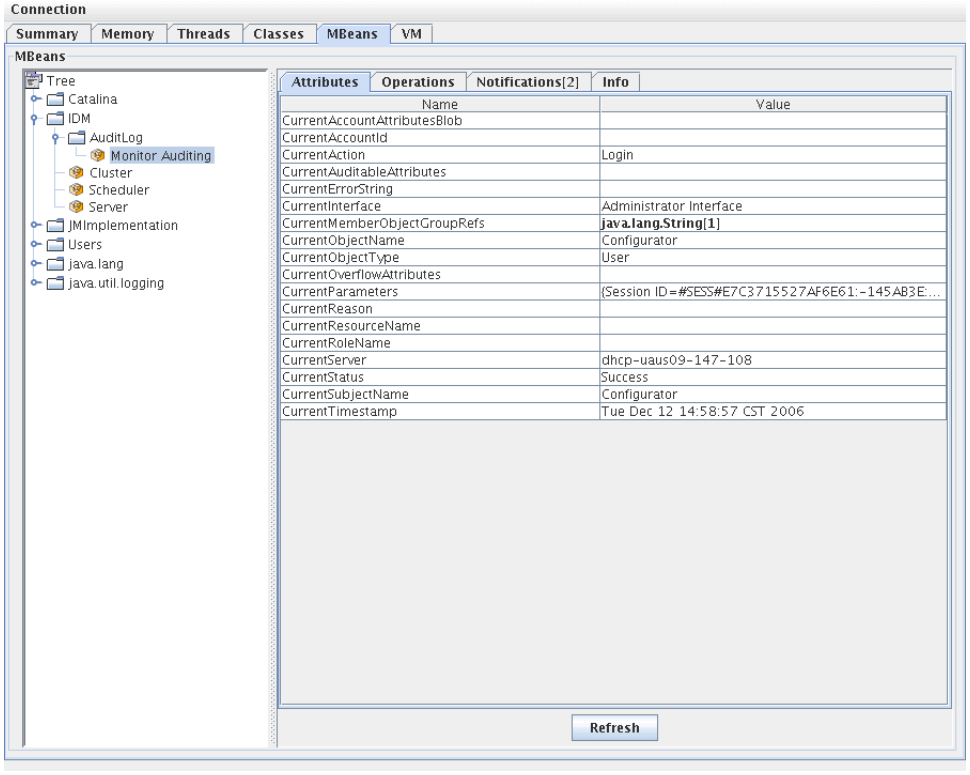
The MBean is virtually a one-to-one mapping to the `com.waveset.object.AuditEvent` class. Table 10-19 provides a description for each attribute/operation that the MBean provides.

Table 10-19 MBeanInfo attribute/operation descriptions

Attribute / Operation	Description
`AccountAttributesBlob`	The list of changed attributes
`AccountId`	AccountId associated with the event
`Action`	Action taken during the event
`AuditableAttributes`	The Auditable attributes
`ErrorString`	Any error string
`Interface`	The Audit interface
`MemberObjectGroupRefs`	The member object group references
`ObjectName`	The object name
`ObjectType`	The object type
`OverflowAttributes`	All the overflow attributes
`Parameters`	All the parameters
`Reason`	The reason for the event
`ResourceName`	Resource associated with the event
`RoleName`	Role associated with the event
`SubjectName`	User or service associated with the event
`Server`	Name of the server from which the event fired
`Status`	Status of the audit event
`Timestamp`	Date/Time of the audit event

In JConsole, click the **Attributes** tab. Attributes are prefixed with `Current` to indicate that the attribute contains the most recent audit event sent to the system.

Figure 10-5 Viewing MBean Attributes in JConsole



Developing Custom Audit Publishers

This section documents how to create a new custom audit publisher in Java.

The Console, File, and JDBC custom publishers that are provided with Identity Manager implement the `AuditLogPublisher` interface. The source code of these publishers can be found in the REF kit. The documentation of the interfaces is also available in the REF kit, in Javadoc format. (Refer to the Javadoc for interface details.)

NOTE The REF (Resource Extension Facility) kit is provided in the `/REF` directory on your product CD or with your install image.

Developers are encouraged to extend the `AbstractAuditLogPublisher` class. This class parses the configuration and ensures that all required options have been provided to the publisher. (See the example publishers in the REF kit.)

Publishers must have a no-arg constructor.

Lifecycle

The following steps describe the lifecycle of a publisher:

1. The Object is instantiated.
2. The Formatter (if any) is set using the `setFormatter()` method.
3. Options are provided using the `configure(`*Map*`)` method.
4. Events are published using the `publish(`*Map*, *LoggingErrorHandler*`)` method.
5. Publisher is terminated using the `shutdown()` method.

Steps 1-3 are executed when Identity Manager starts up and whenever the audit configuration is updated. Step 4 will not occur if no audit event is generated before shutdown is called.

The `configure(`*Map*`)` is only called once on the same publisher object. (A publisher does not have to prepare for on-the-fly configuration changes). After the audit configuration is updated, the current publishers are first shut down and new publishers are created.

The `configure()` method in Step 3 may throw a WavesetException. In this case, the publisher will be ignored and no other calls will be made to the publisher.

Configuration

Publishers can have zero or more options. The `getConfigurationOptions()` method returns the list of options the publisher supports. The options are encapsulated using the PublisherOption class (see Javadoc for details of this class). The audit configuration viewer invokes this method when it builds the configuration interface for the publisher.

Identity Manager configures the publisher using the `configure(Map)` method at server startup and after audit configuration changes.

Developing Formatters

The REF kit includes the source code of the following formatters:

- XmlFormatter — Formats audit events as
- XML strings
- UlfFormatter — Formats audit events according to the Universal Logging Format (ULF). The Sun Application Server uses this format.

Formatters must implement the `AuditRecordFormatter` interface. In addition, formatters must have a no-arg constructor. Refer to the Javadoc included in the REF kit for details.

Registering Publishers/Formatters

The audit attribute of `#ID#Configuration:SystemConfiguration` object lists all the registered publishers and formatters. Only these publishers and formatters are available in the audit configuration user interface.

Chapter 11

PasswordSync

PasswordSync detects user password changes initiated on Windows domains and forwards those changes to Identity Manager. Identity Manager then synchronizes password changes with the other resources defined in Identity Manager.

This chapter is organized as follows:

What is PasswordSync?

The PasswordSync feature keeps user password changes made on Windows Active Directory domains synchronized with other resources defined in Identity Manager. PasswordSync must be installed on each domain controller in the domains that will be synchronized with Identity Manager. PasswordSync must be installed separately from Identity Manager.

PasswordSync consists of a DLL (`lhpwic.dll`) that resides on each domain controller. This DLL receives password update notifications from Windows, encrypts them, and sends them over HTTPS to the PasswordSync servlet. The PasswordSync servlet is located on the application server running Identity Manager.

NOTE Sun recommends using HTTPS. HTTP, however, is also supported.

The PasswordSync servlet translates the notification into a format Identity Manager can understand. It then sends the password change (still encrypted) to Identity Manager using one of the following methods:

- The *Direct method* - The servlet communicates the password change directly to Identity Manager using native Identity Manager classes. (See Figure 11-1 on page 423.)

  The direct connection method is only recommended for smaller, less complex environments that only require message delivery to one system, and that do not require guaranteed message delivery. (If for some reason direct message delivery were to fail, the message would be lost. Backup delivery is not possible.)

- The *JMS method* - The servlet sends the password information to Identity Manager using JMS (Java Message Service). With JMS, the servlet submits password changes to the JMS Message Queue. Separately, Identity Manager's JMS Listener Resource Adapter checks the Queue for new messages. If a password change message is found waiting on the Queue, the JMS Listener Adapter takes the message off the Queue and imports it into Identity Manager. (See Figure 11-2 on page 423.)

  The JMS method is recommended for more complex environments that need messages delivered to multiple systems, as well as guaranteed message delivery. (The JMS Message Queue can be made highly available. And, if message delivery should fail, the Queue will keep the change until it can be delivered to Identity Manager.)

  JMS, however, must be installed and configured separately.

Figure 11-1 diagrams a direct connection. In this configuration the PasswordSync servlet sends update messages directly to Identity Manager

Figure 11-1 PasswordSync Logical Diagram (direct connection).

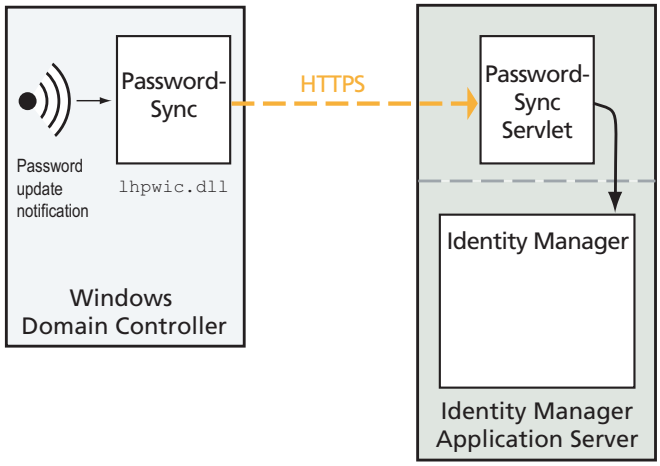
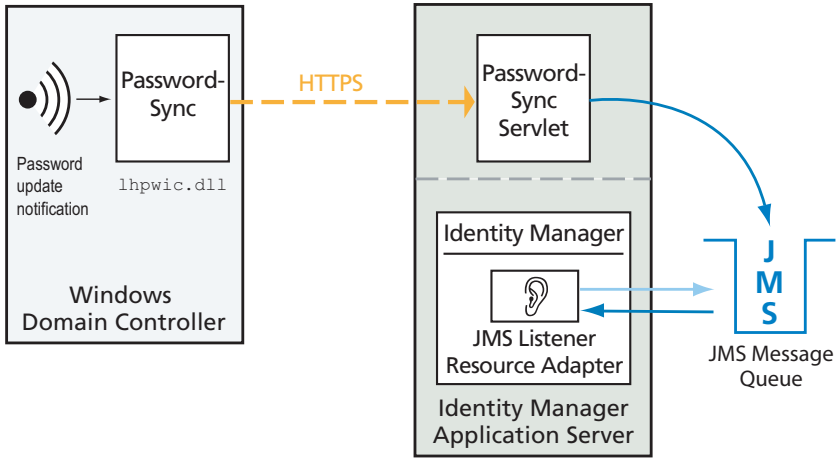


Figure 11-2 diagrams a JMS connection. In this configuration the PasswordSync servlet sends update messages to the JMS Message Queue. Identity Manager's JMS Listener Resource Adapter periodically checks the Queue (indicated by the light blue arrow in the diagram) for new messages. The Queue responds by sending the messages to Identity Manager (indicated by the dark blue arrow).

Figure 11-2 PasswordSync Logical Diagram (JMS connection).

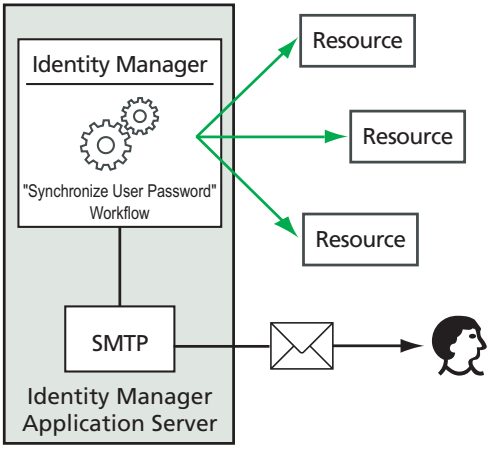


When Identity Manager receives a password change notification, it decrypts it and processes the change using a workflow task. The password is updated on all of the user's assigned resources, and an SMTP server sends an email to the user, notifying the user of the status of the password change.

NOTE Windows only sends out an update notification if a password change is successful. If a password change request does not meet the domain's password policy, Windows will reject it and no synchronization data will be sent to Identity Manager.

Figure 11-3 shows Identity Manager initiating a workflow and sending email to the user after receiving a password update notification.

Figure 11-3 PasswordSync triggers a workflow..



NOTE PasswordSync discards all account change notifications for account names that end in a $ (dollar sign). Account names that end in a $ are assumed to be Windows computer accounts. Any *user* account names that end in a dollar sign will not be forwarded to Identity Manager.

Before You Install

The PasswordSync feature can be set up only on Windows 2003 and Windows 2000 domain controllers. (Support for Windows NT domain controllers has been discontinued in version 8.0 of Identity Manager.) You must install PasswordSync on each primary and backup domain controller in the domains that will be synchronized with Identity Manager. Configuring PasswordSync for HTTPS is highly recommended.

NOTE Versions of PasswordSync that are older than version 7.1.1 should be updated to at least version 7.1.1 on all domain controllers.

Support for the rpcrouter2 servlet has been deprecated in version 8.0, and will be removed in a future release. PasswordSync versions 7.1.1 and newer support the new protocol.

If using JMS, PasswordSync requires connectivity with a JMS server. See the JMS Listener resource adapter section in the *Sun Identity Manager Resources Reference* for more information about the requirements for the JMS system.

In addition, PasswordSync requires you to

- Install at least Microsoft .NET 1.1 on each domain controller
- Remove any previous versions of PasswordSync

These requirements are discussed in more detail in the following sections.

Install Microsoft .NET 1.1

To use PasswordSync, you must install the Microsoft .NET 1.1 Framework. This Framework is installed by default if you are using a Windows 2003 domain controller. If you are using a Windows 2000 domain controller, you can download the toolkit from the Microsoft Download Center at:

`http://www.microsoft.com/downloads`

NOTE

- Enter **`NET Framework 1.1 Redistributable`** in the Keywords search field to quickly locate the framework toolkit.
- The toolkit installs the .NET 1.1 framework.

Configure PasswordSync for SSL

Although sensitive data is encrypted before being sent to the Identity Manager server, Sun Microsystems recommends configuring PasswordSync to use a secure SSL connection (that is, an *HTTPS* connection).

For information on how to install imported SSL certificates, see this Microsoft Knowledge Base How-To article:

`http://support.microsoft.com/kb/816794`

Once you have installed PasswordSync, you can test that your SSL connection is properly configured by specifying an HTTPS URL in the PasswordSync configuration dialog. See "Testing Your Configuration" on page 452 for instructions.

Uninstall Previous Versions of PasswordSync

You *must* remove any previously installed instances of PasswordSync before installing a later version.

- If the previously installed version of PasswordSync supports the `IdmPwSync.msi` installer, you can use the standard Windows Add/Remove Programs utility to remove the program.
- If the previously installed version of PasswordSync *does not* support the `IdmPwSync.msi` installer, use the InstallAnywhere uninstaller to remove the program.

Installing PasswordSync on Windows

The following procedure describes how to install the PasswordSync configuration application.

NOTE You must install PasswordSync on each domain controller in the domains that will be synchronized with Identity Manager.

Be sure to uninstall any previously installed versions of PasswordSync before continuing.

To install PasswordSync, follow these steps:

1. From the Identity Manager installation media, double-click `pwsync\IdmPwSync_x86.msi` if installing to a 32-bit version of Windows, or double-click `pwsync\IdmPwSync_x64.msi` if installing to a 64-bit version of Windows.

   The Welcome window is displayed.

   The installation wizard provides the following navigational buttons:

   - **Cancel**: Click to exit the wizard at any time without saving any of your changes.
   - **Back**: Click to return to a previous dialog box.
   - **Next**: Click to progress to the next dialog box.

2. Read the information provided on the Welcome screen, and then click **Next** to display the Choose Setup Type PasswordSync Configuration window.
3. Click either **Typical** or **Complete** to install the full PasswordSync package, or **Custom** to control which parts of the package are installed.
4. Click **Install** to install the product.

   A message displays to let you know if you installed PasswordSync successfully.

5. Click **Finish** to complete the installation process.

   Be sure to select **Launch Configuration Application** so that you can begin configuring Password Sync. See "Configuring PasswordSync" on page 428 for details about this process.

NOTE A dialog stating that you must restart the system for the changes to take effect displays. It is not necessary to restart until after you have configured PasswordSync, but you must restart the domain controller before implementing PasswordSync.

Table 11-1 describes the files that are installed on each domain controller.

Table 11-1 Domain Controller Files

Installed Component	Description
`%$INSTALL_DIR$%\configure.exe`	PasswordSync configuration program
`%$INSTALL_DIR$%\configure.exe.manifest`	Data file for the configuration program
`%$INSTALL_DIR$%\passwordsyncmsgs.dll`	DLL that handles PasswordSync messages
`%SYSTEMROOT%\SYSTEM32\lhpwic.dll`	Password Notification DLL that implements the Windows `PasswordChangeNotify()` function

Configuring PasswordSync

If you run the configuration application from the installer, the application displays the configuration screens as a wizard. After you have completed the wizard, each subsequent time you run the PasswordSync configuration application, you can navigate between screens by selecting a tab.

To configure PasswordSync, follow these steps:

1. Start the PasswordSync configuration application (if it is not already running).

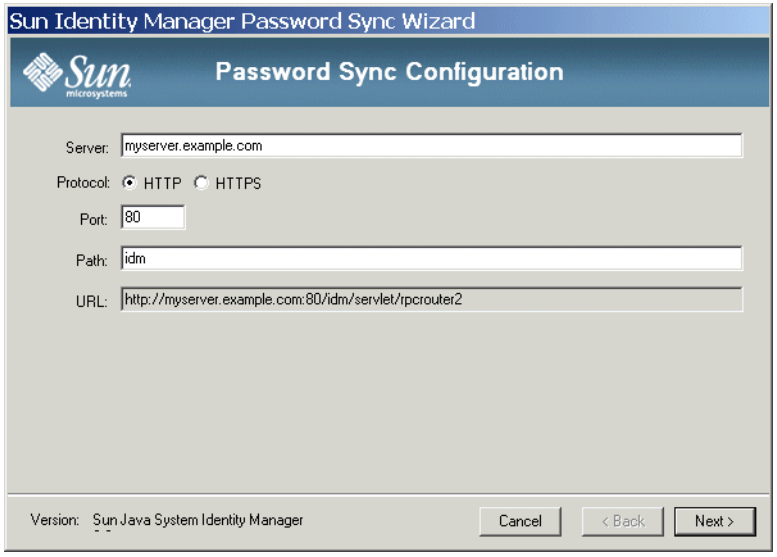
   By default, the configuration application is installed at Program Files > Sun Identity Manager PasswordSync > Configuration.

   If you do not plan to use JMS, launch the configuration application from a command line. Be sure to include the `-direct` flag:

   ```
   C:\InstallDir\Configure.exe -direct
   ```

   The PasswordSync Configuration dialog is displayed (see Figure 11-4).

Figure 11-4 PasswordSync Wizard Configuration Dialog

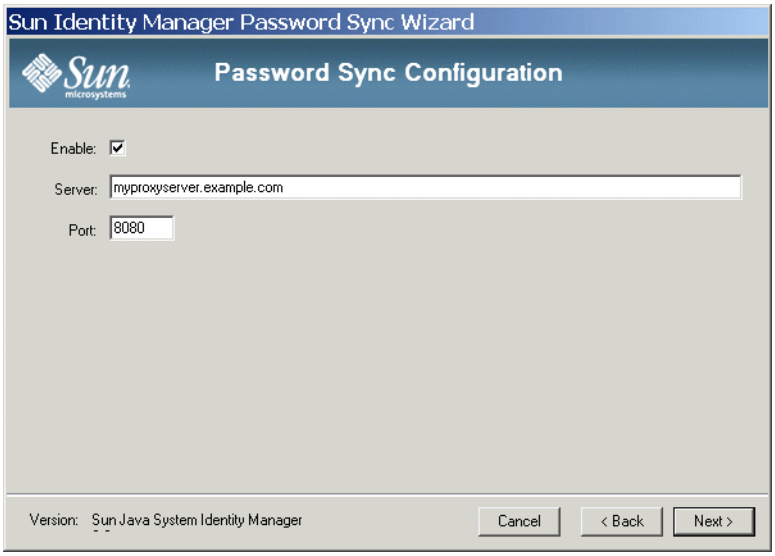


Edit the fields as necessary.

- **Server** must be replaced with the fully-qualified host name or IP address where Identity Manager is installed.
- **Protocol** indicates whether to make secure connections to Identity Manager. If HTTP is selected, the default port is 80. If HTTPS is selected, the default port is 443.
- **Path** specifies the path to Identity Manager on the application server.
- **URL** is generated by concatenating the other fields together. The value cannot be edited within the URL field.

2. Click Next to display the Proxy Server Configuration page (Figure 11-5).

Figure 11-5 PasswordSync Wizard Proxy Server Dialog



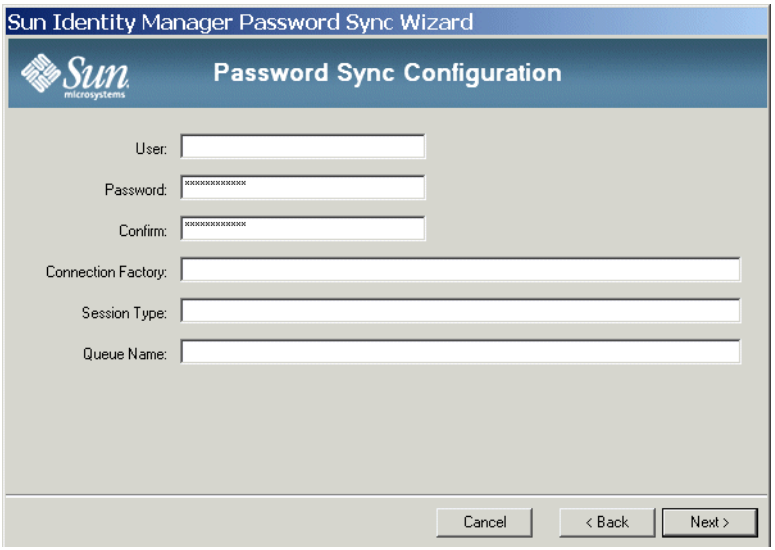
Edit the fields as necessary.

- Select **Enable** if a proxy server is required.
- **Server** must be replaced with the fully-qualified host name or IP address of the proxy server.
- **Port**: Specify an available port number for the server.
  (The default proxy port is 8080 and the default HTTPS port is 443.)

3. Click Next to display the JMS Settings dialog (Figure 11-6).

   Or, if you do not plan to use JMS and you launched the configuration wizard with the `-direct` flag, click **Next** to display the User dialog. Skip to step Step 5 on page 432.

Figure 11-6 PasswordSync Wizard JMS Settings Dialog

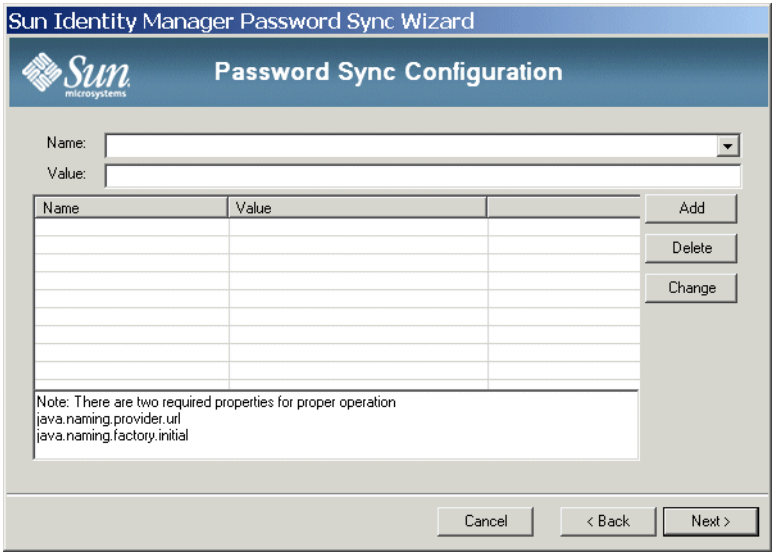


Edit the fields as necessary.

- **User** specifies the JMS user name that places new messages on the queue.
- **Password** and **Confirm** specify the password for the JMS user.
- **Connection Factory** specifies the name of the JMS connection factory to be used. This factory must already exist on the JMS system.
- In most cases, **Session Type** should be set to `LOCAL`, which indicates that a local session transaction will be used. The session will be committed after each message is received. Other possible values include `AUTO`, `CLIENT`, and `DUPS_OK`.
- **Queue Name** specifies the Destination Lookup Name for the password synchronization events.

4. Click Next to display the JMS Properties dialog (Figure 11-7).

Figure 11-7 PasswordSync Wizard JMS Properties Dialog



The JMS Properties dialog allows you to define the set of properties that are used to build the initial JNDI context. The following name/value pairs must be defined:

- `java.naming.provider.url` — The value must be set to the URL of the machine running the JNDI service.
- `java.naming.factory.initial` — The value must be set to the classname (including the package) of the Initial Context Factory for the JNDI Service Provider.

The Name pull-down menu contains a list of classes from the `java.naming` package. Select a class or type in a class name, then enter its corresponding value in the Value field.

5. If you do not plan to use JMS and you launched the configuration wizard with the `-direct` flag, configure the User tab. Otherwise, skip this step and go to the next step.

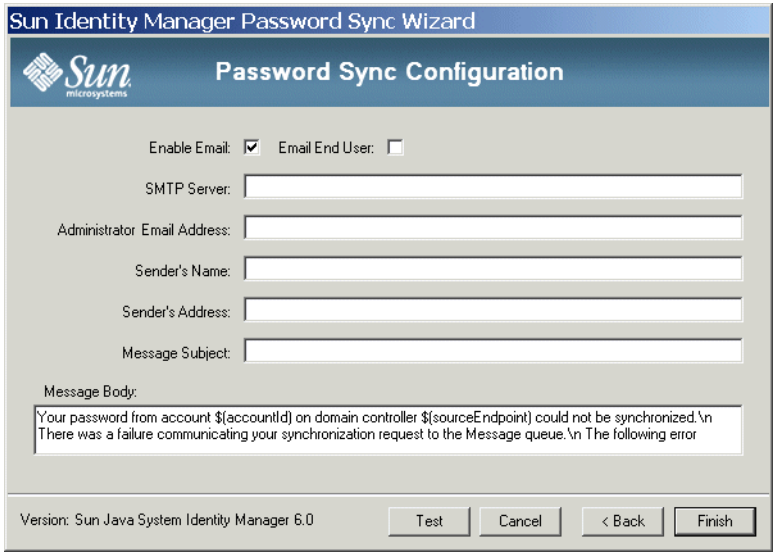
   To configure the User tab, edit the fields as necessary.

   - **Account ID** specify the user name that will be used to connect to Identity Manager.

- **Password** specify the password that will be used to connect to Identity Manager.

6. Click Next to display the Email dialog (Figure 11-8).

Figure 11-8 PasswordSync Wizard Email Dialog



The Email dialog enables you to configure whether to send an email notification when a user's password change does not synchronize successfully due to a communication error or other error outside of Identity Manager.

Edit the fields as necessary.

- Select **Enable Email** to enable this feature. Select **Email End User** if the user is to receive notifications. Otherwise, only the administrator will be notified.
- **SMTP Server** is the fully qualified name or IP address of the SMTP server to be used when sending failure notifications.
- **Administrator Email Address** is the email address used to send notifications.
- **Sender's Name** is the "friendly name" of the sender.
- **Sender's Address** is the email address of the sender.
- **Message Subject** specifies the subject line of all notifications

- **Message Body** specifies the text of the notification.

  The message body may contain the following variables.

  - `$(accountId)` — The accountId of the user attempting to change password.
  - `$(sourceEndpoint)` — The host name of the domain controller where the password notifier is installed, to help locate troubled machines.
  - `$(errorMessage)` — The error message that describes the error that has occurred.

7. Click **Finish** to save your changes.

If you run the configuration application again, a set of tabs is displayed instead of a wizard. If you wish to display the application as a wizard, type the following command from the command line:

`C:\`*InstallDir*`\Configure.exe -wizard`

To test your PasswordSync configuration, see "Testing Your Configuration" on page 452.

Debugging PasswordSync on Windows

See the *Identity Manager Tuning, Troubleshooting, and Error Messages* book for information on troubleshooting PasswordSync on Windows.

Error Logs

PasswordSync writes all failures to the Windows Event Viewer. (For help using Event Viewer, see Windows Help.) The source name for error log entries is *PasswordSync*.

Uninstalling PasswordSync on Windows

To uninstall the PasswordSync application, go to the Windows Control Panel and select **Add or Remove Programs**. Then select **Sun Identity Manager PasswordSync** and click **Remove**.

NOTE PasswordSync can also be uninstalled (or reinstalled) by loading the Identity Manager installation media and clicking on the `pwsync\IdmPwSync.msi` icon.

You must restart your system to complete the process.

Deploying PasswordSync on the Application Server

Once PasswordSync is installed on your Windows domain controllers, you need to take additional steps on the application server running Identity Manager.

You do not need to install the PasswordSync servlet on the application server. It is automatically installed when you installed Identity Manager.

To finish deploying PasswordSync, however, you *do* need to perform the following actions in Identity Manager:

- Add and configure the JMS Listener Adapter (if using JMS)
- Implement the "Synchronize User Password" Workflow
- Set up notifications

Adding and Configuring a JMS Listener Adapter

If the PasswordSync servlet is using JMS to send messages to Identity Manager, you need to add Identity Manager's JMS Listener resource adapter. The JMS Listener resource adapter periodically checks the JMS Message Queue for messages placed there by the PasswordSync servlet. If the Queue contains a new message, it sends it to Identity Manager for processing.

To add the JMS Listener resource adapter, follow these steps.

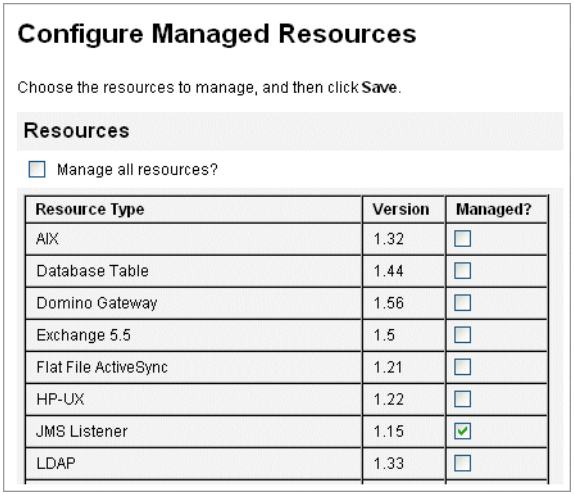
1. Log on to the Identity Manager Administrator Interface (page 50).
2. Click **Resources**.
3. Click **Configure Types** in the secondary menu.

   The "Configure Managed Resources" page opens.
4. Verify that the checkbox in the **Managed?** column is selected for **JMS Listener**. (See Figure 11-9 on page 437.)

   If it is not selected, select the checkbox and click **Save**. Otherwise, go to the next step.

Figure 11-9 shows the "Configure Managed Resources" page. Verify that **JMS Listener** is selected.

Figure 11-9 The "Configure Managed Resources" page.



5. Click **List Resources** in the secondary menu.
6. Locate the **Resource Type Actions** drop-down menu and select **New Resource**.

   The "New Resource" page opens.
7. Select **JMS Listener** from the drop-down menu and click **New**. (See Figure 11-10 on page 438.)

   The "Create JMS Listener Resource Wizard" Welcome page opens. Click **Next** to start the configuration wizard.

Figure 11-10 shows the New Resource Wizard. To add the JMS Listener Adapter, select **JMS Listener** from the list.

Figure 11-10 The New Resource Wizard.

8. Complete the form on the "Resource Parameters" wizard page. Click **Next** when you are done.

You must configure the following settings:

- **Destination Type** — This value will typically be set to **Queue**. (Topics are not usually relevant because there is one subscriber and potentially multiple publishers.)
- **Initial context JNDI properties** — This text box defines the set of properties that are used to build the initial JNDI context. The following name/value pairs must be defined:
  - `java.naming.factory.initial` — The value must be set to the classname (including the package) of the Initial Context Factory for the JNDI Service Provider.
  - `java.naming.provider.url` — The value must be set to the URI of the machine running the JNDI service.

  It may be necessary to define additional properties. The list of properties and values should match those specified on the JMS settings page on the JMS server.

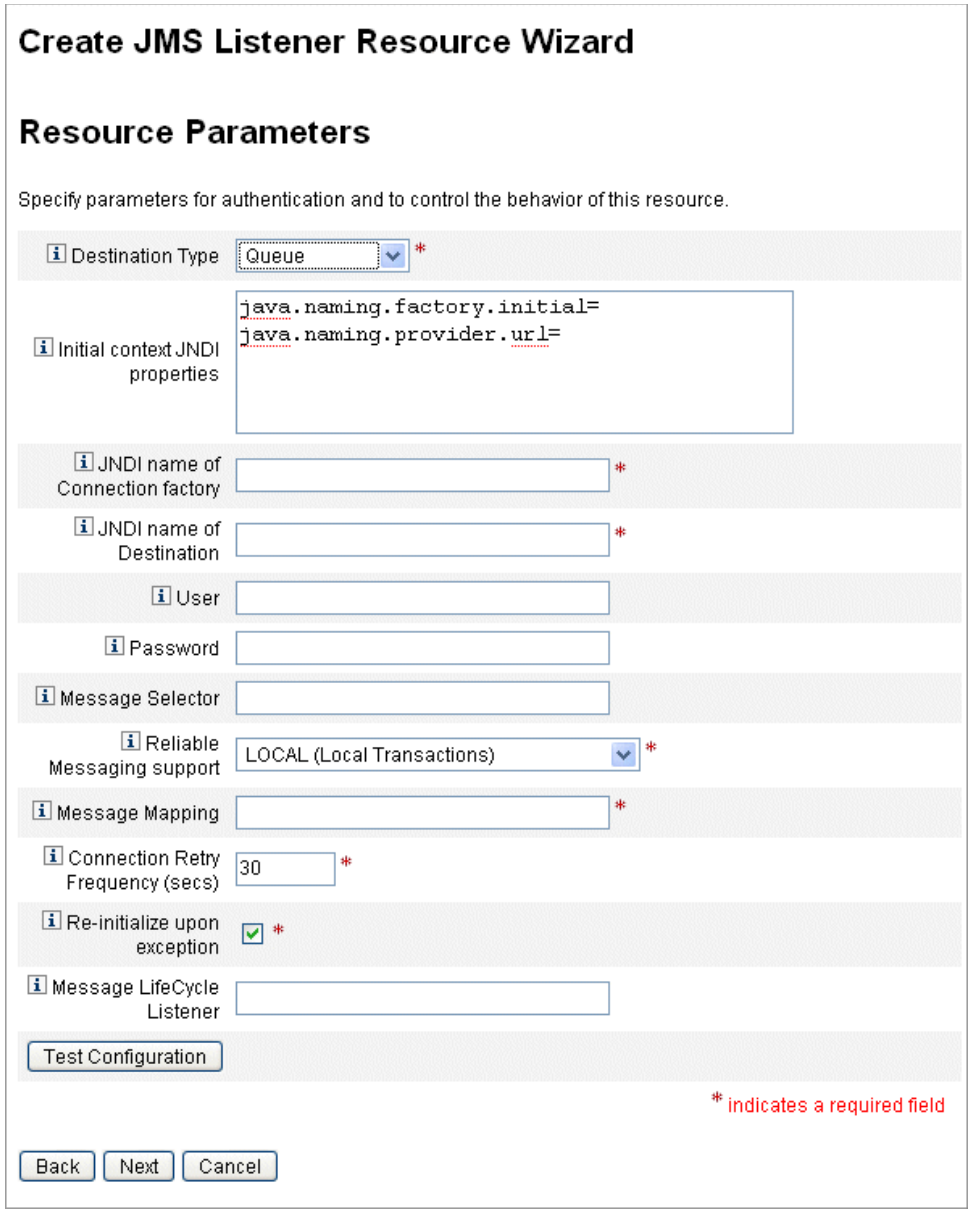
  For example, to provide the credentials and bind method, you may need to specify the following sample properties:

  - `java.naming.security.principal`: Bind DN (for example, cn=Directory manager)

  - `java.naming.security.authentication`: Bind method (for example, simple)
  - `java.naming.security.credentials`: Password

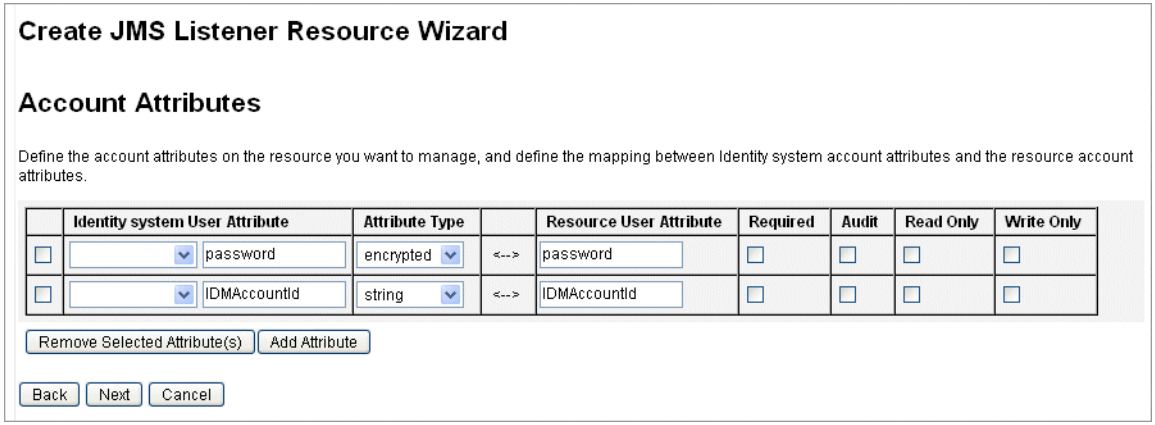
- **JNDI name of Connection factory** — The name of a connection factory, as defined on the JMS server.
- **JNDI name of Destination** — The name of a destination, as defined on the JMS server.
- **User** and **Password** — The account name and password of the administrator that requests new events from the queue.
- **Reliable Messaging Support** — Select `LOCAL (Local Transactions)`. The other options are not applicable for password synchronization.
- **Message Mapping** —
  Enter `java:com.waveset.adapter.jms.PasswordSyncMessageMapper`. This class transforms messages from the JMS server into a format that can be used by the Synchronize User Password workflow.

Figure 11-11 The JMS Listener Resource Wizard "Resource Parameters" page



9. On the "Account Attributes" wizard page, click **Add Attribute**.

Figure 11-12 The "Account Attributes" page of the "Create JMS Listener Resource Wizard"



10. Map the following attributes, which are made available to the JMS Listener Adapter by `PasswordSyncMessageMapper`. Refer to Figure 11-12. Click **Next** when you are done.

    - `IDMAccountId`: This attribute is resolved by the PasswordSyncMessageMapper, based on the `resourceAccountId` and `resourceAccountGUID` attributes passed in the JMS message.
    - `password`: The encrypted password forwarded in the JMS message.

    Click **Next**.

11. The "Identity Template" wizard page opens.

    Note that the attributes you added in the previous step are available in the Attribute Mappings section of the Resource Wizard (Figure 11-13).

    Click **Next**.

Figure 11-13 JMS Listener Resource Wizard Attribute Mappings

12. The "Identity System Parameters" wizard page opens.

    Configure the options on this page as needed.

See *Sun Identity Manager Resources Reference* for more information about setting up the JMS Listener resource adapter.

Implementing the Synchronize User Password Workflow

When Identity Manager receives a password change notification, it starts the "Synchronize User Password" workflow. The default "Synchronize User Password" workflow checks out the ChangeUserPassword viewer, and then checks it back in again. Next, the workflow processes all of the resources accounts (except the Windows resource that sent the initial password change notification). Finally, Identity Manager sends the user email indicating whether the password change was successful on all resources.

If you want to use the default implementation of the "Synchronize User Password" workflow, assign it as the process rule for the JMS Listener adapter instance. Process rules may be assigned when you configure the JMS Listener for synchronization (see "Configuring Active Sync" on page 450).

If you want to modify the workflow, copy the `$WSHOME/sample/wfpwsync.xml` file and make your modifications. Then, import the modified workflow into Identity Manager.

Some of the modifications you might want to make to the default workflow include:

- Which entities are notified when a password is changed.
- What happens if an Identity Manager account cannot be found.
- How resources are selected in the workflow.
- Whether to allow password changes from Identity Manager

For detailed information about using workflows, see *Sun Identity Manager Workflows, Forms, and Views*.

Setting Up Notifications

Identity Manager provides two email templates that can inform users whether a password change was successful across all resources. These templates are:

- Password Synchronization Notice
- Password Synchronization Failure Notice

Both templates should be updated to provide company-specific information about what users should do if they need further assistance. For more information see "Customizing Email Templates" on page 196.

Configuring PasswordSync with a Sun JMS Server

Identity Manager can use Java Message Service (JMS) to receive password change notifications from the PasswordSync servlet. In addition to guaranteed delivery, JMS can deliver messages to multiple systems.

NOTE See the *Sun Identity Manager Resources Reference* for more information about this adapter.

Using a sample scenario, this section provides instructions for configuring PasswordSync with a Sun JMS server. The information is organized as follows:

Overview

This section describes the sample scenario, the Windows PasswordSync solution, and the JMS solution.

Sample Scenario

A typical (simple) use case for configuring PasswordSync with a JMS server is to enable users to change their passwords on Windows, have Identity Manager pick up the new password, and then update the user accounts with the new passwords on a Sun Directory Server.

The following environment was configured for this scenario:

- Windows Server 2003 Enterprise Edition – Active Directory
- Sun Identity Manager 6.0 2005Q4M3
- MySQL running on Suse Linux 10.0
- Tomcat 5.0.28 running on Suse Linux 10.0

- Sun Message Queue 3.6 SP3 2005Q4 running on Suse Linux 10.0
- Sun Directory Server 5.2 SP4 running on Suse Linux 10.0
- Java 1.5 (Java 5.0)

The following files were copied to the Tomcat `common/lib` directory to enable JMS and JNDI:

- `jms.jar` (from Sun Message Queue)
- `fscontext.jar` (from Sun Message Queue)
- `imq.jar` (from Sun Message Queue)
- `jndi.jar` (from Java JDK)

Creating and Storing Administered Objects

This section provides instructions for creating and storing the following administered objects, which are required for the sample scenario to work successfully:

- Connection factory objects
- Destination objects

Administered objects can be stored either in an LDAP directory or in a file. If using a file, all instances of the file must be the same.

Information on storing administered objects in an LDAP directory is covered first. For instructions on storing administered objects in a file, go to page 448.

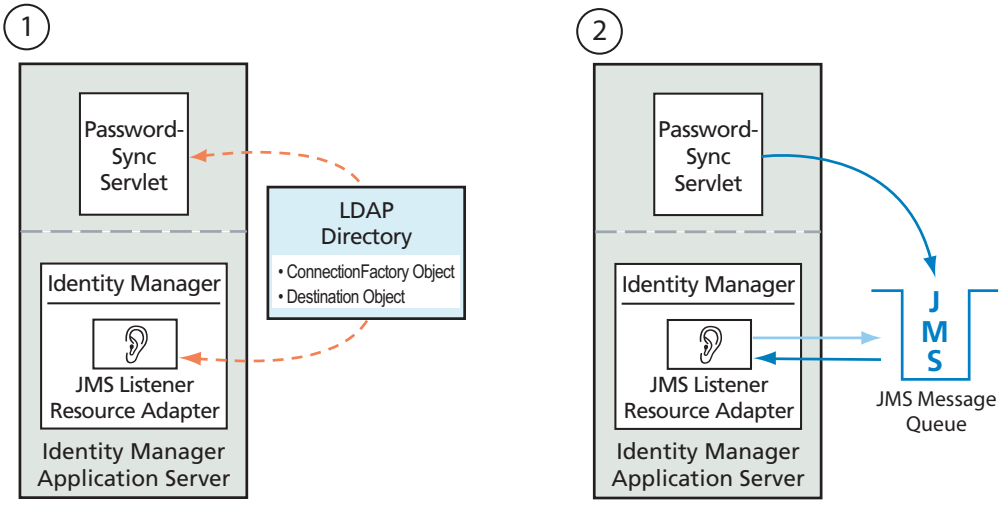
NOTE

- The instructions in this section assume you have installed Sun Message Queue. (The necessary tools are located in the `bin/` directory of your Message Queue installation.)
- You can use either the Message Queue administrative GUI (`imqadmin`) or the command-line tool (`imqobjmgr`) to create these administered objects. The following instructions use the command-line tool.

Storing Administered Objects in an LDAP Directory

PasswordSync and the JMS Listener can be configured to use administered objects stored in an LDAP directory. Figure 11-14 illustrates the process. Both the PasswordSync Servlet and the JMS Listener adapter must retrieve connection factory and destination settings from the LDAP Directory in order to send and receive messages.

Figure 11-14 Retrieving Connection Factory and Destination Objects from the LDAP directory



This section explains how to use the Message Queue command-line tool (`imqobjmgr`) to store administered objects in an LDAP directory.

Storing Connection Factory Objects

Open the Message Queue command-line tool (`imqobjmgr`) and type the commands in Code Example 11-1 to store the connection factory objects.

Code Example 11-1 Storing Connection Factory Objects

```
#> ./imqobjmgr add -l "cn=mytestFactory"
-j "java.naming.factory.initial=com.sun.jndi.ldap.LdapCtxFactory"
-j "java.naming.provider.url=ldap://gwenig.coopsrc.com:389/ou=sunmq,dc=coopsrc,dc=com"
-j "java.naming.security.principal=cn=directory manager"
-j "java.naming.security.credentials=password"
-j "java.naming.security.authentication=simple"
```

Code Example 11-1 Storing Connection Factory Objects *(Continued)*

```
#> ./imqobjmgr add -l "cn=mytestFactory"
-t qf
-o "imqAddressList=mq://gwenig.coopsrc.com:7676/jms"
Adding a Queue Connection Factory object with the following attributes:
imqAckOnAcknowledge [Message Service Acknowledgement of Client Acknowledgements]
...
imqSetJMSXUserID [Enable JMSXUserID Message Property] false

Using the following lookup name:
cn=mytestFactory
The object's read-only state: false
To the object store specified by:
java.naming.factory.initial com.sun.jndi.ldap.LdapCtxFactory
java.naming.provider.url ldap://gwenig.coopsrc.com:389/ou=sunmq,dc=coopsrc,dc=com
java.naming.security.authentication simple
java.naming.security.credentials netscape
java.naming.security.principal cn=directory manager
Object successfully added.
```

In Code Example 11-1 `imqAddressList` defines the JMS server/broker hostname (`gwenig.coopsrc.com`), port (`7676`), and the access method (`jms`).

Storing Destination Objects

In the Message Queue command-line tool (`imqobjmgr`), type the commands in Code Example 11-2 to store the destination objects.

Code Example 11-2 Storing Destination Objects

```
#> ./imqobjmgr add -l "cn=mytestDestination"
-j "java.naming.factory.initial=com.sun.jndi.ldap.LdapCtxFactory"
-j "java.naming.provider.url=ldap://gwenig.coopsrc.com:389/ou=sunmq,dc=coopsrc,dc=com"
-j "java.naming.security.principal=cn=directory manager"
-j "java.naming.security.credentials=password"
-j "java.naming.security.authentication=simple"
-t q
-o "imqDestinationName=mytestDestination"
Adding a Queue object with the following attributes:
imqDestinationDescription [Destination Description] A Description for the Destination
Object imqDestinationName [Destination Name] mytestDestination
Using the following lookup name:
cn=mytestDestination
The object's read-only state: false
To the object store specified by:
java.naming.factory.initial com.sun.jndi.ldap.LdapCtxFactory
java.naming.provider.url ldap://gwenig.coopsrc.com:389/
    ou=sunmq,dc=coopsrc,dc=com
java.naming.security.authentication simple
```

Code Example 11-2 Storing Destination Objects

```
java.naming.security.credentials netscape
java.naming.security.principal cn=directory manager
Object successfully added.
```

NOTE You can check the newly created object with an `ldapsearch` or an LDAP browser.

This concludes the section on Storing Administered Objects on an LDAP Server. Skip the next section, which describes how to store Administered Objects in a file, and go to the section on "Configuring the JMS Listener Adapter for this Scenario" on page 450.

Storing Administered Objects in a File

PasswordSync and the JMS Listener can be configured to use administered objects stored in a file. If you are not storing administered objects on an LDAP server (page 446), follow the instructions in this section.

Storing Connection Factory Objects

Open the Message Queue command-line tool (`imqobjmgr`) and type the commands in Code Example 11-3 to store connection factory objects and specify a lookup name.

Code Example 11-3 Storing Connection Factory Objects and Specifying Lookup Names

```
#> ./imqobjmgr add -l "mytestFactory" -j "java.naming.factory.initial=
com.sun.jndi.fscontext.RefFSContextFactory"
-j "java.naming.provider.url=file:///home/gael/tmp" -t qf -o
"imqAddressList=mq://gwenig.coopsrc.com:7676/jms"
Adding a Queue Connection Factory object with the following attributes:
imqAckOnAcknowledge [Message Service Acknowledgement of    Client Acknowledgements]
...
imqSetJMSXUserID [Enable JMSXUserID Message Property] false
Using the following lookup name:
mytestFactory
The object's read-only state: false
To the object store specified by:
java.naming.factory.initial com.sun.jndi.fscontext.RefFSContextFactory
java.naming.provider.url file:///home/gael/tmp
Object successfully added.
To specify a destination:
```

Code Example 11-3 Storing Connection Factory Objects and Specifying Lookup Names

```
#> ./imqobjmgr add -l "mytestQueue" -j
"java.naming.factory.initial=com.sun.jndi.fscontext.RefFSContextFactory"
-j "java.naming.provider.url=file:///home/gael/tmp" -t q -o
   "imqDestinationName=myTestQueue"
Adding a Queue object with the following attributes:
imqDestinationDescription [Destination Description] A Description for the Destination
Object imqDestinationName [Destination Name] myTestQueue
Using the following lookup name:
mytestQueue
The object's read-only state: false
To the object store specified by:
java.naming.factory.initial com.sun.jndi.fscontext.RefFSContextFactory
java.naming.provider.url file:///home/gael/tmp
Object successfully added.
```

Creating the Destination on the Broker

By default, the Sun Message Queue broker allows auto-creation of the queue destination (see `config.properties`, where the default value for `imq.autocreate.queue` is `true`).

If the queue destination is not created automatically, you must create the destination object on the broker using the command shown in Code Example 11-4 (where *myTestQueue* is the destination):

Code Example 11-4 Creating a Destination Object on the Broker

```
name (Queue name):
#> cd /opt/sun/mq/bin
#>./imqcmd create dst -t q -n mytestQueue
Username: <admin>
Password: <admin>
Creating a destination with the following attributes:
Destination Name mytestQueue
Destination Type Queue
On the broker specified by:
-------------------------
Host Primary Port
-------------------------
localhost 7676
Successfully created the destination.
```

You can store administered objects in a directory or in a file:

- **In a directory:** Using a directory is a centralized way of storing the Connection Factory and the Destination objects.

  When you use a directory, these administered objects are stored as directory entries.

NOTE	If the Identity Manager PasswordSync servlet and the Identity Manager server are not on the same machine, then each of them must be able to access the `.bindings` file. You can repeat the administered object creation twice (on each machine) or you can copy the `.bindings` file to the proper location on each machine.

- **In a file:** If the Identity Manager PasswordSync servlet and Identity Manager server are both running on the same server (or if you do not have a directory available), you can store the administrative objects in a file.

  When you use a file, both administered objects are stored in a single file (called `.bindings` on both Windows and Unix), under the directory you specified for the java.naming.provider.url (for example, `file:///c:/temp` on Windows or `file:///tmp` on Unix).

Configuring the JMS Listener Adapter for this Scenario

Configure the JMS listener adapter on the application server. Follow the instructions in the section "Adding and Configuring a JMS Listener Adapter" on page 436.

Configuring Active Sync

Next, configure the JMS Listener for synchronization. Active Sync is required if you are using JMS, but it is not used for direct connections.

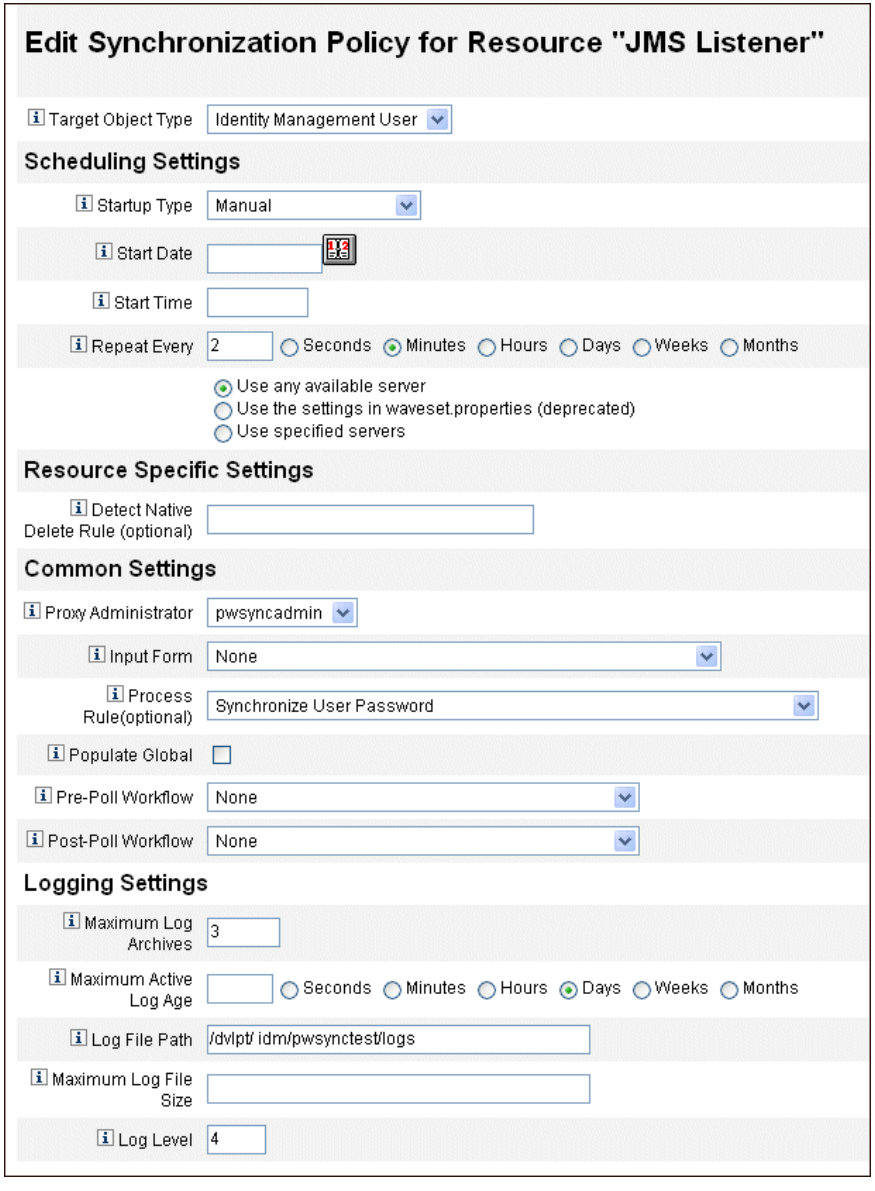
To configure the JMS Listener for synchronization, follow these steps:

1. In the Administrator interface, click **Resources** in the menu.
2. In the **Resource List**, select the **JMS Listener** checkbox.

3. In the **Resource Actions** list, select **Edit Synchronization Policy**.

   The Edit Synchronization page for the JMS Listener resource opens (Figure 11-15).

Figure 11-15 Configuring Active Sync for the JMS Listener



4. Under **Common Settings**, locate **Proxy Administrator** and select `pwsyncadmin`. (This administrator is associated with an empty form.)
5. Under **Common Settings**, locate **Process Rule** and select **Synchronize User Password** from the list. The default Synchronize User Password workflow takes each request that comes in from the JMS Listener adapter, checks out the ChangeUserPassword viewer, and then checks the ChangeUserPassword viewer back in.
6. In the **Log File Path** box, specify a path to a directory where the active and archived log files should be created.
7. For debugging purposes, set the **Log Level** to **4** to generate a verbose log.
8. Click **Save**.

Testing Your Configuration

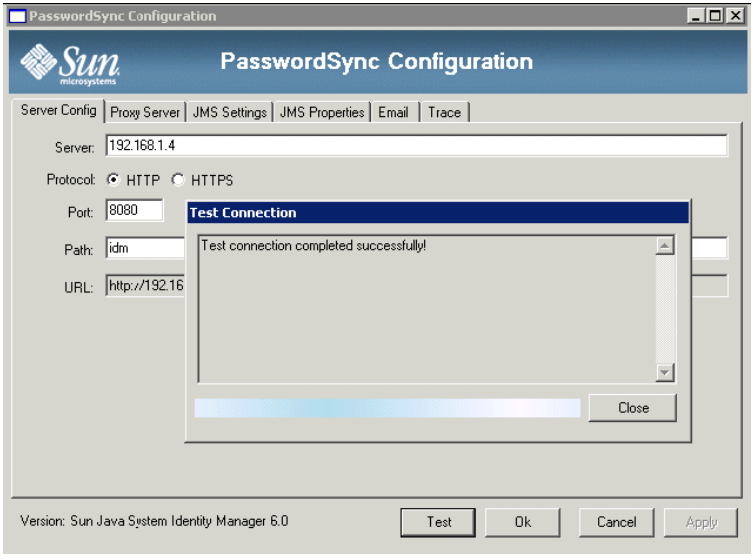
You can use the Windows PasswordSync Configuration application to debug the Windows side of your configuration.

To test your PasswordSync configuration, follow these steps:

1. Start the PasswordSync configuration application, if it is not already running.

   By default, the configuration application is installed at Program Files > Sun Identity Manager PasswordSync > Configuration.
2. When the PasswordSync Configuration dialog displays, click the **Test** button.
3. If using JMS, the Test Connection dialog (Figure 11-16) displays, with a message stating whether the test connection completed successfully.

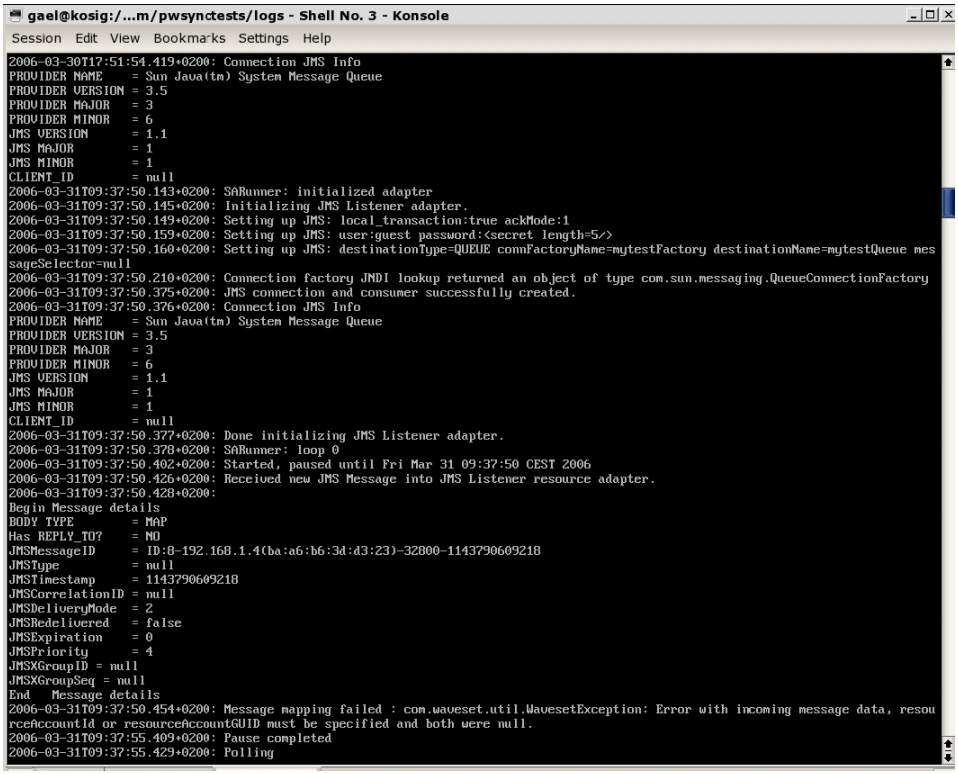
Figure 11-16 Test Connection Dialog



4. Click **Close** to close the Test Connection dialog.
5. Click **OK** to close the PasswordSync Configuration dialog.

   The JMS Listener adapter then runs in debug mode, and generates debug information in a file, similar to the one in Figure 11-17.

Figure 11-17 Debug Information File



Frequently Asked Questions about PasswordSync

Can PasswordSync be implemented without a Java Messaging Service?

Yes, but doing so eliminates the advantages of using a JMS to track password change events.

To implement PasswordSync without a JMS, launch the configuration application with the following flag:

```
Configure.exe -direct
```

When the `-direct` flag is specified, the configuration application displays the User tab.

If you implement PasswordSync without a JMS, you do not need to create a JMS Listener adapter. Therefore, you should omit the procedures listed in "Deploying PasswordSync on the Application Server" on page 436. If you want to set up notifications, you may need to alter the Change User Password workflow.

NOTE If you subsequently run the configuration application without specifying the `-direct` flag, PasswordSync will require a JMS to be configured. Relaunch the application with the `-direct` flag to bypass the JMS again.

Can PasswordSync be used in conjunction with other Windows password filters that are used to enforce custom password policies?

Yes, you can use PasswordSync in conjunction with other _WINDOWS_ password filters. It must, however, be the last password filter listed in the Notification Package registry value.

You must use this Registry path:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Lsa\Notification
Packages (value of type REG_MULTI_SZ)
```

By default, the installer places the Identity Manager password intercept at the end of the list, but if you installed the custom password filter after the installation, you will be required to move `lhpwic` to the end of the Notification Packages list.

You can use PasswordSync in conjunction with other Identity Manager password policies. When policies are checked on the Identity Manager server side, all resource password policies must pass in order for the password synchronization to be pushed out to other resources. Consequently, you should make the Windows native password policy as restrictive as the most restrictive password policy defined in Identity Manager.

NOTE The password intercept DLL does not enforce any password policies.

Can the PasswordSync servlet be installed on a different application server than Identity Manager?

Yes. The PasswordSync servlet requires the `spml.jar` and `idmcommon.jar` JAR files, in addition to any JAR files required by the JMS application.

Does the PasswordSync service send passwords over to the `lh` server in clear text?

Although we recommend running PasswordSync over SSL, all sensitive data is encrypted before being sent to the Identity Manager server.

For information, see "Configure PasswordSync for SSL" on page 426.

Sometimes password changes result in `com.waveset.exception.ItemNotLocked`?

If you enable PasswordSync, a password change (even one initiated from the user interface), will result in a password change on the resource, which causes the resource to contact Identity Manager.

If you configure the `passwordSyncThreshold` workflow variable correctly, Identity Manager examines the user object and decides that it has already handled the password change. However, if the user or the administrator makes another password change for the same user, at the same time, the user object could be locked.

Chapter 12

Security

This chapter provides information about Identity Manager security features, and details steps you can take to further reduce security risks.

Review the following topics to learn more about managing system security with Identity Manager.

Security Features

Identity Manager helps reduce security risks by providing the following features:

- *Instant disabling of account access* – Identity Manager lets you disable organizations or individual access rights with a single action.
- *Login session limitations* — You can set limitations on concurrent login sessions.
- *Active risk analysis* – Identity Manager scans constantly for security risks such as inactive accounts and suspicious password activity.
- *Comprehensive password management* – Complete and flexible password management capabilities ensure complete access control.
- *Auditing and reporting to monitor access activities* – You can run a full range of reports to deliver targeted information on access activities. (See Chapter 8, "Reporting" for more information about reporting features.)
- *Granular Administrative-privilege controls* — You can grant and manage administrative control in Identity Manager by assigning a single Capability to a user or a range of administrative duties defined through Admin Roles.
- *Server key encryption* – Identity Manager allows you to create and manage server encryption keys through the Tasks area.

In addition, system architecture seeks to reduce security risks wherever possible. For example, once logged out, you cannot access previously visited pages through your browser's *Back* feature.

Limiting Concurrent Login Sessions

By default, an Identity Manager user can have concurrent login sessions. You can limit concurrent sessions, however, to one per login application by opening the system configuration object for modification (page 214) and editing the value of the `security.authn.singleLoginSessionPerApp` configuration attribute. This attribute is an object that contains one attribute for each login application name (for example, the Administrator Interface, User Interface, or Identity Manager IDE). Changing the value of this attribute to `true` enforces a single login session for each user.

If enforced, then a user can log in to more than one session; however, only the last logged-in session remains active and valid. If the user performs an action on an invalid session, then he is automatically forced off the session and the session terminates.

Password Management

Identity Manager offers password management at multiple levels:

- **Administrative change management**
  - Change a user's password from multiple locations (**Edit User**, **Find User**, or **Change Password** pages)
  - Change passwords on any one of a user's resources with granular resource selection
- **Administrative password resets**
  - Generate random passwords
  - Display passwords to the end user or the administrator
- **User change password**
  - Provide self-service to the end user for password changes at

    `http://localhost:8080/idm/user`
  - Optionally customize the self-service page to match the end user's environment
- **User update data**
  - Set up any user schema attribute to be managed by the end user
- **User access recovery**
  - Use authentication answers to grant a user access to change his password
  - Use pass-through authentication to grant a user access by using one of several passwords
- **Password policies**
  - Use rules to define password parameters

Pass-through Authentication

Use pass-through authentication to grant user and administrator access through one or more different passwords. Identity Manager manages authentication through the implementation of:

- *Login applications* (collection of login module groups)
- *Login module groups* (ordered set of login modules)
- *Login modules* (sets authentication for each assigned resource and specify one of several success requirements for authentication)

About Login Applications

Login applications define a collection of login module groups, which further define the set and order of login modules that will be used when a user logs in to Identity Manager. Each login application comprises one or more login module groups.

At login, the login application checks its set of login module groups. If only one login module group is set, then it is used, and its contained login modules are processed in the group-defined order. If the login application has more than one defined login module group, then Identity Manager checks the *login constraint rules* applied to each login module group to determine which group to process.

Login Constraint Rules

Login constraint rules are applied to login module groups. For each set of login module groups in a login application, only one cannot have a login constraint rule applied to it.

When determining which login module group of a set to process, Identity Manager evaluates the first login module group's constraint rule. If it succeeds, then it processes that login module group. If it fails, then it evaluates each login module group in turn, until a constraint rule succeeds or a login module group with no constraint rule is evaluated (and subsequently used).

NOTE If a login application will contain more than one login module group, then the login module group with no login constraint rules should be placed in the last position of the set.

Example Login Constraint Rule

In the following example of a location-based login constraint rule, the rule gets the IP address of the requester from the HTTP header, and then checks to see if it is located on the 192.168 network. If 192.168. is found in the IP address, then the rule will return a value of true, and this login module group is selected.

Code Example 12-1 Location-Based Login Constraint Rule

```
<Rule authType='LoginConstraintRule' name='Sample On Local Network'>
  <match>
    <ref>remoteAddr</ref>
    <s>192.168.</s>
  </match>
  <MemberObjectGroups>
    <ObjectRef type='ObjectGroup' name='All'/>
  </MemberObjectGroups>
</Rule>
```

Editing Login Applications

From the menu bar, select **Security**, and then select **Login** to access the Login page.

The login application list shows:

- Each Identity Manager login application (interface) defined
- The login module groups that comprise the login application
- The Identity Manager session timeout limits set for each login application

From the Login page you can:

- Create custom login applications
- Delete custom login applications
- Manage login module groups

To edit a login application, select it from the list.

Setting Identity Manager Session Limits

From the Modify Login Application page, you can set a timeout value (limits) for each Identity Manager login session. Select hours, minutes, and seconds, and then click **Save**. The limits you establish display in the login application list.

You can set session timeouts for each Identity Manager login application. When a user logs in to an Identity Manager application, then the currently configured session timeout value is used to compute the future date and time when the user's session will time out due to inactivity. This computed date is then stored with the user's Identity Manager session so that it is available to be checked each time a request is made.

If a login administrator changes a login application session timeout value, then that value will be in effect for all future logins. Existing sessions will time out based on the value in effect when the user logged in.

Values set for HTTP timeout affect all Identity Manager applications and take precedence over the login application session timeout value.

Disabling Access to Applications

From the Create Login Application and Modify Login Application pages, you can select the Disable option to disable a login application, thereby preventing users from logging in. If a user tries to log in to a disabled application, the user is redirected to an alternate page that states that the application is currently disabled. You can edit the message that displays on this page by editing the custom catalog.

Login applications remain disabled until you de-select the option. As a safeguard, you cannot disable administrator login.

Editing Login Module Groups

The login module group list shows:

- Each login module group
- The individual login modules that make up a login module group
- Whether a login module group contains constraint rules

From the Login Module Groups page you can create, edit, and delete login module groups. Select a login module group from the list to edit it.

Editing Login Modules

Enter details or make selections for login modules as follows. (Not all options are available for each login module.)

- **Login success requirement** — Select a requirement that applies to this module. Selections are:
  - **Required** — The login module is required to succeed. Irrespective of whether it succeeds or fails, authentication proceeds to the next login module in the list. If it is the only login module, the administrator is successfully logged in.
  - **Requisite** — The login module is required to succeed. If it succeeds, authentication proceeds to the next login module in the list. If it fails, authentication does not proceed.
  - **Sufficient** — The login module is not required to succeed. If it does succeed, authentication does not proceed to the next login module, and the administrator is successfully logged in. If it fails, authentication continues to the next login module in the list.
  - **Optional** — The login module is not required to succeed. Irrespective of whether it succeeds or fails, authentication continues to the next login module in the list.
- **Login search attributes** — (LDAP only.) Specify an ordered list of LDAP user attribute names to be used when attempting to bind (log in) to the associated LDAP server. Each of the LDAP user attributes specified, along with the user's specified login name, is used (in order) to search for a matching LDAP user. This allows a user to log in to Identity Manager by using an LDAP cn or email address (when Identity Manager is configured for pass-through to LDAP).

  For example, if you specify:

  ```
  cn
  mail
  ```

  and the user attempts to log in as `gwilson`, then the LDAP resource will first attempt to find an LDAP user where `cn=gwilson`. If that succeeds, then the bind is attempted with the password specified by the user. If it does not succeed, then the LDAP resource will search for an LDAP user where `mail=gwilson`. If that also fails, then login fails.

  If you do not specify a value, then the default LDAP search attributes are:

  ```
  uid
  cn
  ```

- **Login correlation rule** — Select a login correlation rule to be used to map the login information provided by the user to an Identity Manager user. This rule is used to search for an Identity Manager user by using the logic specified in the rule. The rule must return a list of one or more AttributeConditions that will be used to search for an Identity Manager user that matches. The rule you select must have the `LoginCorrelationRule` authType. For a description of the steps Identity Manager takes to map an authenticated user ID to an Identity Manager user, see "Login Module Processing Logic" on page 465.
- **New user name rule** — Select a new user name rule to be used when automatically creating new Identity Manager users as part of login.

Click **Save** to save a login module. Once it is saved, you can position the module relative to all other modules in the login module group.

CAUTION If Identity Manager login is configured to authenticate to more than one system, an account's user ID and password should be the same across all systems that are targets of Identity Manager authentication.

If the user ID and password combinations differ, login will fail on each system whose user ID and password do not match the user ID and password entered on the Identity Manager User Login form.

Some of these systems may have a lockout policy enforcing the number of failed login attempts before an account is locked. For these systems, user accounts will eventually be locked, even though the user's login via Identity Manager continues to succeed.

Login Module Processing Logic

Code Example 12-2 contains pseudocode that describes the steps Identity Manager takes to map authenticated user IDs to Identity Manager users.

Code Example 12-2 Pseudocode describing login module processing logic

```
if an existing IDM user's ID is the same as the specified user ID

   if that IDM user has a linked resource whose resource name matches the
   resource that was authenticated and whose accountId matches the resource
   accountId returned by successful authentication (e.g. dn), then we have
   found the right IDM user

   otherwise if there is a LoginCorrelationRule associated with the
   configured login module

      evaluate it to see if it maps the login credentials to a single IDM
      user

      otherwise login fails

   otherwise login fails

if the specified userID does not match an existing IDM user's ID

   try to find an IDM user that has a linked resource whose resource name
   matches the resource accountID returned by successful authentication

      if found, then we have found the right IDM user

      otherwise if there is a LoginCorrelationRule associated with the
      configured login module

         evaluate it to see if it maps the login credentials to a single
         IDM user

         otherwise login fails

      otherwise login fails
```

In Code Example 12-2 the system will try to find a matching Identity Manager user using the user's linked resources (resource information). If the resource information approach fails, however, and a loginCorrelationRule is configured, the system will try to find a matching user using the loginCorrelationRule.

Configuring Authentication for Common Resources

If you have multiple resources that are logically the same (for example, multiple Active Directory domain servers that share a trust relationship), or if you have multiple resources that all reside on the same physical host, then you can specify that these resources are *common resources*.

You should declare common resources so that Identity Manager knows that it should only try and authenticate to a group of resources one time. Otherwise, if a user types a wrong password, Identity Manager will try the same password against each resource. This can lead to the user's account being locked out due to multiple login failures, even though the user only typed the wrong password one time.

With common resources, a user can authenticate to one common resource, and Identity Manager will automatically try and map the user to the remaining resources in the common resources group. For example, an Identity Manager user account may be linked to a resource account for resource AD-1. The login module group, however, may define that users must authenticate to resource AD-2.

If AD-1 and AD-2 are defined as common resources (in this case, in the same trusted domain), then if the user successfully authenticates to AD-2, Identity Manager can also map the user to AD-1 by finding the same user accountId on resource AD-1.

NOTE All resources listed in a common resources group must also be included in the Login Module definition. If a complete list of common resources does not also appear in the Login Module definition, then the common resources functionality will not work correctly.

Common resources can be defined in the System Configuration object (page 214) using the following format:

Code Example 12-3 Configuring Authentication for Common Resources

```
<Attribute name='common resources'>
    <Attribute name='Common Resource Group Name'>
        <List>
            <String>Common Resource Name</String>
            <String>Common Resource Name</String>
        </List
    </Attribute>
</Attribute>
```

Configuring X509 Certificate Authentication

Use the following information and procedures to configure X509 Certificate Authentication for Identity Manager.

Prerequisites

To support X509 certificate-based authentication in Identity Manager, ensure that two-way (client and server) SSL authentication is configured properly. From the client perspective, this means that an X509-compliant user certificate should have been imported into the browser (or be available through a smart card reader), and that the trusted certificate used to sign the user certificate should be imported into the Web application server's keystore of trusted certificates.

Also, the client certificate used must be enabled for client authentication.

To verify that the client certificate's client authentication option is selected, follow these steps:

1. Using Internet Explorer, select **Tools**, and then select **Internet Options**.
2. Select the **Content** tab.
3. In the Certificates area, click **Certificates**.
4. Select the client certificate, and then click **Advanced**.
5. In the Certificate Purposes area, verify that the Client Authentication option is selected.

Configuring X509 Certificate Authentication in Identity Manager

To configure Identity Manager for X509 certificate authentication, follow these steps:

1. Log in to the Administrator Interface as Configurator (or with equivalent permissions).
2. Select **Configure**, and then select **Login** to display the Login page.
3. Click **Manage Login Module Groups** to displays the Login Module Groups page.
4. Select a login module group from the list.
5. Select Identity Manager X509 Certificate Login Module from the Assign Login Module... list. Identity Manager displays the Modify Login Module page.
6. Set the login success requirement. Acceptable values are:
    - **Required** — The login module is required to succeed. Irrespective of whether it succeeds or fails, authentication proceeds to the next login module in the list. If it is the only login module, the administrator is successfully logged in.
    - **Requisite** — The login module is required to succeed. If it succeeds, authentication proceeds to the next login module in the list. If it fails, authentication does not proceed.
    - **Sufficient** — The login module is not required to succeed. If it does succeed, authentication does not proceed to the next login module, and the administrator is successfully logged in. If it fails, authentication continues to the next login module in the list.
    - **Optional** — The login module is not required to succeed. Irrespective of whether it succeeds or fails, authentication continues to the next login module in the list.
7. Select a login correlation rule. This could be a built-in rule or a custom correlation rule. (See the following section for information about creating custom correlation rules.)
8. Click **Save** to return to the Modify Login Module Group page.
9. Optionally, reorder the login modules (if more than one login module is assigned to the login module group, and then click **Save**.

10. Assign the login module group to a login application if it is not yet assigned. From the Login Module Groups page, click Return to Login Applications, and then select a login application. After assigning a login module group to the application, click **Save**.

NOTE If the `allowLoginWithNoPreexistingUser` option is set to a value of `true` in the waveset.properties file, then when configuring the Identity Manager X509 Certificate Login Module, you are prompted to select a New User Name Rule. This rule is used to determine how to name new users created when one is not found by the associated `Login Correlation Rule`.

The New User Name Rule has the same available input arguments as the Login Correlation Rule. It returns a single string, which is the `user name used to create the new Identity Manager user account.`

A sample new user name rule is included in `idm/sample/rules`, named NewUserNameRules.xml.

Creating and Importing a Login Correlation Rule

A Login Correlation Rule is used by the Identity Manager X509 Certificate Login Module to determine how to map the certificate data to the appropriate Identity Manager user. Identity Manager includes a built-in correlation rule, named Correlate via X509 Certificate subjectDN.

You can also add your own correlation rules. Refer to `LoginCorrelationRules.xml`, which is located in the `idm/sample/rules` directory, as an example. Each correlation rule must follow these guidelines:

- Its `authType` attribute must be set to `LoginCorrelationRule`
- It is expected to return an instance of a list of `AttributeConditions` to be used by the login module to find the associated Identity Manager user. For example, the login correlation rule might return an `AttributeCondition` that searches for the associated Identity Manager user by email address.

Arguments passed to login correlation rules are:

- Standard X509 certificate fields (such as `subjectDN`, `issuerDN`, and valid dates)
- Critical and non-critical extension properties

The naming convention for certificate arguments passed to the login correlation rule is:

```
cert.field name.subfield name
```

Example argument names that are available to the rule include:

- `cert.subjectDN`
- `cert.issuerDN`
- `cert.notValidAfter`
- `cert.notValidBefore`
- `cert.serialNumber`

The login correlation rule, using the passed-in arguments, returns a list of one or more `AttributeConditions`. These are used by the Identity Manager X509 Certificate Login Module to find the associated Identity Manager user.

A sample login correlation rule is included in `idm/sample/rules`, named `LoginCorrelationRules.xml`.

After creating a custom correlation rule, you must import it into Identity Manager. From the Administrator Interface, select **Configure**, and then select **Import Exchange File** to use the file import facility.

Testing the SSL Connection

To test the SSL connection, go to the configured application interface's URL via SSL (for example, `https://idm007:7002/idm/user/login.jsp`). You are notified that you are entering a secure site, and then prompted to specify which personal certificate to send to the Web server.

Diagnosing Problems

Problems authenticating via X509 certificates should be reported as error messages on the login form. For more complete diagnostics, enable trace on the Identity Manager server for these classes and levels:

- `com.waveset.session.SessionFactory 1`
- `com.waveset.security.authn.WSX509CertLoginModule 1`
- `com.waveset.security.authn.LoginModule 1`

If the client certificate attribute is named something other than `javaxservlet.request.X509Certificate` in the HTTP request, then you will receive a message that this attribute cannot be found in the HTTP request.

To correct this:

1. Enable trace for `SessionFactory` to see the complete list of HTTP attributes and determine the name of the X509Certificate.
2. Use the Identity Manager debug facility (page 60) to edit the `LoginConfig` object.
3. Change the name of the `<AuthnProperty>` in the `<LoginConfigEntry>` for the Identity Manager X509 Certificate Login Module to the correct name.
4. Save, and then retry.

You may also need to remove, and then re-add the Identity Manager X509 Certificate Login Module in the login application.

Cryptographic Use and Management

Cryptography is used to ensure the confidentiality and integrity of server data in memory and in the repository, as well as all data transmitted between the server and gateway.

The following sections provide more information about how cryptography is used and managed in the Identity Manager Server and Gateway, and addresses questions about server and gateway encryption keys.

Cryptographically Protected Data

The following table shows the types of data that are cryptographically protected in the Identity Manager product, including the ciphers used to protect each type of data.

Table 12-1 Cryptographically-Protected Data Types

Data Type	RSA MD5	NIST Triple DES 168-bit key (DESede/ECB/NoPadding)	PKCS#5 Password-Based Crypto 56-bit key (PBEwithMD5andDES)
Server encryption keys		default	configuration option[1]
Gateway encryption keys		default	configuration option[1]
Policy dictionary words	yes		
User passwords		yes	
User password history		yes	
User answers		yes	
Resource passwords		yes	
Resource password history	yes		
All payload between server and gateways		yes	

1. Configure via the System Configuration object (page 214) via the `pbeEncrypt` attribute or the Manage Server Encryption task.

Server Encryption Key Questions and Answers

Read the following sections for answers to frequently asked questions about server encryption key source, location, maintenance, and use.

Where do server encryption keys come from?

Server encryption keys are symmetric, triple-DES 168-bit keys. There are two types of keys supported by the server:

- **Default key** — This key is compiled into the server code.
- **Randomly generated key** — This key can be generated at initial server startup, or any time the security of the current key is in question.

Where are server encryption keys maintained?

Server encryption keys are objects maintained in the repository. There can be many data encryption keys in any given repository.

How does the server know which key to use for decryption and re-encryption of encrypted data?

Each piece of encrypted data stored in the repository is prefixed by the ID of the server encryption key that was used to encrypt it. When an object containing encrypted data is read into memory, Identity Manager uses the server encryption key associated with the ID prefix on the encrypted data to decrypt, and then re-encrypt with the same key if the data changed.

How do I update server encryption keys?

Identity Manager provides a task called Manage Server Encryption. This task allows an authorized security administrator to perform several key management tasks, including:

- Generating a new "current" server key
- Re-encrypting existing objects, by type, containing encrypted data with the "current" server key

See Managing Server Encryption in this chapter for more information about how to use this task.

What happens to existing encrypted data if the "current" server key is changed?

Nothing. Existing encrypted data will still be decrypted or re-encrypted with the key referenced by the ID prefix on the encrypted data. If a new server encryption key is generated and set to be the "current" key, any new data to be encrypted will use the new server key.

To avoid multikey issues, as well as to maintain a higher level of data integrity, use the Manage Server Encryption task to re-encrypt all existing encrypted data with the "current" server encryption key.

What happens when you import encrypted data for which an encryption key is not available?

If you import an object that contains encrypted data, but that data was encrypted with a key that is not in the repository into which it is being imported, then the data will be imported, but not decrypted.

How are server keys protected?

If the server is not configured to use password-based encryption (PBE) - PKCS#5 encryption (set in the System Configuration object via the `pbeEncrypt` attribute or the Manage Server Encryption task), then the default key is used to encrypt the server keys. The default key is the same for all Identity Manager installations.

If the server is configured to use PBE encryption, then a PBE key is generated each time the server is started. The PBE key is generated by providing a password, generated from a server-specific secret, to the PBEwithMD5andDES cipher. The PBE key is maintained only in memory and never persisted. In addition, the PBE key is the same for all servers sharing a common repository.

To enable PBE encryption of server keys, the cipher PBEwithMD5andDES must be available. Identity Manager does not package this cipher by default, but it is a PKCS#5 standard that is available in many JCE providers implementations, such as those provided by Sun and IBM.

Can I export the server keys for safe external storage?

Yes. If the server keys are PBE encrypted, then before they are exported, they will be decrypted and re-encrypted with the default key. This allows them to be imported to the same or another server at a later date, independent of the local server PBE key. If the server keys are encrypted with the default key, then no pre-processing is done before they are exported.

When they are imported into a server, if the server is configured for PBE keys, the keys will be decrypted and then re-encrypted with the local server's PBE key, if that server is configured for PBE key encryption.

What data is encrypted between the server and gateway?

All data (payload) transmitted between the server and gateway is triple-DES encrypted with a randomly generated, per server-gateway session symmetric 168 bit key.

Gateway Key Questions and Answers

Read the following sections for answers to frequently asked questions about gateway source, storage, distribution, and protection.

Where do the gateway keys come from to encrypt or decrypt data?

Each time an Identity Manager Server connects to a gateway, the initial handshake will generate a new random 168-bit, triple-DES session key. This key will be used to encrypt or decrypt all subsequent data transmitted between that server and that gateway. There is a unique session key generated for each server/gateway pair.

How are gateway keys distributed to the gateways?

Session keys are randomly generated by the server and then securely exchanged between server and gateway by encrypting them with the shared secret master key as part of the initial server-to-gateway handshake.

At initial handshake time, the server queries the gateway to determine which mode it supports. The gateway can operate in two modes

- **Default mode** — Initial server-to-gateway protocol handshake is encrypted with the default 168 bit triple-DES key, which is compiled into the server code.
- **Secure mode** — A per shared repository, random, 168-bit key, triple-DES gateway key is generated and communicated from the server to the gateway as part of the initial handshake protocol. This gateway key is stored in the server repository like other encryption keys, and also stored by the gateway in its local registry.

  When in secure mode and a server contacts a gateway, the server will encrypt test data with the gateway key and send it to the gateway. The gateway will then attempt to decrypt the test data, add some gateway unique data to the test data, re-encrypt both, and send the data back to the server. If the server can successfully decrypt the test data and the gateway unique data, the server will then generate the server-gateway unique session key, encrypt it with the gateway key and send it to the gateway. Upon receipt, the gateway will decrypt the session key and retain it for use for the life of the server-to-gateway session. If the server cannot successfully decrypt the test data and gateway unique data, the server will encrypt the gateway key using the default key and send it to the gateway. The gateway will decrypt the gateway key using its compiled in default key and store the gateway key in its registry. The server will then encrypt the server-gateway unique session key with the gateway key and send it to the gateway for use for the life of the server-to-gateway session.

  From that point forward, the gateway will only accept requests from servers that have encrypted the session key with its gateway key. On startup, the gateway checks the registry for a key. If there is one, it will use it. If there is not one, it will use the default key. Once the gateway has a key set in the registry, it will no longer allow sessions to be established using the default key. This will prevent someone from setting up a rogue server and establishing a connection to a gateway.

Can I update the gateway keys used to encrypt or decrypt the server-to-gateway payload?

Identity Manager provides a task called Manage Server Encryption that allows an authorized security administrator to do several key management tasks, including generate a new "current" gateway key and update all gateways with the "current" gateway key. This is the key that is used to encrypt the per-session key used to protect all payload transmitted between server and gateway. The newly generated gateway key will be encrypted with either the default key or PBE key, depending on the value of the `pbeEncrypt` attribute in the System Configuration (page 214).

Where are the gateway keys stored on the server, on the gateway?

On the server, the gateway key is stored in the repository just like server keys. On the gateway, the gateway key is stored in a local registry key.

How are gateway keys protected?

The gateway key is protected the same way server keys are. If the server is configured to use PBE encryption, the gateway key will be encrypted with a PBE generated key. If the option is false, it will be encrypted with the default key. See the previous section titled How are server keys protected? for more information.

Can I export the gateway key for safe external storage?

The gateway key can be exported via the Manage Server Encryption task, just as with server keys. See the previous section titled Can I export the server keys for safe external storage? for more information.

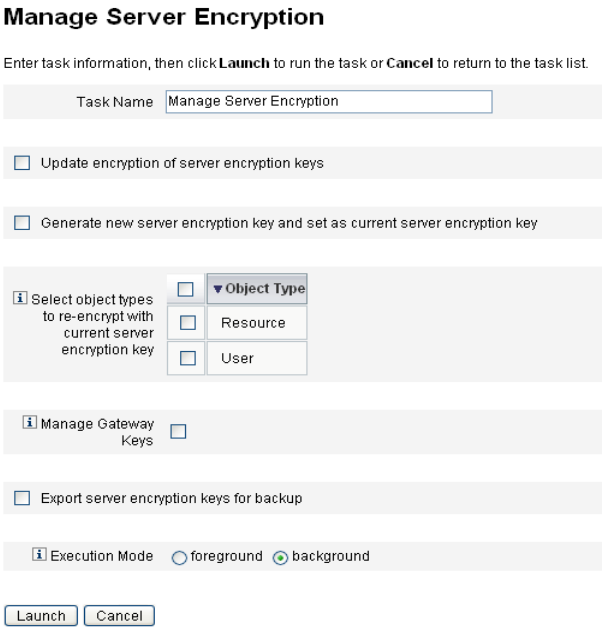
How are server and gateway keys destroyed?

Server and gateway keys are destroyed by deleting them from the server repository. Note that a key should not be deleted as long as any server data is still encrypted with that key or any gateway is still relying on that key. Use the Manage Server Encryption task to re-encrypt all server data with the current server key and to synchronize the current gateway key to all gateways to ensure no old keys are still being used before they are deleted.

Managing Server Encryption

The Identity Manager server encryption feature allows you to create new 3DES server encryption keys, as shown in the following figure, and then encrypt these keys by using 3DES or PKCS#5 encryption. Only users with Security Administrator capabilities can run the Manage Server Encryption task, which is accessed from the **Server Tasks** tab.

Figure 12-1 Manage Server Encryption Task



Select **Run Tasks**, and then select Manage Server Encryption from the list to configure this information for the task:

- **Update encryption of server encryption keys** — Select to specify whether server encryption keys will be encrypted by using default (3DES) encryption or PKCS#5 encryption. When you select this option, two encryption choices appear (Default and PKCS#5); select one.

- **Generate new server encryption key and set as current server encryption key** — Select to generate a new server encryption key. Each piece of encrypted data generated after you make this selection is encrypted with this key. Generating a new server encryption key does not affect the key applied to existing encrypted data.
- **Select object types to re-encrypt with current server encryption key** — Select one or more Identity Manager object types (such as resources or users) to re-encrypt with the current encryption key.
- **Manage Gateway Keys** — When selected, the page displays these gateway key options:
  - **Generate a new key and synchronize all gateways**
    Select this option when initially enabling a secure gateway environment. This option generates a new gateway key and communicates it to all gateways.
  - **Synchronize all gateways with current gateway key**
    Select to synchronize any new gateways, or gateways that have not communicated the new gateway key. Select this option if you had a gateway that was down when all gateways were synchronized with the current gateway key, or when you want to force a key update for a new gateway.
- **Export server encryption keys for backup** — Select to export existing server encryption keys to an XML-formatted file. When you select this option, Identity Manager displays an additional field for you to specify a path and file name to export the keys.

NOTE If you are using PKCS#5 encryption and you choose to generate and set a new server encryption key, you should also select this option. In addition, you should store the exported keys on removable media and in a secure location (not on a network).

- **Execution Mode** — Select whether to run this task in the background (the default option) or in the foreground. If you choose to re-encrypt one or more object types with a newly generated key, this task can take some time and is best run in the background.

Using Authorization Types to Secure Objects

You typically use permissions specified in an `AdminGroup` capability to grant access to an Identity Manager objectType such as a Configuration, Rule, or `TaskDefinition`. However, granting access to all objects of an Identity Manager objectType within one or more controlled organizations is sometimes still too broad.

Using authorization types (`AuthType`) allows you to further scope or restrict this access to a subset of objects for a given Identity Manager objectType. For example, you might not want to give your users access to all rules within their scope of control when populating rules to select from in a user form.

To define a new authorization type, edit the `AuthorizationTypes` configuration object in the Identity Manager repository and add a new `<AuthType>` element. This element requires two properties:

- The name of the new authorization type
- The existing authorization type or objectType the new element extends or scopes

For example, if you want to add a new Rule authorization type, called `Marketing Rule`, that extends `Rule`, you would define the following:

```
<AuthType name='Marketing Rule' extends='Rule'/>
```

Next, to enable the authorization type to be used, you must reference that authorization type in two places.

- Within a custom AdminGroup capability that grants one or more rights to the new authorization type
- Within the objects that should be of this type

Following are examples of both references.

The first example shows an `AdminGroup` capability definition granting access to `Marketing Rules`.

Code Example 12-4

```
<AdminGroup name='Marketing Admin'>
  <Permissions>
    <Permission type='Marketing Rule' rights='View,List,Connect,Disconnect/>
  </Permissions>
  <AdminGroups>
    <ObjectRef type='AdminGroup' id='#ID#Account Administrator'/>
  </AdminGroups>
</AdminGroup>
```

The next example shows a `Rule` definition that enables users to access the object because they have been granted access to `Rule` or `Marketing Rule`.

```
<Rule name='Competitive Analysis Info' authType='Marketing Rule'>
 ...
</Rule>
```

NOTE Any user granted rights to a parent authorization type, or to a static type that an authorization type extends, will have the same rights on all child authorization types. So, using the preceding example, any user granted rights to `Rule` will also have the same rights to `Marketing Rule`. The converse, however, is not true.

Security Practices

As an Identity Manager administrator, you can further reduce security risks to your protected accounts and data by following these recommendations, at setup time and after.

At Setup

You should:

- Access Identity Manager through a secure Web server using HTTPS.
- Reset the passwords for the default Identity Manager administrator accounts (Administrator and Configurator). To further protect the security of these accounts, you can rename them.
- Limit access to the Configurator account.
- Limit administrators' capability sets to only those actions needed for their job functions, and limit administrator capabilities by setting up organizational hierarchies.
- Change the default password for the Identity Manager Index Repository.
- Turn on auditing to track activities in the Identity Manager application.
- Edit the permissions on files in the Identity Manager directory.
- Customize workflows to insert approvals or other checkpoints.
- Develop a recovery procedure to describe how to recover your Identity Manager environment in the event of emergency.

During Use

You should:

- Periodically change the passwords for the default Identity Manager administrator accounts (Administrator and Configurator).
- Log out of Identity Manager when not actively using the system.
- Set or know the default timeout period for an Identity Manager session. Session timeout values may differ, as they can be set independently for each login application.

If your application server is Servlet 2.2-compliant, the Identity Manager installation process sets the HTTP session timeout to a default value of 30 minutes. You can change this value by editing the property; however, you should set the value lower to increase security. Do not set the value higher than 30 minutes.

To change the session timeout value, follow these steps:

1. Edit the `web.xml file`, which is located in the `idm/WEB-INF` directory in your application server directory tree.
2. Change the number value in the following lines:

```
<session-config>
  <session-timeout>30</session-timeout>
</session-config>
```

Chapter 13

Identity Auditing: Basic Concepts

This chapter introduces you to the concepts behind identity auditing and audit controls. Audit controls can be used to monitor and manage auditing and compliance across enterprise information systems and applications.

In this chapter, you will learn about the following concepts and tasks:

About Identity Auditing

Identity Manager defines *auditing* as the systematic capture, analysis, and response to identity data across an enterprise to ensure compliance with internal and external policies and regulations.

Compliance with accounting and data privacy legislation is not a simple task. Identity Manager's auditing features offer a flexible approach, allowing you to implement a compliance solution that works for your enterprise.

In most environments, different groups are involved with compliance: internal and external auditing teams (for whom auditing is the primary focus); and non-auditing staff (who may see auditing as a distraction). IT often is involved with compliance as well, helping transition internal auditing team requirements to a chosen solution's implementation. The key to successfully implementing an auditing solution is in accurately capturing the knowledge, controls, and processes of non-auditing staff, and then automating the application of that information.

Goals of Identity Auditing

Identity auditing improves audit performance as follows:

- *Identity auditing automatically detects compliance violations and facilitates swift remediation through immediate notification*

  Identity Manager audit policy features let you define *rules* (that is, criteria) for violations. Once defined, the system scans for conditions that violate established policies, such as unauthorized access changes or erroneous access privileges. Upon detection, the system notifies the appropriate persons according to a defined escalation chain. User-invoked tasks, or workflows that are automatically invoked by policy violations, can then remediate (correct) the violation.

- *Provides key information, on-demand, about the effectiveness of internal audit controls*

  The Auditor Reports provide summary status information about violations and exceptions for quick analysis of risk status. The Reports tab also provides graphical reports of violations. You can view violations by resource, organization, or policy, customizing each chart according to the report characteristics you define.

- *Automates certification reviews of identity controls to reduce operational risk*

  Workflow capabilities enable automated notification of policy and access violations to selected reviewers.

- *Prepares comprehensive reports that detail user activity and meet regulatory requirements*

  The Reports area lets you define detailed reports and charts that provide information on access history and privileges, and other policy violations. The system keeps a secure and comprehensive identity audit trail that can be mined, through reporting capabilities, for access data and user profile updates.

- *Streamlines the process of periodic reviews to maintain security and regulatory compliance*

  Periodic access reviews can be conducted to collect user entitlement records and determine which entitlements require review. The process then notifies designated attestors of pending requests for review and updates the status or pending requests when attestor actions on the requests are completed.

- *Identifies potential conflict-of-interest capabilities for user accounts*

  Identity Manager provides a Separation of Duties report that identifies users with specific capabilities or privileges that could be a potential conflict of interest.

Understanding Identity Auditing

Identity Manager provides a feature for auditing user account privileges and access rights, and a separate feature for maintaining and certifying compliance. These features are *policy-based compliance* and *periodic access reviews*.

Policy-Based Compliance

Identity Manager employs an audit policy system that allows administrators to maintain compliance of company-established requirements for all user accounts.

You can use audit policies to ensure compliance in two different and complementary ways: *continuous compliance* and *periodic compliance*.

These two techniques are particularly complementary in an environment in which provisioning operations may be performed outside of Identity Manager. When an account can be changed by a process that does not execute or honor existing audit policies, periodic compliance is necessary.

Continuous Compliance

Continuous compliance means that an audit policy is applied to all provisioning operations, such that an account cannot be modified in a way that does not comply with current policy.

You enable continuous compliance by assigning an audit policy to an organization, a user, or both. Any provisioning operations performed on a user will cause the user-assigned policies to be evaluated. Any resulting policy failure will interrupt the provisioning operation.

An *organization-based* policy set is defined hierarchically. There is only one organization policy set in effect for any user. The applied policy set is the one assigned to the lowest-level organization. For example:

Organization	Directly Assigned Policy Set	Effective Policy
Austin	Policies A1, A2	Policies A1, A2
Marketing		Policies A1, A2
Development	Policies B, C2	Policies B, C2
Support		Policies B, C2
Test	Policies D, E5	Policies D, E5
Finance		Policies A1, A2
Houston		<none>

Periodic Compliance

Periodic compliance means that Identity Manager evaluates policy on-demand. Any non-compliant conditions are captured as compliance violations.

When executing periodic compliance scans, you can select which policies to use in the scan. The scan process blends directly-assigned policies (user-assigned and organization-assigned policies) and an arbitrary set of selected policies.

Identity Manager users with Auditor Administrator capabilities can create audit policies and monitor compliance with those policies through periodic execution of policy scans and reviews of policy violations. Violations can be managed through remediation and mitigation procedures.

For more information about the Auditor Administrator capabilities, see "Understanding and Managing Capabilities" on page 238.

Identity Manager auditing allows for regular scans of users. These scans execute audit policies to detect deviations from established account limits. When a violation is detected, remediation activities are initiated. The rules may be standard audit policy rules provided by Identity Manager, or customized, user-defined rules.

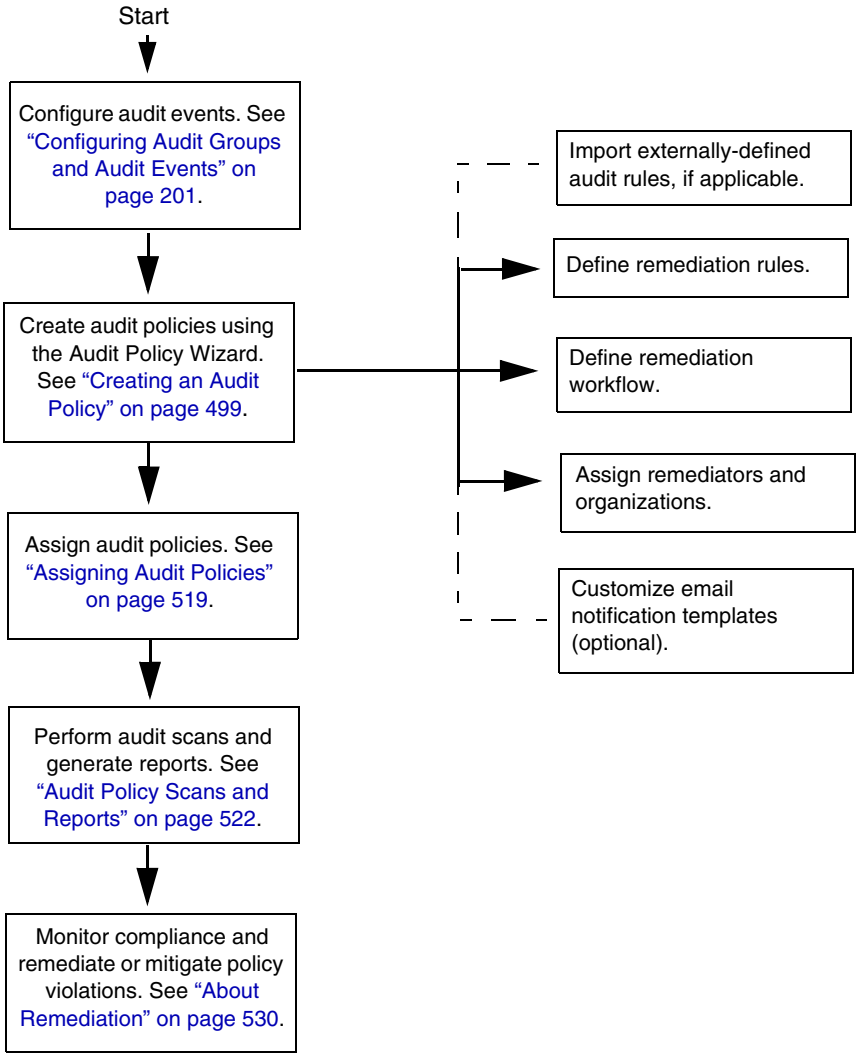
Logical Task Flow for Policy-Based Compliance

Figure 13-1 on page 490 shows a logical task flow for establishing policy-based audit controls.

Periodic Access Reviews

Identity Manager provides for periodic access reviews that enable managers and other responsible parties to review and verify user access privileges on an ad-hoc or periodic basis. For more information about this feature, see "Periodic Access Reviews and Attestation" on page 543.

Figure 13-1 A logical task flow for establishing policy-based compliance



Working with Identity Auditing in the Administrator Interface

This section describes how to access Identity Auditing features in the Administrator Interface. Email notification templates used in identity auditing are also discussed.

The Compliance Section of the Interface

To create and manage audit policies, use the **Compliance** section of the Identity Manager Administrator interface.

To go to the Compliance section where you create and manage audit policies, follow these steps:

1. Log in to the Administrator interface (page 57).
2. Click **Compliance** in the menu bar.

   Three subtabs (or menu items) are available in the Compliance section:

   - Manage Policies
   - Manage Access Scans
   - Access Reviews

Manage Policies

The Manage Policies page lists the policies that you have permission to view and edit. You can also manage access scans from this area.

From the Manage Policies page, you can work with audit policies to accomplish these tasks:

- Create an audit policy
- Select a policy to view or edit
- Delete a policy

Detailed information about these tasks follows in the section "The next section, "Working with Audit Policies," describes how to use the Audit Policy Wizard to create an audit policy." on page 495.

Manage Access Scans

Use the **Manage Access Scans** tab to create, modify, and delete access scans. Here you can define scans that you want to run or schedule for periodic access reviews. For more information about this feature, see "Periodic Access Reviews and Attestation" on page 543.

Access Reviews

The **Access Reviews** tab enables you to launch, terminate, delete, and monitor the progress of your access reviews. It displays a summary report of the scan results with information links that enable you to access more detailed information about the review status and pending activities.

For more information about this feature, see "Managing Access Reviews" on page 556.

Identity Auditing Tasks Interface Reference

To look up how to perform other identity auditing tasks in the Administrator interface, see Appendix C on page 661. This quick reference tells you where to go to start a variety of auditing tasks.

Email Templates

Identity Auditing uses email-based notification for a number of operations. For each of these notifications, an email template object is used. The email template allows the headers and body of email messages to be customized.

Table 13-1 Identity Auditing Email Templates

Template Name	Purpose
Access Review Remediation Notice	Sent to remediators by an access review when user entitlements are initially created in a remediating state.
Bulk Attestation Notice	Sent to attestors by an access review when they have pending attestations.
Policy Violation Notice	Sent to remediators by an audit policy scan when violations occur.
Access Scan Begin Notice	Sent to an access scan owner when an access review starts a scan.
Access Scan End Notice	Sent to an access scan owner when an access scan completes.

Enabling Audit Logging

Before you can begin managing compliance and access reviews, the Identity Manager audit logging system must be enabled and configured to collect audit events. By default, the auditing system is enabled. An Identity Manager administrator with the "Configure Audit" capability can configure auditing.

Identity Manager provides the Compliance Management audit configuration group.

To view or modify the events stored by the Compliance Management group, do the following:

1. Log in to the Administrator interface (page 57).
2. Select **Configure** from the menu bar, and then click **Audit**.
3. On the Audit Configuration page, select the **Compliance Management** audit group name.

For more information about setting up audit configuration groups, see "Configuring Audit Groups and Audit Events" on page 201 in the chapter titled Configuration.

For information about how the audit system records events, see Chapter 10, "Audit Logging."

About Audit Policies

An *audit policy* defines account limits for a set of users of one or more resources. It comprises *rules* that define the limits of a policy and *workflows* to process violations after they occur. *Audit scans* use the criteria defined in an audit policy to evaluate whether violations have occurred in your organization.

The following components comprise an audit policy:

- **Policy rules** define specific violations. Policy rules can contain functions written in the XPRESS, XML Object, or JavaScript languages.
- **Remediation workflow** (optionally) is launched when an audit scan identifies a violation of the policy rules.
- **Remediators** are designated users who are authorized to respond to the policy violation. Remediators can be individual users or groups of users.

Creating a Policy with Audit Policy Rules

Rules define potential conflicts on an attribute basis within an audit policy. An audit policy can contain hundreds of rules that reference a wide range of resources. During rule evaluation, the rule has access to user account data from one or more resources. The audit policy may restrict which resources are available to the rule.

It is possible to have a rule that checks only a single attribute on a single resource, or a rule that checks multiple attributes on multiple resources.

Addressing Policy Violations with Remediation Workflows

After you create rules to define policy violations, you select the workflow that will be launched whenever a violation is detected during an audit scan. Identity Manager provides the default Standard Remediation workflow, which provides default remediation processing for audit policy scans. Among other actions, this default remediation workflow generates notification email to each designated Level 1 remediator (and subsequent levels of remediators, if necessary).

NOTE Unlike Identity Manager workflow processes, remediation workflows must be assigned the `AuthType=AuditorAdminTask` and the `SUBTYPE_REMEDIATION_WORKFLOW` subtype. If you are importing a workflow for use in audit scans, you must manually add this attribute. See *"(Optional) Import a Workflow into Identity Manager" on page 501* for more information.

Designating Remediators

If you assign a remediation workflow, you must designate at least one remediator. You can designate up to three levels of remediators for an audit policy. For more information about remediation, see "Compliance Violation Remediation and Mitigation" on page 530.

You must assign a remediation workflow before you can assign remediators.

A Sample Audit Policy Scenario

Suppose you are responsible for accounts payable and receivable and must implement procedures to prevent a potentially risky aggregation of responsibilities in employees working in the accounting department. This policy must ensure that personnel with responsibility for accounts payable do not also have responsibility for accounts receivable.

The audit policy will contain:

- A set of rules. Each specifies a condition that constitutes a policy violation.
- A workflow that launches remediation tasks
- A group of designated administrators, or remediators, with permission to view and respond to policy violations created by the preceding rules

After the rules identify policy violations (in this scenario, users with too much authority), the associated workflow can launch specific remediation-related tasks, including automatically notifying select remediators.

Level 1 remediators are the first remediators contacted when an audit scan identifies a policy violation. When the escalation period identified in this area is exceeded, Identity Manager notifies the remediators at the next level (if more than one level is specified for the audit policy).

The next section, “Working with Audit Policies,” describes how to use the Audit Policy Wizard to create an audit policy.

Chapter 14

Auditing: Audit Policies

This chapter describes how to create, edit, delete, and assign Audit Policies using the Audit Policy Wizard.

In this chapter, you will learn about the following concepts and tasks:

- Working with Audit Policies
- Creating an Audit Policy
- Editing an Audit Policy
- Deleting an Audit Policy
- Troubleshooting Audit Policies
- Assigning Audit Policies

Working with Audit Policies

To create an audit policy, use Identity Manager's Audit Policy Wizard. After defining an audit policy, you can then perform various actions on the policy, such as modifying or deleting it.

Audit Policy Rules

Audit policy rules define specific violations. Policy rules can contain functions written in the XPRESS, XML Object, or JavaScript languages.

You can use the Audit Policy Wizard to create simple rules, or use the Identity Manager IDE or an XML editor to create more powerful rules.

- Rules must be of subType `SUBTYPE_AUDIT_POLICY_RULE`. Rules generated by the Audit Policy Wizard are automatically assigned this subType.
- Rules must be of authType `AuditPolicyRule`. Rules generated by the Audit Policy Wizard are automatically assigned this authType.

Rules created using the Audit Policy Wizard will return a value of `true` or `false`. Policy rules that return a value of `true` result in a policy violation. Using the Identity Manager IDE, however, you can create a rule that will skip a user during an audit scan or access review. Audit policy rules that return a value of `ignore` will stop rule processing for that user and skip to the next target user.

For information on creating audit policy rules, see "Working with Rules" in the *Identity Manager Deployment Tools* book.

Creating an Audit Policy

To create an Audit Policy, use the Audit Policy Wizard.

Opening the Audit Policy Wizard

The Audit Policy Wizard guides you through the process of creating an audit policy.

To access the Audit Policy Wizard, follow these steps:

1. Log in to the Administrator interface (page 57).
2. Click the **Compliance** tab.

   The **Manage Policies** subtab or menu opens.
3. To create a new audit policy, click **New**.

Creating an Audit Policy: Overview

Using the wizard, you will perform the following tasks to create an audit policy:

- Select or create the rules you want to use to define policy limits
- Assign approvers and establish escalation limitations
- Assign a remediation workflow

After completing the task presented in each wizard screen, click **Next** to move to the next step.

Before You Begin

Plan carefully before creating an audit policy! Before you begin, verify that you have completed these tasks:

- Identify the rules you will use to create the policy in the Audit Policy Wizard. The rules you choose are determined by the type of policy you are creating and the specific limitations you want to define. See "Identify the Rules You Need" in the next section for more information.
- Import any remediation workflow or rule that you want to include in the new policy. See "(Optional) Import a Workflow into Identity Manager" (below) for more information.
- Ensure that you have the required capabilities to create audit policies. See the required capabilities in "Understanding and Managing Capabilities" on page 238.

Identify the Rules You Need

The constraints you specify in the policy are implemented in a set of rules that you create or import. When using the Audit Policy Wizard to create a rule, do the following:

1. Identify the specific resource you are working with.
2. Select an account attribute from the list of attributes that are valid for the resource.
3. Select a condition to impose on the attribute.
4. Enter a value for comparison.

For information on creating audit policy rules outside of the Audit Policy Wizard, see the *Identity Manager Deployment Tools* book.

(Optional) Import Separation of Duty Rules into Identity Manager

The Audit Policy Wizard cannot create Separation of Duty rules. These rules must be constructed outside of Identity Manager and imported by using the **Import Exchange File** option on the **Configure** tab.

(Optional) Import a Workflow into Identity Manager

To use a remediation workflow that is not currently available from Identity Manager, import the external workflow. You can create custom workflows using an XML editor or the Identity Manager IDE (page 61).

To import an external workflow, follow these steps:

1. Set `authType='AuditorAdminTask' and add subtype='SUBTYPE_REMEDIATION_WORKFLOW'`. You can use the Identity Manager IDE or your XML editor of choice to set these configuration objects.
2. Import the workflow by using the Import Exchange File option.
   a. Log in to the Administrator interface (page 57).
   b. Click the **Configure** tab, then click the **Import Exchange File** subtab or menu.

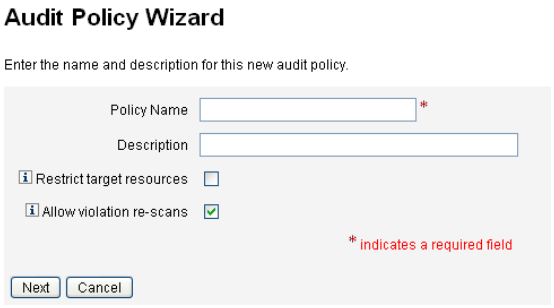
      The "Import Exchange File" page opens.
   c. Browse to the workflow file to upload, then click **Import**.

After you have successfully imported the workflow, it appears in the Audit Policy Wizard (page 499) Remediation Workflow list of options.

Name and Describe the Audit Policy

Enter the name of the new policy and a brief description in the Audit Policy Wizard (shown in Figure 14-1).

Figure 14-1 Auto Policy Wizard: Enter Name and Description Screen



NOTE Audit policy names cannot contain these characters: ' (apostrophe), . (period), | (pipe), [(left bracket),] (right bracket), , (comma), : (colon), $ (dollar sign), " (double quote), \ (backslash), or = (equals sign).

The following characters should also be avoided: _ (underscore), % (percent-sign), ^ (caret), and * (asterisk).

If you want only selected resources to be accessed when executing the scan, select the **Restrict target resources** option.

If you want a remediation of a violation to result in an immediate re-scan of the user, then select the **Allow violation re-scans** option.

NOTE If the audit policy does not restrict resources, then all resources for which a user has accounts will be accessed during the scan. If the rules only use a few resources, then it is more efficient to restrict the policy to those resources.

Click **Next** to proceed to the next page.

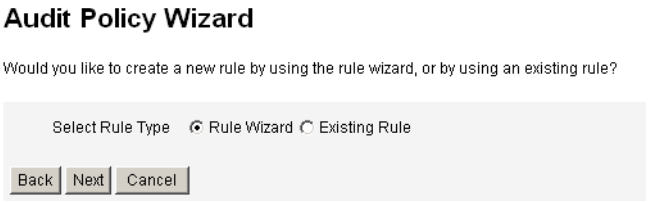
Select a Rule Type

Use this page to start the process of defining or including rules in your policy. (The bulk of your work while creating a policy is defining and creating rules.)

As shown in Figure 14-2, you can choose to create your own rule by using the Identity Manager rule wizard, or you can incorporate an existing rule. The Rule Wizard only allows one resource to be used in a rule. Imported rules can reference as many resources as needed.

By default, the **Rule Wizard** option is selected.

Figure 14-2 Audit Policy Wizard: Select Rule Type Screen



Click **Existing Rule**, then click **Next** to select a rule you created using the Identity Manager IDE (*page 61*). Follow the steps in the next section, "Select an Existing Rule."

Otherwise, click **Rule Wizard**, then click **Next**. Follow the steps on in the section.

Select an Existing Rule

To include an existing rule in the new policy, select **Existing Rule** on the Select Rule Type Screen (Figure 14-2) and click **Next**. Then, select an existing audit policy rule from the **Select Existing Rule** drop-down menu.

NOTE If you cannot see the name of a rule that you have previously imported into Identity Manager, confirm that you have added to the rule the additional attributes that are described in "Creating a Policy with Audit Policy Rules" on page 494.

Click **Next**.

Skip to the section "Add Additional Rules" on page 508.

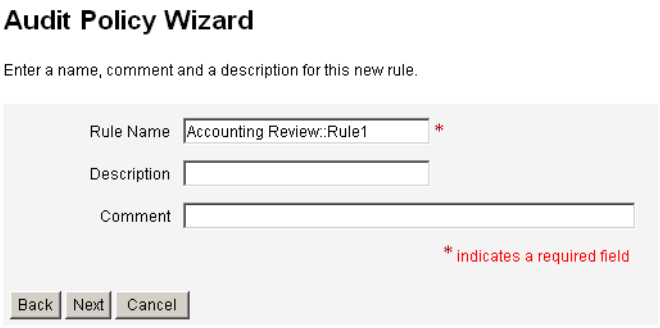
Use the Rule Wizard to Create a New Rule

If you choose to create a rule by using the Rule Wizard selection in the Audit Policy Wizard, proceed by entering information on the pages discussed in the following sections.

Name and Describe the New Rule

Optionally name and describe the new rule. Use this page to enter descriptive text that appears next to the rule name whenever Identity Manager displays the rule. Enter a concise and clear description that is meaningful in describing the rule. This description is displayed within Identity Manager in the Review Policy Violations page.

Figure 14-3 Audit Policy Wizard: Enter the Rule Description Screen



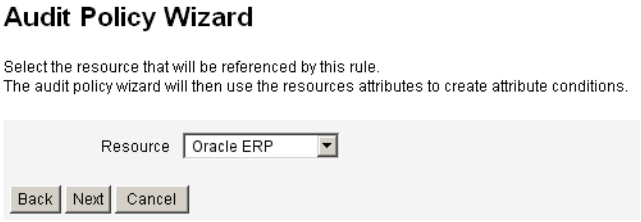
For example, if you are creating a rule that will identify users who have both an Oracle ERP responsibilityKey attribute value of `Payable User` and a `Receivable User` attribute value, you could enter the following text in the Description field: **`Identifies users with both Payable User and Receivable User responsibilities`**.

Use the Comments field to provide any additional information about the rule.

Select the Resource Referenced by the Rule

Use this page to select the resource that the rule will reference. Each rule variable must correspond to an attribute on this resource. All resources that you have view access to will appear in this options list. In this example, Oracle ERP is selected.

Figure 14-4 Audit Policy Wizard: Select Resource Screen



NOTE Most, but not all, attributes of each available resource adapter are supported. For information on the specific attributes that are available, see *Identity Manager Resources Reference*.

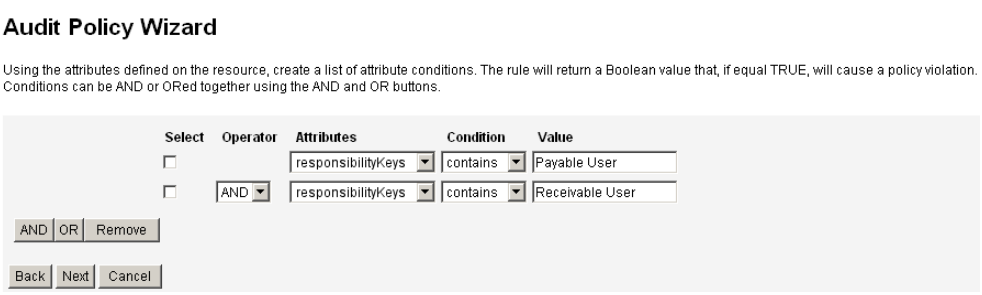
Click **Next** to move to the next page.

Create the Rule Expression

Use this screen to enter the rule expression for your new rule. This example creates a rule in which a user with an Oracle ERP responsibilityKey attribute value of `Payable User` cannot also have a `Receivable User` attribute value.

1. Select a user attribute from the list of available attributes. This attribute will directly correspond to a rule variable.
2. Select a logical condition from the list. Valid conditions include = (equal to), != (not equal to), < (less than), <= (less than or equal to), > (greater than), >= (greater than or equal to), is true, is null, is not null, is empty, and contains. For the purpose of this example, you could select `contains` from the list of possible attribute conditions.
3. Enter a value for the expression. For example, if you enter `Payable user`, you are specifying an Oracle ERP user with the value of `Payable user` in the responsibilityKeys attribute.
4. (Optional) Click **AND** or **OR** operators to add another line and create another expression.

Figure 14-5 Audit Policy Wizard: Select Rule Expression Screen



This rule returns a Boolean value. If both statements are true, then the policy rule returns a value of TRUE, which causes a policy violation.

NOTE Identity Manager does not support the control of rule nesting. In addition, using the Audit Policy Wizard to create policies with different Boolean operators between the rules will produce unpredictable results because the order of evaluation is unspecified.

For complex Rule expressions, create the rules using an XML editor instead of using the Audit Policy Wizard. Using an XML editor allows you to negate where necessary to only use a single Boolean operator between rules.

The following code example shows the XML for the rule you have created in this screen:

Code Example 14-1 Example of XML Syntax for a Newly Created Rule

```
<Description>Payable User/Receivable User</Description>
  <RuleArgument name='resource' value='Oracle ERP'>
    <Comments>Resource specified when  audit policy was created.</Comments>
    <String>Oracle ERP</String>
  </RuleArgument>
    <and>
      <contains>
        <ref>accounts[Oracle ERP].responsibilityKeys</ref>
        <s>Receivable User</s>
      </contains>
      <contains>
        <ref>accounts[Oracle ERP].responsibilityKeys</ref>
        <s>Payables User</s>
      </contains>
    </and>
    <MemberObjectGroups>
      <ObjectRef type='ObjectGroup' id='#ID#Top' name='Top'/>
    </MemberObjectGroups>
</Rule>
```

To remove an expression from the rule, select the attribute condition and then click **Remove**.

Click **Next** to continue in the Audit Policy Wizard. You will have the opportunity to add more rules, either by adding existing rules, or by again using the wizard.

Add Additional Rules

You can create additional rules by importing existing rules (page 503), or by using the wizard (page 504).

Click **AND** or **OR** to continue adding rules as necessary. To remove a rule, select it and then click **Remove**.

Policy violations occur only if the Boolean expression of *all* rules evaluates to true. By grouping rules with AND/OR operators, it is possible for the policy to evaluate to true, even though all rules do not. Identity Manager creates violations only for rules that evaluate to true, and only if the policy expression evaluates to true. The Audit Policy Wizard does not provide explicit control over the Boolean expression nesting, so it is best not to build deep expressions.

NOTE Identity Manager does not support the control of rule nesting. In addition, using the Audit Policy Wizard to create policies with Boolean expression nesting can produce unpredictable results.

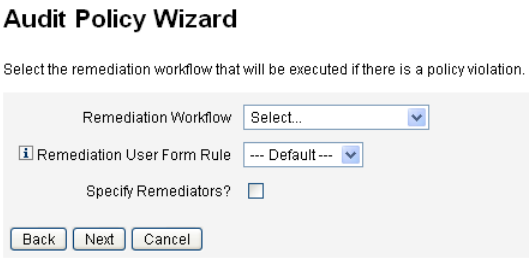
For complex Rule expressions, use an XML editor to create a separate XPRESS rule that references all of the rules you want to use.

Select a Remediation Workflow

Use this screen to select a Remediation workflow to associate with this policy. The workflow assigned here determines the actions taken within Identity Manager when an audit policy violation is detected.

NOTE One workflow is started for each failed audit policy. Each workflow will contain one or more work items for each compliance violation created by the policy scan for the specific policy.

Figure 14-6 Audit Policy Wizard: Select Remediation Workflow Screen



NOTE For information about importing a workflow that you have created by using an XML editor or the Identity Manager Integrated Development Environment (IDE), see "(Optional) Import a Workflow into Identity Manager" on page 501.

Use the **Remediation User Form Rule** drop-down menu to select a rule that will calculate the user form that should be applied when editing a user through a remediation. By default, a remediator that edits a user in response to a remediation work item will use the user form assigned to the remediator. If an audit policy specifies a remediation user form, then this form is used instead. This allows a very specific form to be used when an audit policy indicates a corresponding, specific problem.

To specify remediators to be associated with this remediation workflow, select the **Specify Remediators?** check box. If you select this option, then clicking **Next** will display the "Assign Remediators" page. If you do not select this option, then the wizard will next display the "Audit Policy Wizard Assign Organizations" screen.

Select Remediators and Timeouts for Remediations

If you specify remediators, the remediators assigned to this audit policy will be notified when a violation of this policy is detected. Also, the default workflow assigns a remediation work item to them. Any Identity Manager user can be a remediator.

You might choose to assign at least one Level 1 remediator, or designated user. Level 1 remediators are contacted first through email launched by the remediation workflow when a policy violation is detected. If the designated escalation timeout period is reached before a Level 1 remediator responds, Identity Manager next contacts the Level 2 remediators that you specify here. Identity Manager contacts Level 3 remediators only if neither Level 1 nor Level 2 remediators respond before the escalation time period lapses.

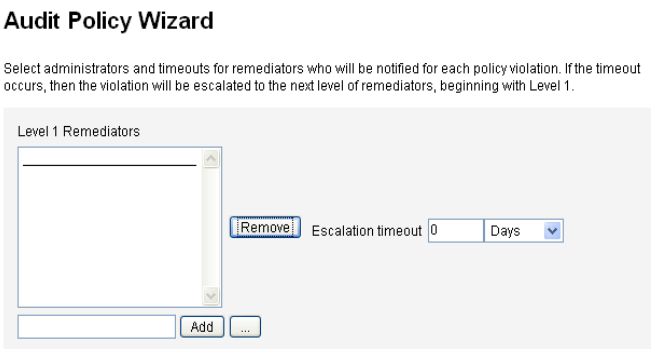
NOTE If you specify an escalation timeout value for the highest-level remediator selected, then the work item is removed from the list when the escalation times out. By default, an escalation timeout is set to a value of 0. In this case, the work item does not expire and remains in the remediator's list.

Assigning Remediators is optional. If you select this option, then click **Next** to proceed to the next screen after specifying the settings.

To add users to the available list of remediators, enter a user ID and then click **Add**. Alternatively, click **...** (More) to search for a user ID. Enter one or more characters in the Starts With field, and then click **Find**. After selecting a user from the search list, click **Add** to add it to the list of remediators. Click **Dismiss** to close the search area.

To remove a user ID from the list of remediators, select it in the list, and then click **Remove**.

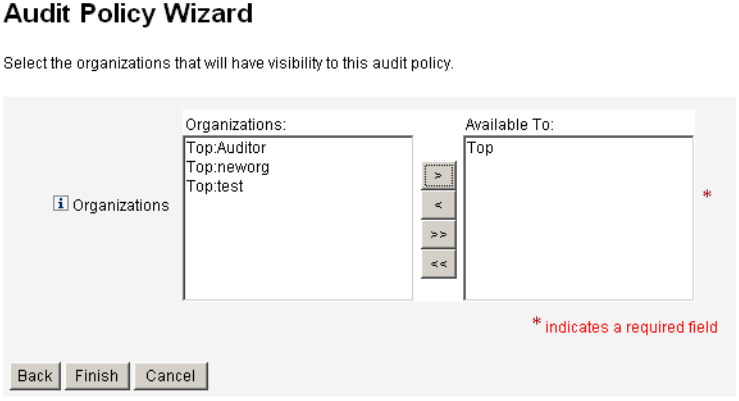
Figure 14-7 Audit Policy Wizard: Select Level 1 Remediator Area



Select Organizations that Can Access this Policy

Use this screen, illustrated in Figure 14-8, to select the organizations that can view and edit this policy.

Figure 14-8 Audit Policy Wizard: Assign Organizations Visibility Screen



After making organization selections, click **Finish** to create the audit policy and return to the Manage Policies page. The newly created policy is now visible in this list.

Editing an Audit Policy

Common editing tasks on audit policies include:

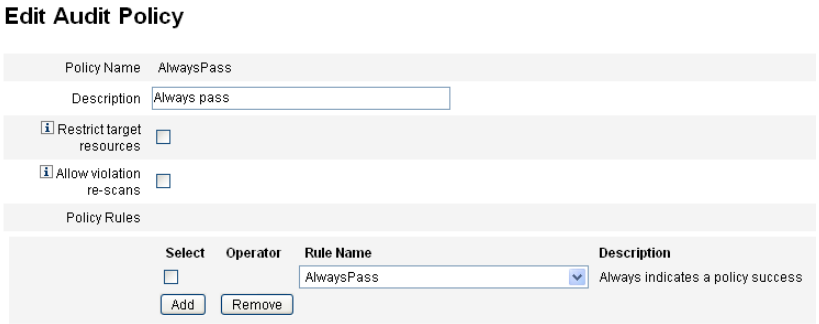
- Adding or deleting rules
- Changing the targeted resources
- Adjusting the list of organizations that have access to the policy
- Changing the escalation timeout associated with each level of remediation
- Changing the remediation workflow associated with the policy

The Edit Policy Page

Click a policy name in the Audit Policy name column to open the Edit Audit Policy page. This page categorizes audit policy information in these areas:

- Identification and Rules area
- Remediators and Escalation timeout area
- Workflow and Organizations Area

Figure 14-9 Edit Audit Policy Page: Identification and Rules Area



Use this area of the page to:

- Edit the policy description
- Add or delete a rule

NOTE You cannot use this product to directly edit an existing rule. Use the Identity Manager IDE or an XML editor to edit the rule, and then import it into Identity Manager. You can then remove the previous version, and add the newly revised version.

Edit Audit Policy Description

Edit the audit policy description by selecting the text in the Description field and then entering new text.

Edit Options

Optionally select or de-select the **Restrict target resources** or **Allow violation re-scans** options.

Delete a Rule from the Policy

To delete a rule from the policy, click the **Select** button that precedes the rule name, and then click **Remove**.

Add a Rule to the Policy

Click **Add** to append a new field that you can use to select a rule to add.

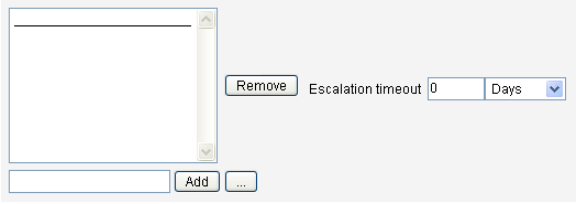
Change a Rule used by the Policy

In the Rule Name column, select another rule from the selection list.

Remediators Area

Figure 14-10 shows a portion of the Remediators area, where you assign Level 1, Level 2, and Level 3 remediators for a policy.

Figure 14-10 Edit Audit Policy Page: Assign Remediators



Use this area of the page to:

- Remove or assign remediators to a policy
- Adjust escalation timeouts

Remove or Assign Remediators

Select a remediator for one or more remediation levels by entering a user ID and then clicking **Add**. To search for a user ID, click **...** (More). You must select at least one remediator.

To remove a remediator, select a user ID in the list, and then click **Remove**.

Adjust Escalation Timeouts

Select the timeout value, then enter the new value. By default, no timeout value is set

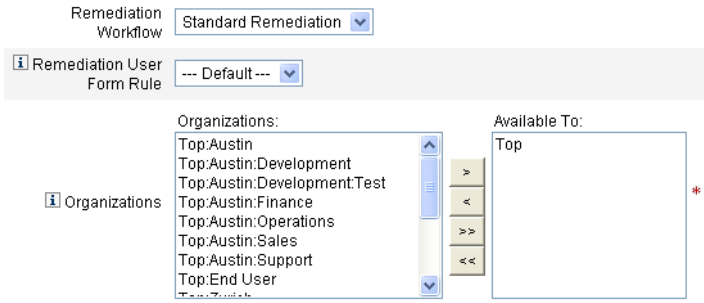
.

NOTE If you specify an escalation timeout value for the highest-level remediator selected, then the work item is removed from the list when the escalation times out.

Remediation Workflow and Organizations Area

Figure 14-11 shows the area in which you specify the remediation workflow and organizations for an audit policy.

Figure 14-11 Edit Audit Policy Page: Remediation Workflow and Organizations



Use this area of the page to:

- Change the remediation workflow that is launched when a policy violation occurs
- Select a remediation user form rule
- Adjust the organizations that have access to this policy

Change the Remediation Workflow

To change the workflow assigned to a policy, you can select an alternative workflow from the list of options. By default, no workflow is assigned to an audit policy.

NOTE If no workflow is assigned to the Audit Policy, the violations will not be assigned to any remediators.

Select a remediation workflow from the list, and then click **Save**.

Select Remediation User Form Rule

Optionally select a rule to calculate the user form applied when editing a user through a remediation.

Assign or Remove Visibility to Organizations

Adjust the organizations to which this audit policy will be available, and then click **Save**.

Sample Policies

Identity Manager provides these sample policies, accessible from the Audit Policies list:

- IDM Role Comparison Policy
- IDM Account Accumulation Policy

IDM Role Comparison Policy

This sample policy allows you to compare a user's current access to the access specified by Identity Manager roles. The policy ensures that all resource attributes specified by roles are set for the user.

This policy fails if:

- The user is missing any resource attributes specified by roles
- The user's resource attributes differ from those specified by roles

IDM Account Accumulation Policy

This sample policy verifies that all accounts held by the user are referenced by at least one role also held by that user.

This policy fails if the user has accounts on any resources that are not explicitly referenced by a role assigned to the user.

Deleting an Audit Policy

When an audit policy is deleted from Identity Manager, all violations that reference the policy are also deleted.

Policies can be deleted from the Compliance area of the interface, when you click Manage Policies to view policies. To delete an audit policy, select the policy name in the policy view, and then click **Delete**.

Troubleshooting Audit Policies

Problems with your audit policy typically are best addressed through policy rule debugging.

Debugging Rules

To debug a rule, add the following trace elements to the rule code.

```
<block trace='true'>
<and>
    <contains>
        <ref>accounts[AD].firstname</ref>
        <s>Sam</s>
    </contains>
    <contains>
        <ref>accounts[AD].lastname</ref>
        <s>Smith</s>
    </contains>
</and>
</block>
```

Problem

I can't see my workflow in the Identity Manager interface.

Resolution

Confirm that:

- You have added the `subtype='SUBTYPE_REMEDIATION_WORKFLOW'` attribute to your workflow. Workflows without this subtype will not be visible in the Identity Manager Administrator interface.
- You have the capability for authType `AuditorAdminTask`.
- You control the organization that the workflow is in.

Problem

I imported rules, but do not see them in the Audit Policy Wizard.

Resolution

Confirm that:

- Each rule is of `subtype='SUBTYPE_AUDIT_POLICY_RULE'` or `subtype='SUBTYPE_AUDIT_POLICY_SOD_RULE'`.

- You have the capability for authType `AuditPolicyRule`.
- You control the organization that the workflow is in.

Assigning Audit Policies

To assign an audit policy to an organization, the user must have (at least) the Assign Organization Audit Policies capability. To assign an audit policy to a user, the user must have the Assign User Audit Policies capability. A user with the Assign Audit Policies capability has both of these capabilities.

To assign organization-level policy, select the Organization on the Accounts tab, and then select the policies in the Assigned audit policies list.

To assign user-level policy, follow these steps:

1. Click the user in the Accounts area.
2. Select **Compliance** in the user form.
3. Select policies in the Assigned audit policies list.

NOTE Audit policies that are directly assigned to a user—that is, assigned through user account or organization assignment—are always re-evaluated when a violation for that user is remediated.

Resolving Auditor Capabilities Limitations

By default, capabilities needed to perform auditing tasks are contained in the Top organization (object group). As a result, only those administrators who control Top can assign these capabilities to other administrators.

You can resolve this limitation by adding the capabilities to another organization. Identity Manager provides two utilities, located in the `sample/scripts` directory, to assist with this task.

To add the capabilities needed to perform auditing tasks to an organization other than Top, follow these steps:

1. Run the following command to list all capabilities (AdminGroups) and their associated organizations (object groups):

   ```
   beanshell objectGroupUpdate.bsh -type AdminGroup -action list -csv
   ```

   This command captures the output to a comma-separated value (CSV) file.

2. Edit the CSV file to adjust the capabilities organizational locations as desired.

3. Run this command to update Identity Manager.

```
beanshell objectGroupUpdate.bsh -data CSVFileName -action add -groups NewObjectGroup
```

Chapter 15

Auditing: Monitoring Compliance

This chapter focus on how to conduct audit reviews and implement practices that help you manage compliance with federally mandated regulations.

In this chapter, you will learn about the following concepts and tasks:

- Audit Policy Scans and Reports
- Compliance Violation Remediation and Mitigation
- Periodic Access Reviews and Attestation
- Access Review Remediation

Audit Policy Scans and Reports

This section provides information about audit policy scans, and provides procedures for running and managing audit scans.

Scanning Users and Organizations

A scan runs selected audit policies on individual users or organizations. You might want to scan a user or organization for a specific violation or execute policies not assigned to the user or organization. Launch scans from the **Accounts** area of the interface.

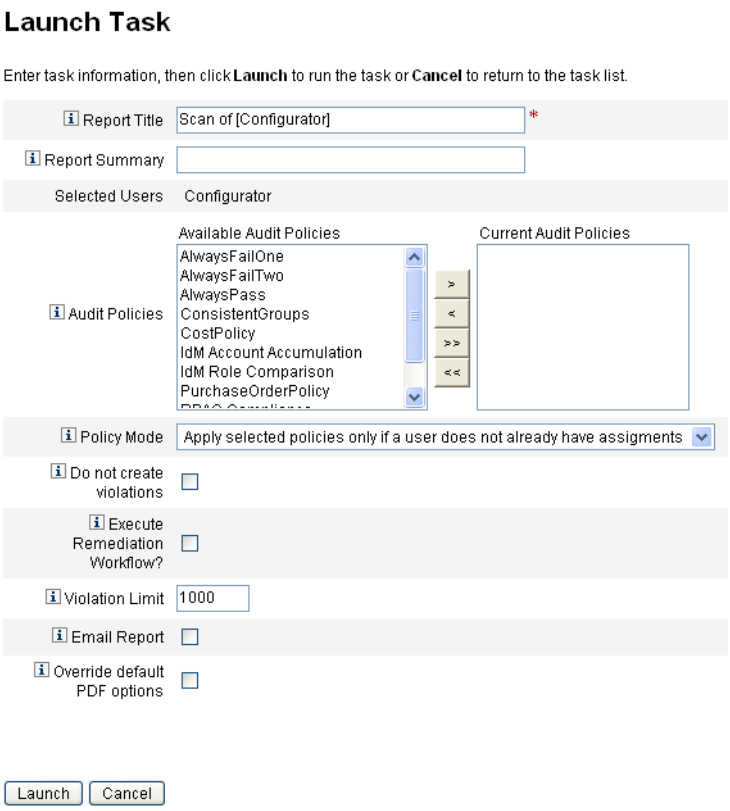
NOTE You can also launch or schedule an audit policy scan from the Server Tasks tab.

To initiate a scan on a user account or organization from the Accounts area, follow these steps:

1. In the Administrator interface, click **Accounts** in the main menu.
2. In the Accounts list, perform one of these actions:
   a. Select one or more users, and then select **Scan** from the User Actions options list.
   b. Select one or more organizations and then select **Scan** from the Organization Actions options list.

   The Launch Task dialog displays. Figure 15-1 is an example of the Launch Task page for an audit policy user scan.

Figure 15-1 Launch Task dialog



3. Specify a title for the scan in the **Report Title** field. This field is required. You can optionally specify a description for the scan in the **Report Summary** field.
4. Select one or more audit policies to run. You must specify at least one policy.
5. Select a **Policy Mode**. This determines how the selected policies should interact with users who already have policy assignments. Assignments can come directly from the user or from the organization to which the user is assigned.
6. Optionally select the **Do not create violations** option. When you enable this option, audit policies will be evaluated and violations reported, but no compliance violations will be created or updated, and no remediation workflow will be executed. However, task results from the scan will show which violations would have been created, making this option useful when testing audit policies.

7. Check **Execute Remediation Workflow?** to run the remediation workflow assigned in the audit policy. If the audit policy does not define a remediation workflow, no remediation workflow will run.
8. Edit the **Violation Limit** value to set the maximum number of compliance violations that can be emitted by the scan before it aborts. This value is a safeguard to limit risk when running an audit policy that may be overly aggressive in its checks. An empty value means no limit is set.
9. Check **Email Report** to specify recipients for the report. You may also have Identity Manager attach a file containing a report in CSV (comma-separated values) format.
10. If you prefer to override the default PDF options, enable the **Override default PDF options** option.
11. Click **Launch** to begin the scan.

    To view the reports resulting from an audit scan, view the Auditor Reports.

Working with Auditor Reports

Identity Manager provides a number of Auditor Reports. The following table describes these reports.

Table 15-1 Auditor Reports Descriptions (Page 1 of 2)

Auditor Report Type	Description
Access Review Coverage	Shows the overlap or differences among the users that are implied by the selected access reviews. Because most access reviews have a user scope that is specified by a query or some membership operation, the exact set of users is expected to change over time. This report can show the overlap, differences, or both, between users specified by two different access reviews (to see if the reviews are going to be efficient in operation); between entitlements generated by two different access reviews (so you can see if the coverage changes over time); or between users and entitlements (so you can see if the entitlements were generated for all users scoped by the review.
Access Review Detail	Shows the current status of all user entitlement records. This report can be filtered by a user's organization, Access Review and Access Review Instance, state of an entitlement record, and attestor.
Access Review Summary	Provides summary information about all access reviews. It summarizes the status of users scanned, policies scanned, and attestation activities for each access review scan listed.
Access Scan User Scope Coverage	Compares selected scans to determine which users are included in the scan scope. It shows the overlap (users included in all scans) or difference (users not included in all scans, but included in more than one). This report is useful when trying to organize multiple access scans to cover the same or different users, depending on the needs of the scan.
Audit Policy Summary	Summarizes the key elements of all audit policies, including the rules, remediators, and workflow for each policy.
Audited Attribute	Shows all audit records indicating a change of a specified resource account attribute. This report mines the audit data for any auditable attributes that have been stored. It will mine the data based on any extended attributes, which can be specified from WorkflowServices or resource attributes marked as auditable. For information on configuring this report, see "Configuring the Audited Attribute Report" on page 529.
AuditPolicy Violation History	Graphical view of all compliance violations per policy that were created during a specified period of time. This report can be filtered by policy, and grouped by day, week, month, or quarter.
User Access	Shows the audit record and user attributes for a specified user.
Organization Violation History	Graphical view of all compliance violations per resource, that were created during a specific period of time. Can be filtered by organization, and grouped by day, week, month, or Quarter.

Table 15-1 Auditor Reports Descriptions (Page 2 of 2)

Auditor Report Type	Description
Resource Violation History	Graphical view of all compliance violations per resource that were created during the specified time range.
Separation of Duties	Shows separation of duties violations arranged in a conflicts table. Using a Web-based interface, you can access additional information by clicking the links. This report can be filtered by organization, and grouped by day, week, month, or quarter.
Violation Summary	Shows all current compliance violations. This report can be filtered by remediator, resource, rule, user, or policy

The reports are available from the Reports tab in the Identity Manager interface.

NOTE The `RULE_EVAL_COUNT` value equals the number of rules that were evaluated during a policy scan. This value is sometimes included in reports.

Identity Manager calculates the `RULE_EVAL_COUNT` value as follows:

```
# of users scanned x (# of rules in policy + 1)
```

The +1 is included in the calculation because Identity Manager also counts the *policy rule*, which is the rule that actually decides if a policy is violated. The policy rule inspects the audit rule results, and performs the boolean logic to come up with a policy result.

For example, if you have Policy A with three rules and Policy B with two rules, and you scanned ten users, the `RULE_EVAL_COUNT` value equals 70 because

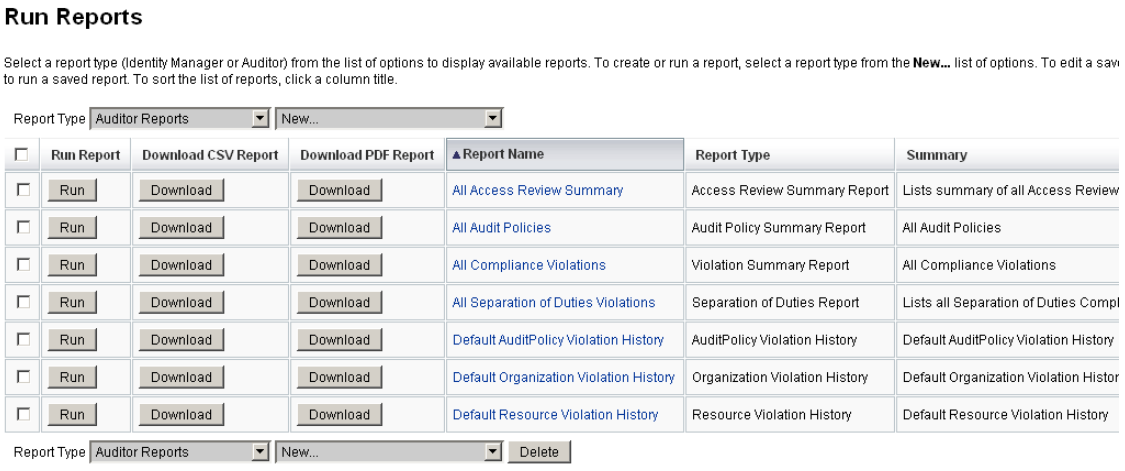
```
10 users x (3 + 1 + 2 + 1 rules)
```

Creating an Auditor Report

To run a report, you must first create the report template. You can specify various criteria for the report, including specifying email recipients to receive the report results. After a report template has been created and saved, it is available from the Run Reports page.

Figure 15-2 shows an example of the Run Reports page with a list of defined Auditor Reports.

Figure 15-2 Run Reports Page Selections



To create an auditor report, use the following procedure:

1. In the Administrator interface, click **Reports** in the main menu.

   The Run Reports page opens.

2. Select **Auditor Reports** for the report type.

3. In the **New** list of reports, select a report.

The Define a Report page appears. The fields and layout of the report dialog varies for each type of report. Refer to Identity Manager Help for information about specifying the report criteria.

After entering and selecting report criteria, you can:

- Run the report without saving — Click **Run** to start running the report. Identity Manager does not save the report (if you defined a new report) or the changed report criteria (if you edited an existing report).
- Save the report — Click **Save** to save the report. After it is saved, you can run the report from the Run Reports page (the list of reports).

After running a report from the Run Reports page, you can view the output immediately or at a later time from the View Reports tab.

- For information about scheduling a report, see "Scheduling Reports" on page 303.

Configuring the Audited Attribute Report

The Audited Attribute Report (see Table 15-1 on page 525) can report attribute-level changes to Identity Manager users and accounts. Standard audit logging, however, does not generate enough audit log data to support a full query expression.

Standard audit logging *does* write the changed attributes to the `acctAttrChanges` field in the audit log, but the changed attributes are written in a way that the report query can only match records based on the changed attribute's name. The report query cannot accurately match the attribute's value.

You can configure this report to match records containing changes to the attribute `lastname`, by specifying the following parameters:

```
Attribute Name = 'acctAttrChanges'

Condition = 'contains'

Value = 'lastname'
```

NOTE Using `Condition='contains'` is necessary because of the way data is stored in the `acctAttrChanges` field. This field is not multi-valued. Essentially, it is a data structure that contains the `before/after` values of all changed attributes in the form `attrname=value`. Consequently, the preceding settings allow the report query to match any instances of `lastname=`*xxx*.

It is also possible to capture only those audit records that have a specific attribute with a specific value. To do this, follow the procedure in the "Configuring the Audit Tab" section on page 365. Select the **Audit entire workflow** checkbox, click the **Add Attribute** button to select the attributes you want to record for reporting purposes, and click **Save**.

Next, enable the task template configuration (if it is not already enabled). To do this, follow the procedure in the "Enabling the Task Templates" section on page 332. Do not change the default value in the **Selected Process Types** list, just click **Save**.

The workflow can now provide audit records that are suitable for matching both the attribute name and the value. Although turning on this level of auditing provides much more information, be aware that there is a significant performance cost and your workflows will run slower.

Compliance Violation Remediation and Mitigation

This section describes how to use Identity Manager Remediation to protect your critical assets. The following topics discuss elements of the Identity Manager Remediation process:

About Remediation

When Identity Manager detects an unresolved (not mitigated) audit policy compliance violation, it creates a remediation request, which must be addressed by a remediator — a designated user who is allowed to evaluate and respond to audit policy violations.

Remediator Escalation

Identity Manager allows you to define three levels of remediator escalation. Remediation requests are initially sent to Level 1 remediators. If a Level 1 remediator does not act on a remediation request before the time-out period expires, Identity Manager escalates the violation to the Level 2 remediators and begins a new time-out period. If a Level 2 remediator does not respond before the time-out period expires, then the request is escalated once again to the Level 3 remediator.

To perform remediation, you must designate at least one remediator for your enterprise. Specifying more than one remediator for each level is optional, but recommended. Multiple remediators help ensure workflow is not delayed or halted.

Remediation Security Access

These authorization options are for work items of authType `RemediationWorkItem`.

- The remediation work item owner
- A direct or indirect manager of the remediation work item owner
- An administrator who controls an organization in which the remediation work item owner belongs

By default, the behavior for authorization checks is as follows:

- Owner is the user attempting the action, OR
- Owner is in an organization controlled by the user attempting the action, OR
- Owner is a subordinate of the user attempting the action

The second and third checks are independently configurable by modifying these options:

- **controlOrg** — Valid values are true or false.
- **subordinate** — Valid values are true or false.
- **lastLevel** — The last subordinate level to include in the result; -1 means all levels. The integer value for lastLevel defaults to -1, meaning direct and indirect subordinates.

These options can be added or modified in the following:

```
UserForm: Remediation List
```

Remediation Workflow Process

Identity Manager provides the Standard Remediation Workflow to provide remediation processing for Audit Policy scans.

The Standard Remediation Workflow generates a remediation request (a review-type work item) containing information about the compliance violation and sends an email notification to each Level 1 remediator named in the audit policy. When a remediator mitigates the violation, the workflow changes the state of, and assigns an expiration to, the existing compliance violation object.

A compliance violation is uniquely identified by the combination of the user, policy name, and rulename. When an audit policy evaluates to true, a new compliance violation is created for each user/policy/rule combination, if an existing violation for this combination does not already exist. If a violation does exist for the combination, and the violation is in a mitigated state, then the workflow process takes no action. If the existing violation is not mitigated, then its recurrent count is incremented.

For more information about remediation workflows, see "About Audit Policies" on page 493.

Remediation Responses

By default, three response options are given to each remediator:

- **Remediate —** A remediator indicates that something has been done to fix the problem on the resource.

  When a compliance violation is modified, Identity Manager creates an audit event to log the remediation. In addition, Identity Manager stores the name of the remediator and any comments provided.

NOTE After remediation, a violation is not deleted until the next audit scan. If an audit policy is configured to allow re-scans, then the user will be re-scanned as soon as the violation is remediated.

- **Mitigate —** A remediator allows the violation and gives the user an exemption from the violation for a certain amount of time.

  If the violation is deliberate (for example, there is a business case for belonging to two groups), you can mitigate the violation for an extended period of time. You can also mitigate the violation for a short period of time (for example, in cases where the resource's system administrator is on vacation and you do not know how to fix the problem).

Identity Manager stores the name of the remediator that mitigated the violation along with the expiration date assigned to the exemption and any comments provided.

NOTE When Identity Manager detects an expired exemption, it returns the violation from the mitigated state to a pending state.

- **Forward** — A remediator reassigns the responsibility for resolving the violation to another individual.

Remediation Example

Your enterprise establishes a rule in which a user cannot be responsible for both Accounts Payable and Accounts Receivable, and you receive notice that a user is violating this rule.

- If the user is a supervisor who has responsibility for both roles until the company hires a second person for that position, you might mitigate the violation and issue an exemption for up to six months.
- If the user is violating the rule, you might ask your Oracle ERP Administrator to correct the conflict, and then remediate the violation when the problem is fixed for that resource. Alternatively, you might forward the remediation request to the Oracle ERP Administrator.

Remediation Email Template

Identity Manager provides a Policy Violation Notice email template (available by selecting the **Configuration** tab, then the **Email Templates** subtab. You can configure this template to notify remediators of pending violations. For more information, see "Customizing Email Templates" on page 196.

Working with the Remediations Page

Select **Work Items**, and then **Remediations** to access the Remediations page.

You can use this page to:

- View pending violations
- Prioritize policy violations
- Mitigate one or more policy violations
- Remediate one or more policy violations
- Forward one or more violations
- Edit users from a remediation work item

Viewing Policy Violations

You can use the Remediations page to view details about violations before taking action on them.

Depending on your capabilities or place in the Identity Manager capabilities hierarchy, you may be able to view and take action on violations for other remediators.

The following topics are related to viewing violations:

- "Viewing Pending Requests" on page 535
- "Viewing Completed Requests" on page 536
- "Updating the Table" on page 536

Viewing Pending Requests

Pending requests assigned to you are, by default, displayed in the Remediation table. You can use the **List Remediations for** option to view pending remediation requests for a different remediator:

- Select **My Direct Reports** to view pending requests for users in your organization who report directly to you.
- Select **Search Users** to enter or locate one or more users whose pending requests you want to view. Enter a user ID, and then click **Apply** to view pending requests for that user. Alternatively, click **...** (More) to search for a user. After locating and selecting a user, click **Dismiss** to close the Search area.

The resulting table provides the following information about each request:

- **Remediator** — Name of the assigned remediator. This column displays only when you view remediation requests for other remediators.
- **User** — User for whom the request is made.
- **Audit Policy/Request** — Action requested of the remediator.
- **Audit Rule/Description** — Remediation comments for the request.
- **Violation State** — Current state of the violation.
- **Severity** — Severity assigned to the request (None, Low, Medium, High, or Critical)
- **Priority** — Priority assigned to the request (None, Low, Medium, High, or Urgent)
- **Date of Request**: Date and time the remediation request was issued.

NOTE Each user can choose a custom form that displays remediation data relevant to that particular remediator. To assign a custom form, select the **Compliance** tab on the user form.

Viewing Completed Requests

To view your completed remediation requests, click the **My Work Items** tab, and then click the **History** tab. A list of previously remediated work items displays.

The resulting table (which is generated by an `AuditLog` report) provides the following information about each remediation request:

- **Timestamp —** Date and time the request was remediated
- **Subject —** Name of the remediator who processed the request
- **Action —** Whether the remediator mitigated or remediated the request
- **Type —** `ComplianceViolation` or `User Entitlement`
- **Object Name —** Name of the audit policy that was violated
- **Resource —** Provides the remediator's account ID (or may indicate N/A)
- **ID** — The account ID related to the policy violation.
- **Result —** Always indicates `Success`

Clicking a timestamp in the table opens an Audit Events Details page.

The Audit Events Details page provides information about the completed request, including information about the remediation or mitigation, event parameters (if applicable), and auditable attributes.

Updating the Table

To update the information provided in the Remediations table, click **Refresh**. The Remediation page updates the table with any new remediation requests.

Prioritizing Policy Violations

You can prioritize policy violations by assigning them a priority, severity, or both. Prioritize violations from the Remediations page.

To edit the priority or severity for violations, follow these steps:

1. Select one or more violations in the list.
2. Click **Prioritize**.

   The Prioritize Policy Violations page appears.
3. Optionally set a severity for the violation. Selections are None, Low, Medium, High, or Critical.
4. Optionally set a priority for the violation. Selections are None, Low, Medium, High, or Urgent.
5. Click OK when you have finished making selections. Identity Manager returns to the list of remediations.

NOTE Severity and priority values can be set only on remediations of type CV (Compliance Violation).

Mitigating Policy Violations

You can mitigate policy violations from the Remediations and Review Policy Violations pages.

From the Remediations Page

To mitigate pending policy violations from the Remediations page, follow these steps:

1. Select rows in the table to specify which requests to mitigate.
   - Enable one or more individual options to specify requests to be mitigated.
   - Enable the option in the table header to mitigate all requests listed in the table.

NOTE Identity Manager allows you to enter only one set of comments to describe a mitigation action. You may not want to perform a bulk mitigation unless the violations are related and a single comment will suffice.

You can mitigate only those requests that include compliance violations. Other remediation requests cannot be mitigated.

---

2. Click **Mitigate**.

   The Mitigate Policy Violation page (or Mitigate Multiple Policy Violations page) appears:

Figure 15-3 Mitigate Policy Violation Page

3. Enter comments about the mitigation into the Explanation field. (This field is required.)

   Your comments provide an audit trail for this action, so be sure to enter complete and meaningful information. For example, explain why you are mitigating the policy violation, the date, and why you chose the exemption period.

4. Provide an expiration date for the exemption by typing the date (in the format **`YYYY-MM-DD`**) directly into the Expiration Date field, or by clicking the date button and selecting a date from the calendar.

NOTE If you do not provide a date, the exemption is valid indefinitely.

5. Click **OK** to save your changes and return to the Remediations page.

Remediating Policy Violations

To remediate one or more policy violations, follow these steps:

1. Use the check boxes in the table to specify which requests to remediate.
   - Enable one or more individual check boxes in the table to specify requests to remediate.
   - Enable the check box in the table header to remediate all requests listed in the table.

     If selecting more than one request, keep in mind that Identity Manager allows you to enter only one set of comments to describe a remediation action. You may not want to perform a bulk remediation unless the violations are related and a single comment will suffice.
2. Click **Remediate**.
3. The Remediate Policy Violation page (or Remediate Multiple Policy Violations page) displays.
4. Enter your comments about the remediation into the Comments field.
5. Click **OK** to save your changes and return to the Remediations page.

NOTE Audit policies that are directly assigned to a user—that is, assigned through user account or organization assignment—are always re-evaluated when a violation for that user is remediated.

Forwarding Remediation Requests

You can forward one or more remediation requests to another remediator.

To forward remediation requests, follow these steps:

1. Use the check boxes in the table to specify which requests to forward.
   - Enable the check box in the table header to forward all requests listed in the table.
   - Enable individual check boxes in the table to forward one or more requests.
2. Click **Forward**.

   The Select and Confirm Forwarding page appears.

Figure 15-4 Select and Confirm Forwarding Page

3. Enter a remediator name in the Forward to field, and then click **OK**. Alternatively, you can click **...** (More) to search for a remediator name. Select a name from the search list, and then click **Set** to enter that name in the Forward to field. Click **Dismiss** to close the search area.

When the Remediations page redisplays, the new remediator's name displays in the Remediator column of the table.

Editing a User from a Remediation Work Item

From a remediation work item, you can (with appropriate user editing capabilities) edit a user to remediate problems (as described in the associated entitlement history).

To edit a user, click **Edit User** from the Review Remediation Request page. The displayed Edit User page shows:

- Entitlement history associated with the user, for this work item
- Attributes for the user. The options that appear here are the same as on the Edit User form available from the Accounts area.

After making changes to the user, click **Save**.

NOTE Saving user edits causes the Update User workflow to run. Because this workflow may have approvals, it is possible that the changes to the user accounts are not in effect for a period of time after the save. If the audit policy allows rescans, and the Update User workflow has not completed, then the subsequent policy scan may detect the same violation.

Periodic Access Reviews and Attestation

Identity Manager provides a process for conducting access reviews that enable managers or other responsible parties to review and verify user access privileges. This process helps to identify and manage user privilege accumulation over time, and helps to maintain compliance with Sarbanes-Oxley, GLBA, and other federally regulated mandates.

Access reviews can be performed as needed or scheduled to occur periodically—for example, every calendar quarter—enabling you to conduct periodic access reviews to maintain the correct level of user privileges. An access review can optionally include audit policy scans.

About Periodic Access Reviews

Periodic access review is the periodic process of attesting that a set of employees has the appropriate privileges on the appropriate resources at a specific point in time.

A periodic access review involves the following activities:

- Access review scans — Scans that perform rule-based evaluations of *user entitlements* to determine if attestation is needed.
- Attestation — Process of responding to attestation requests by approving or rejecting user entitlements.

A *user entitlement* is a detailed record of a user's accounts on a specific set of resources.

Access Review Scans

To initiate a periodic access review, you must first define at least one access scan.

The access scan defines who will be scanned, which resources will be included in the scan, any optional audit policies to be evaluated during the scan, and rules to determine which entitlement records will be manually attested, and by whom.

Access Review Workflow Process

In general, the Identity Manager access review workflow:

- Constructs a list of users, gets account information for each user, and evaluates optional audit policies
- Creates user entitlement records
- Determines if attestation is required for each user entitlement record
- Assigns work items to each attestor
- Waits for all attestors to approve, or for the first rejection
- Escalates to the next attestor, if no response to a request is received within a specified timeout period
- Updates user entitlement records with resolutions

See "Access Review Remediation" on page 566 for a description of the remediation capabilities.

Required Administrator Capabilities

To conduct a periodic access review and manage the review processes, a user must have the Auditor Periodic Access Review Administrator capability. A user with Auditor Access Scan Administrator capability can create and manage access scans.

To assign these capabilities, edit the user account and modify the security attributes. For more information about these and other capabilities, see "Understanding and Managing Capabilities" on page 238.

Attestation

Attestation is the certification process performed by one or more designated attestors to confirm a user entitlement as it exists on a specific date. During an access review, the attestor (or attestors) receives notice of the access review attestation requests through email notification. An attestor must be an Identity Manager user, but is not required to be an Identity Manager administrator.

Attestation Workflow

Identity Manager uses an attestation workflow that is launched when an access scan identifies entitlement records requiring review. The access scan makes this determination based on the rules defined in the access scan.

A rule evaluated by the access scan determines if the user entitlement record needs to be manually attested, or if it can be automatically approved or rejected. If the user entitlement record needs to be manually attested, then the access scan uses a second rule to determine who the appropriate attestors are.

Each user entitlement record to be manually attested is assigned to a workflow, with one work item per attestor. Notification to the attestor of these work items can be sent using a ScanNotification workflow that bundles the items into one notification, per attestor, per scan. Unless the ScanNotification workflow is selected, notification will be per user entitlement. This means an attestor could receive multiple notifications per scan, and possibly a large number depending on the number of users scanned.

Attestation Security Access

These authorization options are for work items of authType `AttestationWorkItem`:

- The Work Item owner
- A direct or indirect manager of the Work Item owner
- An administrator who controls an organization in which the Work Item owner belongs
- Users who have been validated through authentication checks

By default, the behavior for authorization checks is as follows:

- Owner is User attempting the action, OR
- Owner is in Organization controlled by user attempting the action, OR
- Owner is a subordinate of user attempting the action.

The second and third checks are independently configurable by modifying these form properties:

- `controlOrg` — Valid values are “true” or “false”
- `subordinate` — Valid values are “true” or “false”
- `lastLevel` — the last subordinate level to include in the result; -1 means all levels

The integer value for `lastLevel` defaults to -1, meaning direct and indirect subordinates.

These options can be added or modified in the following:

```
UserForm: AccessApprovalList
```

.

NOTE If security on attestations is set to organization-controlled, then the Auditor Attestor capability is also required to modify another user's attestations.

Delegated Attestation

By default, the access scan workflow respects delegations, for work items of type Access Review Attestation and Access Review Remediation, created by users for attestation work items and notifications. The access scan administrator may deselect the Follow Delegation option to ignore delegation settings. If an attestor has delegated all work items to another user but the Follow Delegation option is not set for an access review scan, then the attestor—*not* the user to which delegations have been assigned—will receive attestation request notifications and work items.

Planning for a Periodic Access Review

An access review can be a labor- and time-intensive process for any business enterprise. The Identity Manager periodic access review process helps minimize the cost and time involved by automating many parts of the process. However, some of the processes still are time-consuming. For example, the process of fetching user account data from a number of locations for thousands of users can take a considerable amount of time. The act of manually attesting records can be time-consuming as well. Proper planning improves the efficiency of the process and greatly reduces the effort involved.

Planning for a periodic access review involves the following considerations:

- Scan times can vary greatly depending on the number of users and the resources involved.

  A single periodic access review for a large organization can take one or more days for scanning, as well as one or more weeks for manual attestation to complete.

  For example, for an organization with 50,000 users and ten resources, an access scan might take approximately one day to complete, based on the following calculation:

  1 sec/resource * 50K users * 10 resources / 5 concurrent threads = 28 hours

  If resources are spread across geographies, network latencies can add to the process time.

- Using multiple Identity Manager servers for parallel processing can speed up the access review process.

  Running parallel scans is most effective when the resources are not common across the scans. When defining an access review, create multiple scans and restrict resources to a specific set of resources, using different resources for each scan. Then when you launch the task, select multiple scans and schedule them to run immediately.

- Customizing the Attestation workflow and rules gives you greater control and can provide greater efficiency:

  For example, customize the Attestor rule to spread attestation duties across multiple attestors. The attestation process assigns work items and sends out notifications accordingly.

- Using Attestor Escalation Rules helps improve response time for attestation requests.

Set the Default Escalation Attestor rule, or use a customized rule, to set up an escalation chain of attestors. Also specify escalation timeout values.

- Understand how to use the Review Determination Rules to save time by automatically determining which entitlement records need to be manually reviewed.
- Bundle notification of attestation requests for a scan by specifying a scan-level Notification Workflow.

Tuning Scan Tasks

During the scan process, multiple threads access the user's view, potentially accessing resources on which the user has accounts. After the view is accessed, multiple audit policies and rules are evaluated, which may result in the creation of compliance violations.

To prevent two threads from updating the same user view at the same time, the process establishes an in-memory lock on the user name. If this lock cannot be established in (by default) 5 seconds, then an error is written to the scan task and the user is skipped, thus providing protection for concurrent scans that are processing the same set of users.

You can edit the values of several "tunable parameters" that are provided as task arguments to the scan task:

- `clearUserLocks` (Boolean) — If true, then all current user locks are freed before the scan starts.
- `userLock` (integer) — Time (in milleseconds) to wait when trying to lock a user. The default value is 5 seconds. A negative value disables locking for that scan.
- `scanDelay` (integer) — Time (in milleseconds) to sleep between dispatching scan threads. The default value is 0 (no delay). If you provide a value for this argument, then the scan is slower, but the system is more responsive to other operations.
- `maxThreads` (integer) — Number of concurrent threads used to process a scan. The default value is 5. If resources are very slow to respond, increasing this number may increase scan throughput.

To change the values of these parameters, edit the corresponding Task Definition form. For more information about this task, see *Identity Manager Workflows, Forms, and Views*.

Creating an Access Scan

To define the access review scan, follow these steps:

1. Select **Compliance**, and then select **Manage Access Scans**.
2. Click **New** to display the Create New Access Scan page.
3. Assign a name to the access scan.

NOTE Access scan names cannot contain these characters:

' (apostrophe), . (period), | (pipe), [(left bracket),] (right bracket), , (comma), : (colon), $ (dollar sign), " (double quote), \ (backslash), or = (equals sign).

The following characters should also be avoided: _ (underscore), % (percent-sign), ^ (caret), and * (asterisk).

4. Optionally add a description that is meaningful in identifying the scan.
5. Optionally enable the **Dynamic entitlements** option. If enabled, attestors are given these additional options:
   - A pending attestation can be immediately re-scanned to refresh the entitlement data and re-evaluate the need for attestation.
   - A pending attestation can be routed to another user for remediation. Following remediation, the entitlement data is refreshed and re-evaluated to determine the need for attestation.
6. Select the **User Scope Type** from the following options: (This field is required.)
   - **According to attribute condition rule —** Choose this option to scan users according to a selected User Scope Rule. Identity Manager provides these default rules:
     - All Administrators
     - All My Reports
     - All Non-Administrators
     - My Direct Reports
     - Users without a Manager

NOTE You can add user scoping rules by using the Identity Manager Integrated Development Environment (IDE). For information about the IDE, see "Identity Manager IDE" on page 61.

- **Assigned to resources —** Choose this option to scan all users that have an account on one or more selected resources. When you choose this option, the page displays the User Scope Resources, which lets you specify resources.
- **According to a specific role** — Choose this option to scan all members who have at least one role, or who have all the roles, that you specify.
- **Members of Organizations** — Choose this option to scan all members of one or more selected organizations.
- **Reports to managers** — Choose this option to scan all users reporting to selected managers. Manager hierarchy is determined by the Identity Manager attribute of the user's Lighthouse account.

If the user scope is *organization* or *manager*, then the Recursive Scope option is available. This option allows for user selection to occur recursively through the chain of controlled members.

7. If you choose also to scan audit policies to detect violations during the access review scan, select the audit policies to apply to this scan by moving your selections from Available Audit Policies to the Current Audit Policies list.

   Adding audit policies to an access scan results in the same behavior as performing an audit scan over the same set of users. However, in addition, any violations detected by the audit policies are stored in the user entitlement record. This information can make automatic approval or rejection easier, because the rule can use the presence or absence of violations in the user entitlement record as part of its logic.

8. If you scanned audit policies in the preceding step, you can use the **Policy mode** option to specify how the access scan determines which audit policies to execute for a given user. A user can have policies assigned both at the user level and/or at the organization level. The default access scan behavior is to apply the policies specified for the access scan only if the user does not already have any assigned policies.

   a. Apply select policies and ignore other assignments

   b. Apply selected policies only if user does not already have assignments

c. Apply selected policies in addition to user assignments

9. (Optional) Specify the **Review Process Owner**. Use this option to specify an owner of the access review task being defined. If a Review Process Owner is specified, then an attestor who encounters a potential conflict in responding to an attestation request can *abstain* in lieu of approving or rejecting a user entitlement and the attestation request is forwarded to the Review Process Owner. Click the selection (ellipsis) box to search the user accounts and make your selection.

10. **Follow delegation** — Select this option to enable delegation for the access scan. The access scan will only honor delegation settings if this option is checked. Follow Delegation is enabled by default.

11. **Restrict target resources** — Select this option to restrict scanning to targeted resources.

    This setting has a direct bearing on the efficiency of the access scan. If target resources are not restricted, each user entitlement record will include account information for every resource the user is linked to. This means that during the scan every assigned resource is queried for each user. By using this option to specify a subset of the resources, you can greatly reduce the processing time required for Identity Manager to create user entitlement records.

12. **Execute Violation Remediation** — Select this option to enable the audit policy's remediation workflow when a violation is detected.

    If this option is selected, then a violation detected for any of the assigned audit policies will result in the respective audit policy's remediation workflow being executed.

    Typically, this option should not be selected except for advanced cases.

13. **Access Approval Workflow** — Select the default Standard Attestation workflow or select a customized workflow if available.

    This workflow is used to present the user entitlement record for review to the appropriate attestors (as determined by the attestor rule). The default Standard Attestation Workflow creates one work item for each attestor. If the access scan specifies escalation, this workflow is responsible for escalating work items that have been dormant too long. If no workflow is specified, the user attestation will remain in the pending state indefinitely.

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NOTE The *Identity Manager Deployment Tools* book contains detailed information about Identity Auditor rules, how you might customize them, and why. Refer to the "Working with Rules" chapter, "Customizing Default Rules and Rule Libraries" section, "Auditor Rules" topic.

14. **Attestor Rule** — Select the Default Attestor rule, or select a customized attestor rule if available.

    The attestor rule is given the user entitlement record as input, and returns a list of attestor names. If Follow Delegation is selected, the access scan transforms the list of names to the appropriate users following the delegation information configured by each user in the original list of names. If an Identity Manager user's delegation results in a routing cycle, then the delegation information is discarded, and the work item is delivered to the initial attestor. The `Default Attestor` rule indicates that the attestor should be the manager (idmManager) of the user that the entitlement record represents, or the Configurator account if that user's `idmManager` is null. If attestation needs to involve resource owners as well as managers, you must use a custom rule. For information about customizing the Attestor Rule, see the *Identity Manager Deployment Tools* book.

15. **Attestor Escalation Rule** — Use this option to specify the Default Escalation Attestor rule, or select a customized rule if available. You can also specify the Escalation Timeout value for the rule. The default escalation timeout value is 0 days.

    This rule specifies the escalation chain for a work item that has passed the Escalation Timeout period. The Default Escalation Attestor rule escalates to the assigned attestor's manager (`idmManager`), or to Configurator if the attestor's `idmManager` value is null.

    You can specify the Escalation Timeout value in minutes, hours, or days.

    The *Identity Manager Deployment Tools* book contains additional information about the Attestor Escalation Rule.

16. **Review Determination Rule** — Select one of the following rules to specify how the scan process will determine the disposition of an entitlement record: (This field is required.)

    - **Reject Changed Users** — Automatically rejects a user entitlement record if it is different than the last user entitlement from the same access scan definition and the last user entitlement was approved. Otherwise, forces manual attestation and approves all user entitlements that are unchanged from the previously approved user entitlement. By default, only the "accounts" portion of the user view is compared for this rule.
    - **Review Changed Users** — Forces manual attestation for any user entitlement record if it is different than the last user entitlement from the same access scan definition and the last user entitlement was approved. Approves all user entitlements that are unchanged from the previously approved user entitlement. By default, only the "accounts" portion of the user view is compared for this rule.
    - **Review Everyone** — Forces manual attestation for all user entitlement records.

NOTE The Reject Changed Users and Review Changed Users rules compare the user entitlement to the last instance of the same access scan in which the entitlement record was approved.

You can change this behavior by copying and modifying the rules to restrict comparison to any selected part of the user view. See *Identity Manager Deployment Tools* for information about customizing rules.

This rule can return values of:

- -1 — no attestation required
- 0 — automatically rejects the attestation
- 1 — manual attestation required
- 2 — automatically approves the attestation
- 3 — automatically remediates the attestation (auto-remediation)

The *Identity Manager Deployment Tools* book contains additional information about the Review Determination Rule.

17. **Remediator Rule —** Select the rule to be used to determine who should remediate a specific user's entitlement in the event of Auto-Remediation. The rule can examine the user's current user entitlement and violations, and must return a list of users that should remediate. If no rule is specified, then no remediation will take place. A common use for this rule would be if the entitlement has compliance violations.

    The *Identity Manager Deployment Tools* book contains additional information about the Remediator Rule.

18. **Remediation User Form Rule —** Select a rule to be used to select an appropriate form for attestation remediators when editing users. Remediators can set their own form, which overrides this one. This form rule would be set if the scan collects very specific data that matches a custom form.

    The *Identity Manager Deployment Tools* book contains additional information about the Review Determination Rule.

19. **Notification Workflow** — Select one of the following options to specify the notification behavior for each work item.

    - **None** — This is the default selection. This selection results in an attestor getting an email notification for each individual user entitlement that he must attest.
    - **ScanNotification** —This selection bundles attestation requests into a single notification. The notification indicates how many attestation requests were assigned to the recipient.

      If there is a Review Process Owner specified in the access scan, the ScanNotification Workflow will also send a notification to the review process owner when the scan begins, and when it ends. See Step 9.

      The ScanNotification workflow uses the following email templates

      - Access Scan Begin Notice
      - Access Scan End Notice
      - Bulk Attestation Notice

      You can customize the ScanNotification Workflow.

20. **Violation limit** — Use this option to specify the maximum number of compliance violations that can be emitted by this scan before the scan aborts. The default limit is 1000. An empty value field is equal to no limit.

    Although typically during an audit scan or access scan the number of policy violations is small compared to the number of users, setting this value could provide protection from the impact of a defective policy that increases the number of violations significantly. For example, consider the following scenario:

    If an access scan involves 50,000 users and generates two to three violations per user, the cost of remediation for each compliance violation can have a detrimental effect on the Identity Manager system.

21. **Organizations** — Select the organizations to which this access scan object is available. This is a required field.

Click **Save** to save the scan definition.

Deleting an Access Scan

You can delete one or more access scans. To delete an access scan, from the **Compliance** tab select **Manage Access Scans**, select the name of the scan, and then click **Delete**.

Managing Access Reviews

After defining an access scan, you can use or schedule it as part of an access review. After initiating an access review, several options are available to manage the review process. Read the following sections for more information about:

- Launching an Access Review
- Scheduling Access Review Tasks
- Managing Access Review Progress
- Modifying Scan Attributes
- Canceling an Access Review

Launching an Access Review

To launch an access review from the Administrator interface, use one of these methods:

- Click **Launch Review** from the **Compliance > Access Reviews** page.
- Select the Access Review task in the **Server Tasks > Run Tasks** page.

On the displayed Launch Task page, specify a name for the access review. Select the scans from the Available Access Scans list and move them to the Selected list. If you select more than one scan, you can choose one of the following launch options:

- **immediately** — This option starts running the scan immediately upon clicking the Launch button. If you select this option for multiple scans in the launch task, then the scans will run in parallel.
- **after waiting** — This option allows you to specify a period of time to wait before launching the scan, relative to the launch of the access review task.

NOTE You can initiate more than one scan during an access review session. However, consider that each scan may involve a large number of users, and therefore the scan process can take many hours to complete. Best practice dictates that you manage your scans accordingly. For example, you might launch one scan to run immediately and schedule other scans at staggered intervals.

Click **Launch** to start the access review process.

NOTE The name you assign to an access review is important. Access reviews that run on a periodic basis with the same name can be compared by some reports.

When you launch an access review, the workflow process diagram is displayed, showing the steps in the process.

Scheduling Access Review Tasks

An access review task can be scheduled from the Server Tasks area. For example to set up access reviews on a periodic basis, select **Manage Schedule** and then define the schedule. You might schedule the task to occur every month or every quarter.

To define the schedule, select the Access Review task on the Schedule Tasks page and then complete the information on the Create task schedule page.

Click **Save** to save the scheduled task.

NOTE Identity Manager keeps the results from access review tasks for one week, by default. If you choose to schedule a review more often than once a week, set the Results Options to delete. If Results Options are not set to delete, the new review will not run because the previous task results still exist.

Managing Access Review Progress

Use the **Access Reviews** tab to monitor the progress of an access review. Access this feature through the **Compliance** tab.

From the **Access Reviews** tab you can review a summary of all active and previously processed access reviews. The following information is provided for each access review listed:

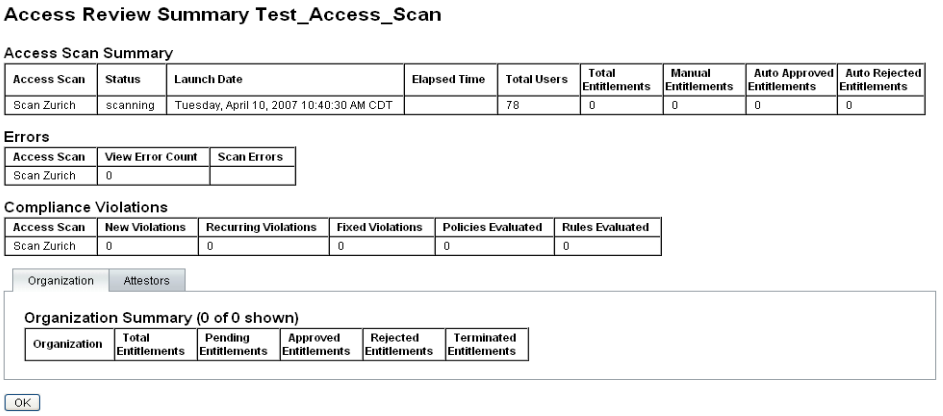
- **Status** — Current status of the review process: initializing, terminating, terminated, number of scans in progress, number of scans scheduled, awaiting attestations, or completed.
- **Launch Date** — The date (timestamp) the access review task started.
- **Total Users** — Total number of users to be scanned.
- **Entitlements details** — Additional columns in the table provide entitlement totals by status. These include details for pending, approved, rejected, terminated, and remediated entitlements, as well as total entitlements.

  The Remediated column indicates the number of entitlements currently in the REMEDIATING state. After an entitlement is remediated, it goes to the PENDING state; therefore, at the conclusion of an access review, the value of this column is zero.

To view more detailed information about the review, select it to open a summary report.

Figure 15-5 shows a sample Access Review Summary report.

Figure 15-5 Access Review Summary Report Page



Access Review Summary Test_Access_Scan

Access Scan Summary

Access Scan	Status	Launch Date	Elapsed Time	Total Users	Total Entitlements	Manual Entitlements	Auto Approved Entitlements	Auto Rejected Entitlements
Scan Zurich	scanning	Tuesday, April 10, 2007 10:40:30 AM CDT		78	0	0	0	0

Errors

Access Scan	View Error Count	Scan Errors
Scan Zurich	0	

Compliance Violations

Access Scan	New Violations	Recurring Violations	Fixed Violations	Policies Evaluated	Rules Evaluated
Scan Zurich	0	0	0	0	0

Organization | Attestors

Organization Summary (0 of 0 shown)

Organization	Total Entitlements	Pending Entitlements	Approved Entitlements	Rejected Entitlements	Terminated Entitlements

OK

Click the **Organization** or **Attestors** form tab to view scan information categorized by those objects.

You can also review and download this information in a report by running the Access Review Summary Report.

Modifying Scan Attributes

After setting up an access scan, you can edit the scan to specify new options, such as specifying target resources to scan or specifying audit policies to scan for violations while the access scan is running.

To edit a scan definition, select it from the list of Access Scans, and then modify the attributes on the Edit Access Review Scan page.

You must click **Save** to save any changes to the scan definition.

NOTE Changing the scope of an access scan might change the information in newly-acquired user entitlement records, as it can affect the Review Determination Rule if that rule compares user entitlements to older user entitlement records.

Canceling an Access Review

From the **Access Reviews** page, click **Terminate** to stop a selected review in progress. Terminating a review causes these actions to occur:

- Any scheduled scans are unscheduled
- Any active scans are halted
- All pending workflows and work items are deleted
- All pending attestations are marked canceled
- Any attestations that users completed are left unchanged

Deleting an Access Review

From the Access Reviews page, click **Delete** to delete a selected review.

You can delete an access review if the status of the task is *terminated* or *completed*. An access review task in progress cannot be deleted unless it is first terminated.

Deleting an access review deletes all user entitlement records that were generated by the review. The delete action is recorded in the audit log.

To delete an access review, click **Delete** from the Access Reviews page.

NOTE Canceling and deleting an access review may result in updates to a large number of Identity Manager objects and tasks, and can take several minutes to complete. You can check the progress of the operation by viewing the task results in **Sever Tasks > All Tasks**.

Managing Attestation Duties

You can manage attestation requests from the Identity Manager Administrator or User interface. This section provides information about responding to attestation requests and the duties involved in attestation.

Access Review Notification

During a scan, Identity Manager sends notification to Attestors when attestation requests require their approval. If attestor responsibilities have been delegated, the requests are sent to the delegate. If multiple attestors are defined, each attestor receives an email notification.

Requests appear as **Attestation** work items in the Identity Manager interface. Pending attestation work items are displayed when the assigned attestor logs in to Identity Manager.

Viewing Pending Requests

View attestation work items from the Work Items area of the interface. Selecting the **Attestation** tab in the Work Items area lists all the entitlement records requiring approval. From the Attestations page, you can also list entitlement records for all of your direct reports and for specified users for which you have direct or indirect control.

Acting on Entitlement Records

Attestation work items contain the user entitlement records requiring review. Entitlement records provide information about user access privileges, assigned resources, and policy violations.

The following are possible responses to an attestation request:

- **Approve** — Attests that the entitlement is appropriate as of the date recorded in the entitlement record.
- **Reject** — The entitlement record indicates possible discrepancies that cannot be currently validated or remediated.
- **Rescan** — Requests a rescan to re-evaluate the user entitlement.
- **Forward** — Enables you to specify another recipient for review.
- **Abstain** — Attestation for this record is not appropriate, and a more appropriate attestor is not known. The attestation work item is forwarded to the Review Process Owner. This option is available only if a Review Process Owner has been defined in the Access Review task.

If an attestor does not respond to a request by taking one of these actions before the specified escalation timeout period, notice is sent to the next attestor in the escalation chain. The notification process continues until a response is logged.

Attestation status can be monitored from the **Compliance > Access Reviews** tab.

Closed-Loop Remediation

You can avoid rejecting user entitlements by:

- Marking an entitlement as needing to be fixed by requesting a fix from another user (Request Remediation). In this case, a new remediation work item is created and assigned to one or more specified remediators.

  The new remediator can then choose to edit the user, either by using Identity Manager or independently, and then mark the work item as remediated when satisfied. At that point, the user entitlement is rescanned and evaluated again.

- Requesting a re-evaluation of the entitlement (Rescan). In this case, the user entitlement is rescanned and evaluated again. The original attestation work item is closed. A new attestation work item is created if the entitlement still requires attestation according to the rules defined in the access scan.

Requesting Remediation

If defined by the access scan, you can route a pending attestation to another user for remediation.

NOTE The Dynamic Entitlements option on the Create or Edit Access Scan pages enables this feature.

To request remediation from another user, follow these steps:

1. Select one or more entitlements from the list of attestations, and then click **Request Remediation**.

   The Select and Confirm to Request Remediation page appears.

2. Enter a user name, and then click **Add** to add the user to the Forward to field. Alternatively, click **...** (More) to search for a user. Select the user in the search list, and then click **Add** to add the user to the Forward to list. Click **Dismiss** to close the Search area.

3. Enter comments in the Comments field, and then click **Proceed**.

   Identity Manager returns to the list of attestations.

NOTE Details of the remediation request appear in the History area of the individual user entitlement.

Rescanning Attestations

If defined by the access scan, you can rescan and re-evaluate a pending attestation.

NOTE The Dynamic Entitlements option on the Create or Edit Access Scan pages enables this feature.

To rescan a pending attestation, follow these steps:

1. Select one or more entitlements from the list of attestations, and then click **Rescan**.

   The Rescan User Entitlements page appears.

2. Enter comments about the rescan action in the Comments area, and then click **Proceed**.

Forwarding Attestation Work Items

You can forward one or more attestation work items to another user.

To forward attestations, follow these steps:

1. Select one or more work items in the attestation list, and then click **Forward**.

   The Select and Confirm Forwarding page appears.

2. Enter a user name in the Forward to field. Alternatively, click **...** (More) to search for a user name.
3. Enter comments about the forwarding action in the Comments field.
4. Click **Proceed**.

   Identity Manager returns to the list of attestations.

NOTE Details of the forwarding action appear in the History area of the individual user entitlement.

Digitally Signing Access Review Actions

You can set up digital signing to handle access review actions. For information about configuring digital signatures, see "Signing Approvals" on page 264. The topics discussed there explain the server-side and client-side configuration required to add the certificate and CRL to Identity Manager for signed approvals.

Access Review Reports

Identity Manager provides the following reports to enable you to evaluate the results of an access review:

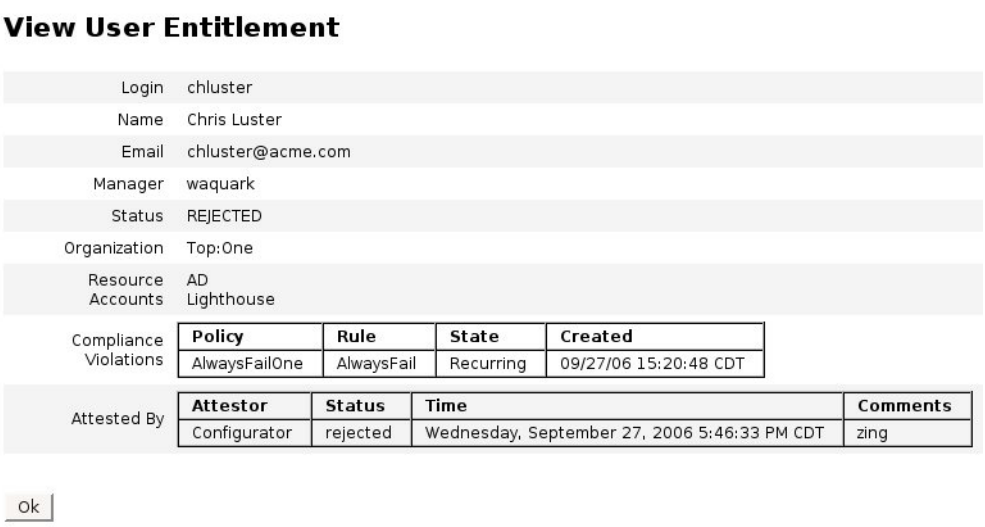
- **Access Review Coverage Report —** This report can provide the following information, in table format, depending on how the report is defined:
  - **Name** — List of users with user entitlement overlaps, differences, or both

  This report may also contain additional columns that show which access reviews contain overlaps and/or differences.

- **Access Review Detail Report** — This report provides the following information, in table format:
  - **Name** — Name of user entitlement record
  - **Status** — Current status of the review process: initializing, terminating, terminated, number of scans in progress, number of scans scheduled, awaiting attestation, or completed
  - **Attestor** — Identity Manager users assigned as the attestor for the record
  - **Scan Date** — Timestamp recorded for when the scan occurred
  - **Disposition Date** — Date (timestamp) when entitlement record was attested
  - **Organization** — Organization of user in the entitlement records
  - **Manager** — Manager of a scanned user
  - **Resources** — Resources the user has accounts on that were captured in this user entitlement
  - **Violations** — Number of violations detected during the review

Click a name in the report to open the user entitlement record. Figure 15-6 shows a sample of the information provided in the user entitlement record view.

Figure 15-6 User Entitlement Record



View User Entitlement

Login	chluster
Name	Chris Luster
Email	chluster@acme.com
Manager	waquark
Status	REJECTED
Organization	Top:One
Resource Accounts	AD Lighthouse

Compliance Violations

Policy	Rule	State	Created
AlwaysFailOne	AlwaysFail	Recurring	09/27/06 15:20:48 CDT

Attested By

Attestor	Status	Time	Comments
Configurator	rejected	Wednesday, September 27, 2006 5:46:33 PM CDT	zing

Ok

- **Access Review Summary Report** — This report, also discussed in "Managing Access Review Progress" on page 558 and illustrated in Figure 15-5, shows the following summary information about the access scans you select for the report:
  - **Review Name** — Name of the access scan
  - **Date** — Timestamp for when the review was launched
  - **User Count** — Number of users scanned for the review
  - **Entitlement Count** — Number of entitlement records generated
  - **Approved** — Number of entitlement records approved
  - **Rejected** — Number of entitlement records rejected
  - **Pending** — Number of entitlement records still pending
  - **Canceled** — Number of entitlement records canceled

These reports are available for download, in Portable Document Format (PDF) or comma-separated value (CSV) format, from the Run Reports page.

Access Review Remediation

Compliance violation remediation and mitigation, and access review remediation, are managed from the Remediations area of the Work Items tab. However, there are differences between the two remediation types. This section describes the unique behavior of access review remediation, and how it differs from the remediation tasks and information described in "Compliance Violation Remediation and Mitigation" on page 530.

About Access Review Remediation

When an attestor requests that a user entitlement be remediated, the Standard Attestation workflow creates a remediation request, which must be addressed by a remediator (a designated user who is allowed to evaluate and respond to remediation requests).

The problem can only be remediated; it cannot be mitigated. Attestation cannot continue until the problem is resolved.

When remediations result from an access review, then the Access Review dashboard tracks all attestors and remediators involved with the review.

Remediator Escalation

Access Review remediation requests are not escalated beyond the initial remediator.

Remediation Workflow Process

The logic of access review remediation is defined in the Standard Attestation workflow.

When an attestor requests remediation of a user entitlement, the Standard Attestation workflow:

- Generates a remediation request (of type `accessReviewRemediation)` that contains information about the user entitlement requiring remediation.
- Sends an email to the requested remediator.

The new remediator can then choose to edit the user, either by using Identity Manager or independently, and then mark the work item as remediated when satisfied. At that point, the user entitlement is rescanned and evaluated again.

Remediation Responses

By default, three response options are given to the access review remediator:

- **Remediate** — A remediator indicates that something has been done to fix the problem.

  The user entitlement is then rescanned and evaluated again. If the user entitlement is again marked as requiring attestation, then the original attestor will see the user entitlement show again in his Attestations work item list.

  Details of the remediation request action appear in the History area of the individual user entitlement.

- **Forward** — A remediator reassigns the responsibility for resolving the remediation request to another individual.

  Details of the forwarding action appear in the History area of the individual user entitlement.

- **Edit User** — A remediator chooses to directly edit the user to remediate the problem.

  This button is shown only if the remediator has permission to modify users. After making changes to the user and clicking **Save**, the remediator is taken to the Remediation confirmation page to supply a comment describing the change made to the user.

The user entitlement is then rescanned and evaluated again. If the user entitlement is again marked as requiring attestation, then the original attestor will see the user entitlement show again in his Attestations work item list.

Details of the edit appear as a remediation request action in the History area of the individual user entitlement.

Working with the Remediations page

The Type column is shown as UE (user entitlement) for all remediation work items that are access review remediation work items.

Unsupported Access Review Remediation Actions

The prioritization and mitigation features are not supported for access review remediations.

Chapter 16

Data Exporter

The Data Exporter feature allows you to write information about users, roles, and other object types to an external data warehouse.

Read this chapter for information and procedures to help you set up and maintain Data Exporter. For full details about planning and implementing Data Exporter, refer to the *Identity Manager Technical Deployment Overview*.

This chapter is organized as follows:

What is Data Exporter?

Identity Manager contains and processes data relevant to managing identities across distributed systems and applications. To improve overall performance, Identity Manager does not retain all of the data it generates during normal provisioning and other daily activities. For example, Identity Manager by default does not persist the intermediate status workflow activities and task instances. If it is necessary to capture all or some of the data that Identity Manager normally discards, you can enable the Data Exporter feature.

When Data Exporter is enabled, Identity Manager stores each detected change to a specified object (data type) as a record in a table in the repository. These events are queued until a task writes them to an external data warehouse. (You can configure how frequently each type of data is exported.) The exported data can be further processed or used as a basis for queries and transformations with commercial transformation, reporting, and analysis tools.

Exporting data to a data warehouse has a negative impact on the Identity Manager server's performance, and this feature should not be enabled unless there is a business need for the exported data.

Identity Manager also allows you to create and execute forensic queries. A forensic query searches the data warehouse to identify User or Role objects that meet the criteria you specify. See "Configuring Forensic Queries" on page 583 for more information.

Planning to Implement Data Exporter

Because Data Exporter is disabled by default, it must be configured to become operational. Configuration of Data Exporter requires several decisions to be made before configuration can begin.

- Which data types will be exported?
- Which techniques will be used to capture data for each data type?
- How often will data be exported for each type?
- What will be in the exported schema for each type?
- Will a custom Warehouse Interface Code (WIC) factory class be required?

When Data Exporter is enabled, the default configuration exports all attributes of all data types. This may cause an unnecessary processing burden on Identity Manager and the warehouse by consuming warehouse storage that will never be used. Data warehousing tends to be conservative and capture data when there is a chance the data might be used later. You do not have to export all the data that can be exported. You can configure which data types to export and restrict some events from being export.

Once these decisions above have been made, use the following steps to implement Data Exporter:

1. (Optional) Customize the export schema for selected types and regenerate the warehouse DDL. Refer to the *Identity Manager Technical Deployment Overview* for more information.
2. Create a user account on the warehouse RDBMS and load the warehouse DDL on that system. Refer to the *Identity Manager Technical Deployment Overview* for more information.
3. Configure Data Exporter, as described in "Configuring Data Exporter" on page 572.
4. Test Data Exporter to ensure it was configured correctly. See "Testing Data Exporter" on page 582 for more information.
5. (Optional) Create forensic queries that can search data written to the data warehouse. See "Configuring Forensic Queries" on page 583 for more information.
6. Maintain Data Exporter using JMX and monitoring the log files. See "Maintaining Data Exporter" on page 588 for more information.

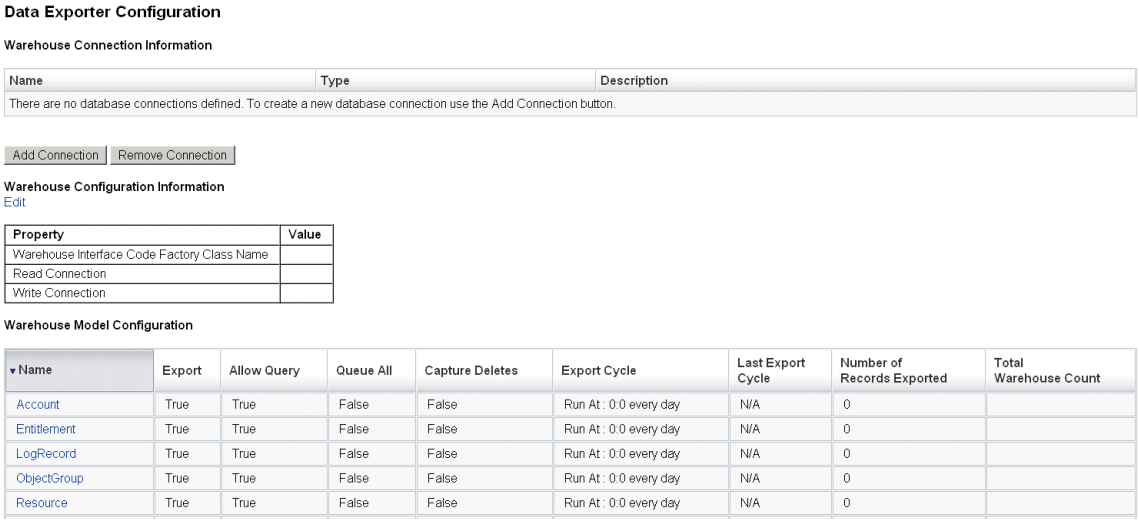
Configuring Data Exporter

The Data Exporter configuration page allows you to define what types of data to retain, specify which attributes to export, and schedule when to export the data. Each data type can be configured independently.

To configure Data Exporter, follow these steps:

1. In the Administrator interface, click **Configure** in the main menu. Then click the **Warehouse** secondary tab. The Data Exporter Configuration page opens.

Figure 16-1 Data Exporter Configuration



2. To define read and write connections, click the **Add Connection** button. The Edit Database Connection page opens.

   Complete the fields on this page and click **Save** to return to the Data Exporter Configuration page. See "Defining Read and Write Connections" on page 574 for more information.

3. To assign the WIC class and database connections, click the **Edit** link that is in the Warehouse Configuration Information section. The Data Exporter Warehouse Configuration page opens.

   Complete the fields on this page and click **Save** to return to the Data Exporter Configuration page. See "Defining the Warehouse Configuration Information" on page 576 for more information.

4. Click on a data type link in the Warehouse Model Configuration table. The Data Exporter Type Configuration page opens.

   Complete the **Export**, **Attributes**, and **Schedule** tabs on this page and click **Save** to return to the Data Exporter Configuration page. See "Configuring Warehouse Models" on page 577 for more information.

   Repeat this step for every data type.

5. To configure the export task daemon, click the **Edit** link that is in the Warehouse Task Configuration section. The Data Exporter Warehouse Configuration page opens.

   Complete the fields on this page and click **Save** to return to the Data Exporter Configuration page. See "Configuring the Warehouse Task" on page 579 for more information.

NOTE Exporting is fully operational once these steps have been completed. When exporting is enabled, data records will start queuing for export. If you do not enable the export task, the queue tables will fill up, and queuing will be suspended. It is generally more efficient to export smaller batches (more frequently) than larger ones, but exporting is subject to the write availability of the warehouse itself, which may be constrained for other reasons.

---

6. Optionally set the maximum queue size. See "Modifying the Configuration Object" on page 581 for more information.

Defining Read and Write Connections

Identity Manager uses a write connection during the export cycles. It uses the read connection to indicate how many records are currently in the warehouse (during warehouse configuration) and to service the forensic query interface.

Warehouse connections can be defined as an application server DataSource, as a JDBC connection, or as a reference to a database resource. If a JDBC connection or database resource is defined, data exporting uses a small number of connections extensively during write operations and then closes all of the connections. Data Exporter only uses the read connection during warehouse configuration and during forensic query execution, and it will close those connections as soon as the operation completes.

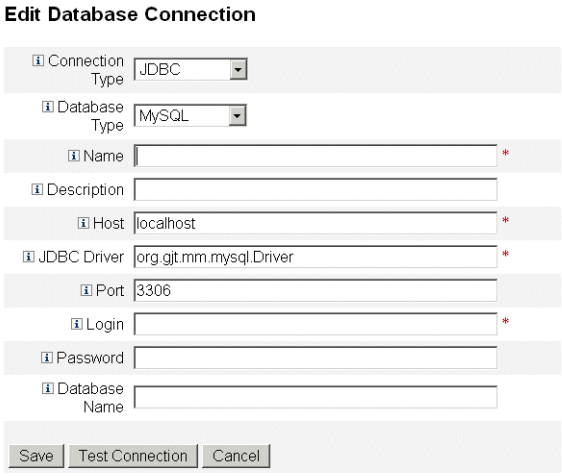
Exporter uses the same schema for write and read connections, and you can use the same connection information for both. However, if you have separate connections, the deployment can write to a set of warehouse staging tables, transform those tables into the real warehouse, and then transform the warehouse tables to a data mart that Identity Manager will read from.

You can edit the Data Export Configuration form to prevent Identity Manager from reading from the warehouse. This form contains the `includeWarehouseCount` property, which causes Identity Manager to query the warehouse and display the number of records of each data type. To disable this feature, copy the Data Export Configuration Form, change the value of the `includeWarehouseCount` property to `true`, and import your customized form.

To define read and write connections, follow these steps:

1. From the Data Exporter Configuration page, click the **Add Connection** button.

Figure 16-2 Data Exporter Configuration



2. Specify how Identity Manager will establish read or write connections to the data warehouse by selecting an option from the **Connection Type** drop-down menu.

   - **JDBC** — Connects to a database using the Java Database Connectivity (JDBC) application programming interface. Connection pooling is provided by the Warehouse Interface Code.
   - **Resource** — Uses the connection information defined in a resource. Connection pooling is provided by the Warehouse Interface Code.
   - **Data Source** — Uses the underlying application server for connection management and pooling. This type of connection requests connections from the application server.

   The fields that are displayed on the page vary, depending on which option you selected from the **Connection Type** drop-down menu. Refer to the online help for detailed information about configuring the database connection.

3. Click **Save** to save your configuration changes and return to the Data Exporter Configuration page.

Repeat this procedure if you will use separate read and write connections.

Defining the Warehouse Configuration Information

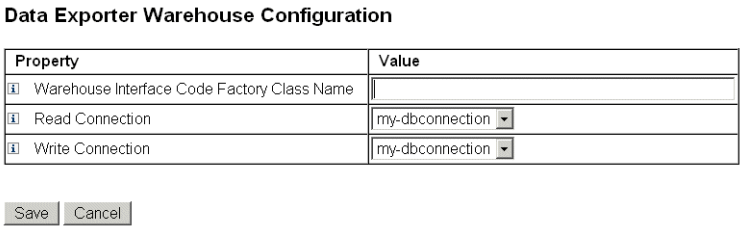
To configure the warehouse, you must select a read connection, a write connection, and specify a Warehouse Interface Code factory class. The WIC factory class provides the interface between Identity Manager and the warehouse. Identity Manager provides a default implementation of the code, but you may build your own. See the *Identity Manager Technical Deployment Overview* for information about creating custom factory classes.

The JAR file containing the factory class and any supporting JAR files must be present in the `$WSHOME/exporter` directory on the Identity Manager server that executes the export task and on any server that configures the Data Exporter. Only one Identity Manager server can export data at any given time.

To define warehouse configuration information, follow these steps:

1. From the Data Exporter Configuration page, click the **Edit** link that is in the Warehouse Configuration Information section.

Figure 16-3 Data Exporter Configuration



2. Specify a value in the **Warehouse Interface Code Factory Class Name** field. If your integrator has not created a custom class, enter the value `com.sun.idm.warehouse.base.Factory`.
3. Specify the connections by selecting an option from both the **Read Connection** and **Write Connection** drop-down menus.
4. Click **Save** to save your configuration changes and return to the Data Exporter Configuration page.

Configuring Warehouse Models

Each exportable data type has a set of options that are used to control if, how and when the type is exported. Exporting data increases the load on the Identity Manager servers, so exporting should only be enabled for data types that are of business interest.

The following table describes each of the data types that can be exported.

Table 16-1 Supported Data Types

Data Type	Description
Account	A record containing the linkage between a User and a ResourceAccount
Entitlement	A record containing the list of attestations for a specific User
LogRecord	A record containing a single audit record
ObjectGroup	A security container that is modeled as an organization
Resource	A system/application on which accounts are provisioned
ResourceAccount	A set of attributes that comprise an account on a specific Resource
Role	A logical container for access
Rule	A block of logic that can be executed by Identity Manager
TaskInstance	A record indicating an executing or completed process
User	A logical user that includes zero or more accounts.
WorkflowActivity	A single activity of an Identity Manager workflow
WorkItem	A manual action from an Identity Manager workflow

To configure warehouse models, follow these steps:

1. From the Data Exporter Configuration page, click on a data type link.
2. In the Export tab, specify whether to export the data type. If you do not want to export this data type, deselect the **Export** check box and click **Save**. Otherwise, select the remaining options on this Export tab as needed.
   - **Allow Query** — Controls whether the model can be queried.
   - **Queue All** — Captures all changes to objects of this type. Checking this option may add significant processing costs to the Exporter. Use this option sparingly.
   - **Capture Deletes** — Records all deleted objects of this type. Checking this option may add significant processing costs to the Exporter. Use this option sparingly.
3. The Attributes tab allows you to select which attributes may be specified as part of a forensic query, and which attributes can be displayed in the query results. You cannot delete the default attributes from the Administrator interface. See the *Identity Manager Technical Deployment Overview* for information about changing the default attributes.

   New attribute names have the following characteristics:
   - *attrName* — The attribute is a top-level and scalar.
   - *attrName***[]** — The attribute is a list-valued top-level attribute, and the elements in the list are scalar.
   - *attrName***['***key***']** — The attribute contains a map value, and the value of the map with the specified key is desired.
   - *attrName***[]**.*name2* — The attribute is a list-valued top-level attribute, where the elements in the list are structures. *name2* is the attribute in the structure to be accessed.
4. Specify how often to export the information associated with the data type on the Schedule tab. Cycles are relative to midnight on the server. A cycle of every 20 minutes would occur on the hour, then 20 minutes and 40 minutes past the hour. If an export attempt takes longer than a scheduled cycle, the next cycle will be skipped. For example, if a cycle is defined as 20 minutes and starts at midnight, and it takes 25 minutes to complete the export, the next export will start at 12:40. The export originally scheduled for 12:20 will not occur.

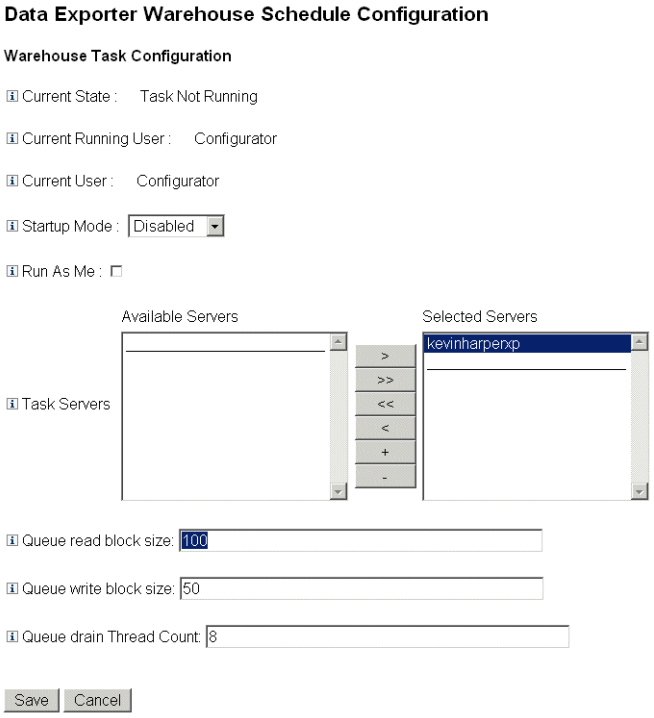
Configuring the Warehouse Task

It is not required to run the export task on a dedicated server, but you should consider it if you expect to export a large amount of data. The export task is efficient at transferring data from Identity Manager to the warehouse, and will consume as much CPU as possible during the export operation. If you do not use a dedicated server, you should restrict the server from handling interactive traffic, because the response time will degrade dramatically during a large export.

To configure the warehouse configuration information, follow these steps:

1. From the Data Exporter Configuration page, click the **Edit** link that is in the Warehouse Task Configuration section.

Figure 16-4 Data Warehouse Schedule Configuration



2. Select an option from the **Startup Mode** drop-down menu to determine whether the warehouse task starts automatically when Identity Manager starts. Selecting Disabled means the task must be started manually.

3. Check the **Run As Me** check box to cause the Exporter task to run under the your administrative account.
4. Select the servers that the task can run on. You may specify multiple servers, but only one warehouse task can run at any given time. If the server executing the task is stopped, the scheduler automatically restarts the task on another server from the list (if available).
5. Specify the number of records read from the queue into a memory buffer before writing in the **Queue read block size** field. The default value for this field is good for most exports. Increase this value if the Identity Manager repository server is slow compared to the warehouse server.
6. Specify the number of records written to the warehouse in a single transaction in the **Queue write block size** field.
7. Specify the number of Identity Manager threads to use for reading queued records in the **Queue drain Thread Count** field. Increase this number if the queue table has a large number of records of different types. Decrease this number if the queue table has few data types.
8. Click **Save** to save your configuration changes and return to the Data Exporter Configuration page.

Modifying the Configuration Object

When Data Exporter is configured and operational, any data types that are configured to be queued will be captured in the internal queue table. By default this table does not have an upper bound, but one can be configured by editing the `Data Warehouse Configuration` Configuration object. This object has a nested object named `warehouseConfig`. Add the following line to the `warehouseConfig` object:

```
<Attribute name='maxQueueSize' value='YourValue'/>
```

The value of `maxQueueSize` can be any positive integer that is less than 2^{31}. Data Exporter disables queuing when that limit is reached. Data that is generated cannot be exported until the queue is drained.

Normal Identity Manager operation can generate multiple thousands of changed records per hour, so the queued table can grow very quickly. Since the queue table is in the Identity Manager repository, this growth will consume tablespace in the RDBMS, with the potential to exhaust the tablespace. Placing a cap on the queue may be necessary if you have a limited amount of tablespace.

Use the Data Queue JMX Mbean to monitor the size of the queue table. See "Monitoring Data Exporter" on page 588 for more information.

Testing Data Exporter

After Data Exporter is correctly configured, it behaves as a background process, sending data to the warehouse at the configured intervals. To run the Exporter on demand, use the Data Warehouse Exporter Launcher task.

To launch the Data Warehouse Exporter Launcher, follow these steps:

1. Disable the Warehouse Task. See "Configuring the Warehouse Task" on page 579 for more information.
2. Click **Server Tasks** in the main menu. Then click the **Run Tasks** secondary tab. The Available Tasks page opens.
3. Click the **Data Warehouse Exporter Launcher** link. The Launch Task page opens.
4. Select the **Debug options** check box to display additional options.
5. Select the **Ignore Initial LastMods** check box to cause the Exporter to ignore the "last polled" timestamp it uses to determine which records in the Identity Manager repository have already been exported. When this option is selected, all records in the Identity Manager repository of the selected types will be exported.
6. Choose which types of data to export from the **Export Once** list. If you do not choose any types in the Export Once list, the export task runs as a daemon and exports based on the schedule previously defined. If you select one or more data types, Identity Manager exports these types immediately, and the export task exits.
7. Set the values for the other fields on the page as needed.
8. Click **Launch** to begin the task.

Configuring Forensic Queries

Forensic queries allow Identity Manager to read data that has been stored in the data warehouse. They can identify users or roles based on current or historical values of the user, role, or related data types. A forensic query is similar to a Find User or Find Role report, but it differs in that the matching criteria can be evaluated against historical data, and because it allows you to search attributes that are of data types other than the user or role being queried.

The purpose of the forensic query is to take action on the results using Identity Manager. The forensic query is not a general-purpose reporting tool.

A forensic query can ask questions similar to the following:

- Who had access to system X between time A and B, and who approved of that access?
- How many provisioning requests have been processed in the last 48 hours, and how long did each request take?

The results of a forensic query cannot be saved. General reporting on the warehouse data should be accomplished using commercial reporting tools.

Creating a Query

A forensic query can search for either User or Role objects. The query can be very complex, allowing the author to select one or more attribute conditions on related data types. User forensic queries can search attributes with the data types of User, Account, ResourceAccount, Role, and Entitlement, and WorkItem. Role forensic queries can search attributes with data types of Role, User, and Work Item.

Within a single data type, all attribute conditions are logically ANDed, so that all conditions must be met for a match to occur. By default, matches are ANDed across data types, but if you select the **Use OR** check box, the matches across data types are logically ORed.

The warehouse may contain multiple records for a single User or Role object, and a single query could return multiple matches for the same user or role. To help differentiate these matches, each data type can be constrained with a date range, such that only records from within the specified date range are considered matches. Each related data type may be constrained with a date range, so it is possible to issue a query of the form:

```
find all Users with Resource Account on ERP1 between May and July 2005 who
were attested by Fred Jones between June and August 2005
```

The date range is from midnight to midnight. For example, the range May 3, 2007 to May 5, 2007 is 48 hours. It would not include any records from May 5, 2007.

The operands (values to be compared to) for each attribute condition must be specified as part of the query definition. The schema restricts some attributes to have a limited set of potential values, while other attributes have no restrictions. For example, most date fields must be entered in YYYY-MM-DD HH:mm:ss format.

NOTE Due to the potentially large volume of data in the warehouse, and the complexity of the query, it may take a long time for the query to produce results. If you navigate away from the query page while a forensic query is running. you will not be able to see the results of the query.

To create a forensic query, follow these steps:

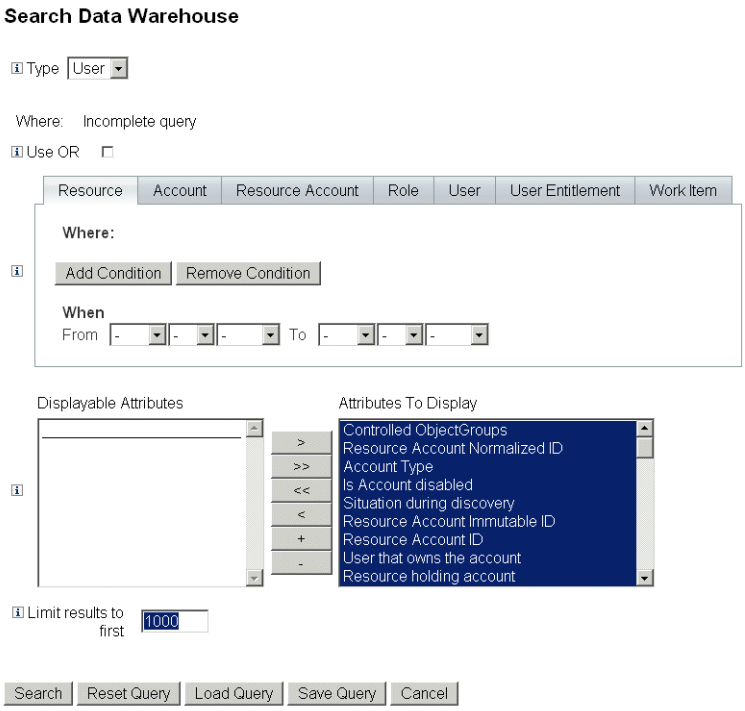
1. In the Administrator interface, click **Compliance** in the main menu.

   The Audit Policies page (Manage Policies tab) opens.

2. Click the **Forensic Query** secondary tab.

   The Search Data Warehouse page opens.

Figure 16-5 Search Data Warehouse



3. Select whether to search user or role records from the **Type** drop-down menu.
4. Select the **Use OR** check box to cause Identity Manager to logically OR the results of each data type queried. By default, the system performs a logical AND on the results.
5. Select a tab that represents a data type that will be in the forensic query.
   a. Click **Add Condition**. A set of drop-down menus displays.

b. Select an operand (condition to check for) from the left drop-down menu and the type of comparison to make in the right drop. Then enter a string or integer to search for. The list of possible operands is defined in the external schema. Refer to the online help for a description of each operand.

c. Optionally, select a range of dates to narrow the scope of the query.

Add more conditions as necessary to the currently-selected data type. Repeat this step for all data types that will be part of the forensic query definition.

6. Pick the attributes in the available attributes that you would like to display in the results of the forensic query.

7. Specify the a value in the **Limit results to first** field. When using conditions from multiple data types, the limit will be applied to the subquery for each type, and the final result is the intersection of all subqueries. As a result, the final result may exclude some records because of the limit on a subquery.

8. Click **Search** to run the forensic query immediately or **Save Query** to reuse the query. See "Saving a Forensic Query" on page 587 for information about re-using your forensic queries.

Saving a Forensic Query

After you have configured a query (and optionally executed it to ensure that it produces the desired results), you can save the query for later execution.

To save a forensic query, follow these steps:

1. From the Search Data Warehouse page, click **Save Query**. The Save Forensic Query page opens.
2. Specify a name and description for query.
3. Select the **Save condition values** check box to save the values of the conditions (strings and integers) you entered on the Search Data Warehouse page. If you do not select this check box, then the saved forensic query serves as a template, and you must enter values each time you run the query.
4. Anyone can execute any saved query, but by default only the query author can modify the query. To allow other users to modify your query, select the **Allow others to alter this query** check box.
5. Because the query returns User or Role objects, you can choose which attributes of the objects to display in the results. If you want to display attributes that are not included in the **Attributes to Display** list, you can go to Data Exporter Configuration page and add new displayable attributes to the User or Role type.

Loading a Query

You can load any query that has been saved by any user, but you can only alter queries that you have created, or that other people have marked as modifiable by anyone.

To load a forensic query, follow these steps:

1. From the Search Data Warehouse page, click **Load Query**. The Load Forensic Query page opens. The Query Summary column displays **Incomplete Query** if the query has been saved as a template.
2. Select the check box to the left of the query and click **Load Query**.

Maintaining Data Exporter

This section describes ways you can track the status of Data Exporter:

- Monitoring Data Exporter
- Monitoring Logging

Monitoring Data Exporter

After the Exporter has been configured and is operational, you may choose to monitor it to ensure its continuous operation. The Exporter has several JMX beans that are useful for determining how the Exporter is behaving. The JMX beans include statistics on the average read/write rates for the Exporter, the current/maximum size of the internal memory queue, and the size of the persistent queue. The Exporter also produces audit records during export, one record for each cycle of each data type. The audit record includes how many records of the type were exported, and how long the export took.

Data Exporter provides the following JMX management beans that monitor the Exporter.

Table 16-2 JMX Management Beans

Bean Name	Description
DataExporter	Contains the number of currently queued exports and the upper limit for the queue.
DataQueue	Contains the number of currently cached queued exports and the rate of arrival to the cache.
ExporterTask	Contains the number of export reads (from Identity Manager), writes (to the warehouse), rates (records/second) for reading, writing, and number of errors.

Data Exporter can be configured to queue export records to a queuing table during normal Identity Manager operation. Because the queue needs to potentially scale to a large number of records and survive a server restart, the queue is backed by a table in the Identity Manager repository. Since writes to the repository would typically slow down normal Identity Manager operations, the queue uses a small memory cache to buffer records in memory until they can be persisted in the repository.

The DataQueue MBean attributes can be plotted to show the largest number of records queued in memory (on a single Identity Manager server). On a balanced system, the number of records in the memory cache should be small and trend quickly to zero. If you observe this number get large (in the thousands) or not return to zero within a few seconds, you should investigate the write performance of the repository.

The ExportTask MBean contains two error counts, one for read and one for write. These counts should be zero, but there are a number of reasons that errors might occur, especially during write. The most common write error will result from the exported data not fitting within the warehouse table columns - typically a string overflow. Some exported String data is unbounded, where the export table columns must have some upper limit.

Monitoring Logging

Identity Manager has two sets of objects that grow without bounds: the audit log and the system log. Data Exporter addresses some of the maintenance problems associated with the log tables.

Audit Logs

Identity Manager writes immutable audit records to the audit log to serve as a historical audit trail of the operations it performs. Identity Manager uses these records in certain reports, and the data from the records may be displayed in the administrator interface. However, because the audit log grows without bounds and it grows at a modest rate, the deployer must determine when to truncate the audit log. Before Data Exporter, if you wanted to preserve the records prior to truncation, you were forced to dump the tables from the repository. If Data Exporter is enabled and configured to export log records, then the old records are preserved in the warehouse, and Identity Manager may truncate the audit tables as needed.

System Logs

System logs have the same immutable property that the audit logs have, but system logs are not typically generated as frequently. Data Exporter does not export system logs. To truncate the system log and preserve old records, you must dump the tables in the repository.

Chapter 17

Service Provider Administration

This chapter provides information that you need to know to administer the Service Provider functionality in Sun Identity Manager. To use this information, an understanding of Lightweight Directory Access Protocol (LDAP) directories and federation management is helpful. For a broader discussion of a Service Provider implementation, see *Identity Manager Service Provider Deployment*.

This chapter contains the following topics:

Overview of Service Provider Features

In a service provider environment, you need the ability to manage user provisioning for all end-users—that is extranet users, as well as intranet users. The Identity Manager Service Provider features enable company administrators to categorize identity accounts into two distinct types: Identity Manager users and Service Provider users. Service provider users in Identity Manager are user accounts that have been configured as the Service Provider User type.

The Identity Manager user-provisioning and auditing capabilities extend to service provider implementations by providing the following features:

Enhanced End-User Pages

Enhanced end-user pages that are customizable for a service provider implementation are provided.

Password and Account ID policy

You can define account ID and password policies for service provider users and resource accounts, as with other Identity Manager users.

Policy checking code is activated for service provider users with the **Service Provider System Account Policy**, which has been added to the main Policies table.

Identity Manager and Service Provider Synchronization

Synchronization for Identity Manager and Service Provider accounts can be configured to run on any Identity Manager server, or restricted to selected servers.

Service Provider Synchronization, like Identity Manager synchronization, can be easily stopped and started from the Resource Actions options on the Resources page. See "Start and Stop Synchronization" on page 638.

The Input Forms for Identity Manager user synchronization and Service Provider user synchronization differ. See "End-User Interface" on page 633.

Access Manager integration

You can use Sun Access Manager 7 2005Q4 for authentication on Service Provider end-user pages. If integration with Access Manager is configured, Access Manager ensures that only authenticated users can access the end-user pages.

Service Provider requires the user name for auditing purposes. Update the `AMAgent.properties` file to add the user's ID to the HTTP headers, for example:

```
com.sun.identity.agents.config.response.attribute.mapping[uid] =
HEADER_speuid
```

The end-user-page authentication filter puts the HTTP header value into the HTTP session where the rest of the code expects it to be.

Initial Configuration

To configure the Service Provider features, use the following procedures to edit Identity Manager configuration objects to the directory server:

- Edit Main Configuration
- Edit User Search Configuration

NOTE Before continuing, ensure that you have:

- Defined your LDAP resource. A sample resource named Service Provider End-User Directory is imported by default. You can configure multiple resources if user and configuration information is to be stored in different directories.
  - The schema must include mapping for an XML object.
  - The Base context configured for the directory resource only applies to the users stored in the directory.
- If desired, configure your Service Provider Account Policy.

Edit Main Configuration

To edit configuration objects for a Service Provider implementation, follow these steps:

1. In the Administrator interface, click **Service Provider** in the menu.
2. Click **Edit Main Configuration**.

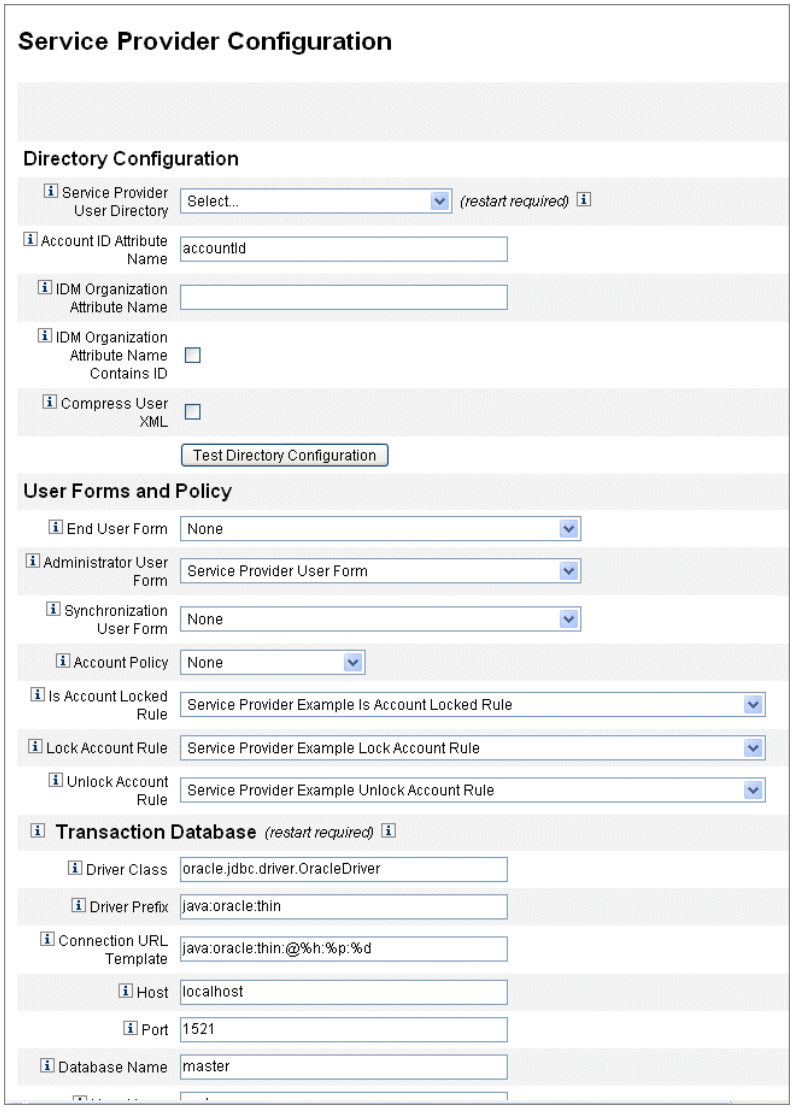
   The **Service Provider Configuration** page opens.
3. Complete the Service Provider Configuration form, as appropriate:
   - Directory Configuration
   - User Forms and Policy
   - Transaction Database
   - Tracked Event Configuration
   - Synchronization Account Indexes
   - Callout Configuration

Directory Configuration

In the Directory Configuration section, provide information to configure the LDAP Directory and specify Identity Manager attributes for service provider users.

Figure 17-1 shows this area of the Service Provider Configuration page, as well as the User Forms and Policy area discussed in the next section.

Figure 17-1 Service Provider Configuration (Directory, User Forms and Policy)



To complete the Directory Configuration form, follow these steps:

1. Select the **Service Provider End-User Directory** from the list.

   Select the LDAP directory resource where all Service Provider user data is stored.

2. Enter the **Account ID Attribute Name**.

   This is the name of the LDAP account attribute that contains a unique short identifier for the account. This is considered the name of the user for authentication and account access through the API. The attribute name must be defined in the schema map.

3. Specify an **IDM Organization Attribute Name.**

   This option specifies the name of the LDAP account attribute that contains the name or ID of an organization within Identity Manager to which the LDAP account belongs. It is used for delegated administration of LDAP accounts. The attribute name must exist in the LDAP resource schema map and is the Identity Manager system attribute name (the name on the left side of the schema map).

NOTE You should specify the Identity Manager Organization Attribute Name — and IDM Organization Attribute Name Contains ID, if needed — if you want to enable delegated administration through organization authorization.

4. If you choose to select **IDM Organization Attribute Name Contains ID,** enable this option.

   Select this option if the LDAP resource attribute, that refers to the Identity Manager organization to which the LDAP account belongs, contains the ID of the Identity Manager organization, and not the name.

5. If you choose to select **Compress User XML**, enable this option.

   Select this option if you choose to compress user XML stored in the directory.

6. Click **Test Directory Configuration** to verify your entries for the configuration.

NOTE You may test your **Directory**, **Transaction**, and **Audit Configurations** as appropriate to your needs. To fully test all three, click all three tests configuration buttons.

User Forms and Policy

In the User Forms and Policy area, shown in Figure 17-1 above, specify the forms and policies to use for service provider user administration.

To specify the forms and policies to use for service provider user administration, follow these steps:

1. Select the **End User Form** from the list.

   This form is used everywhere except for the Delegated Administrator pages and during synchronization. If **None** is selected, no default user form is used.

2. Select the **Administrator User Form** from the list.

   This is the default user form that is used in Administrator contexts. This includes the Service Provider Accounts edit pages. If **None** is selected, no default user form is used.

NOTE If you do not choose an Administrator User Form, then administrators will not be able to create or edit Service Provider users from Identity Manager.

3. Select a **Synchronization User Form** from the list.

   The Synchronization User Form is the default form used if no form is specified for a resource running Service Provider synchronization. If an input form is specified on a resource's synchronization policy, that form will be used instead. Resources usually require different synchronization input forms. In this case, you should set the synchronization user form on each resource instead of selecting a form from the list.

4. Select an **Account Policy** from the list.

   The choices include any Identity Account Policy defined through Configure > Policies.

5. Select an **Is Account Locked Rule** from the list.

   Select a rule to be run against the Service Provider User view that can determine if an account is locked.

6. Select a **Lock Account Rule**.

   Select a rule to be run against the Service Provider User view that can set attributes in the view that cause the account to be locked.

7. Select a **Unlock Account Rule**.

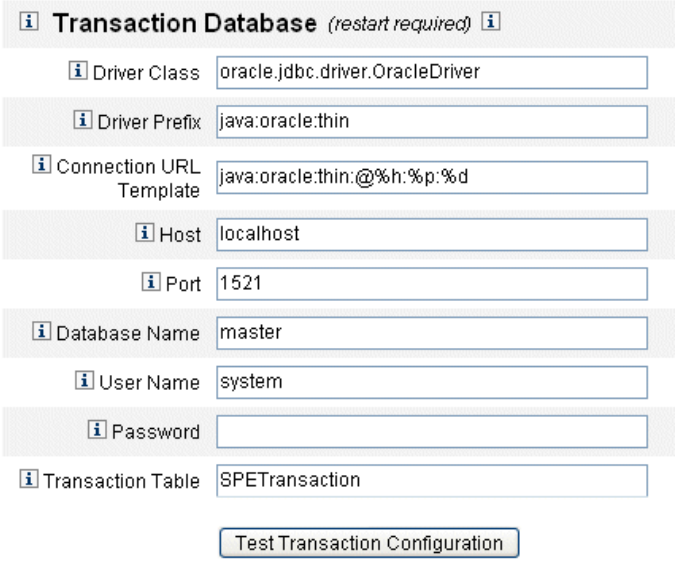
   Select a rule to be run against the Service Provider User view that can set attributes in the view that cause the account to be unlocked.

Transaction Database

Use this section of the Service Provider Configuration page, shown in Figure 17-2, to configure a transaction database. These options are required only when using the JDBC Transaction Persistent Store. Changing any of these values requires that you restart the server to apply them.

The database table for transactions must be set up according to the schema shown in the `create_spe_tables` DDL scripts (located in the `sample` directory of your Identity Manager installation). The appropriate script may have to be customized for the target environment.

Figure 17-2 Service Provider Configuration (Transaction Database)



To configure a transaction database, follow these steps:

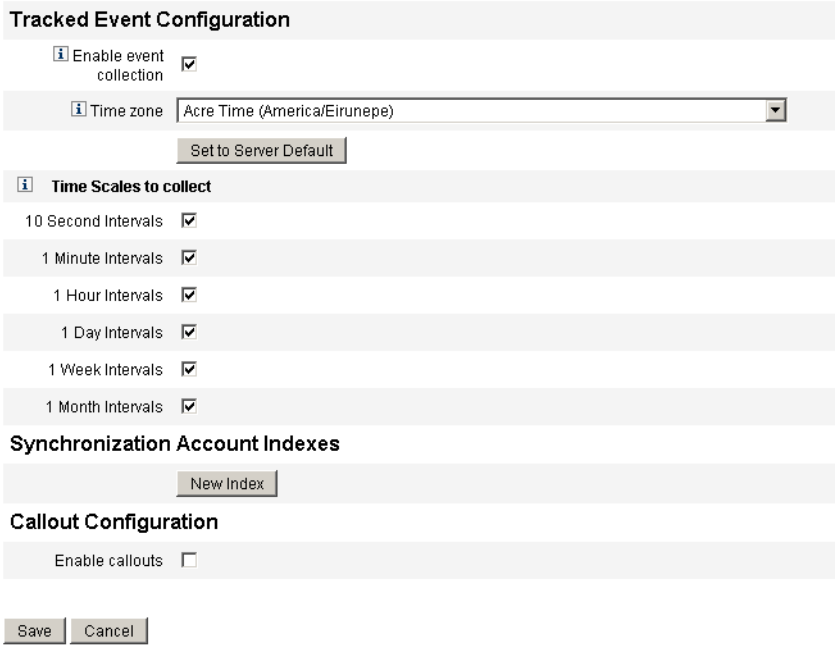
1. Enter the following database information:
   - **Driver Class** - Specify the JDBC Driver class name.
   - **Driver Prefix** - This field is optional. If specified, the JDBC DriverManager is queried before registering a new driver.
   - **Connection URL Template** - This field is optional. If specified, the JDBC DriverManager is queried before registering a new driver.
   - **Host** - Enter the name of the host where the database is running.
   - **Port** - Enter the port number the database server is listening on.
   - **Database Name** - Enter the name of the database to use.
   - **User Name** - Enter the ID of a database user with permission to read, update, and delete rows from the transaction and audit tables in the selected database.
   - **Password** - Enter the database user password.
   - **Transaction Table** - Enter the name of the table in the selected database to use for storing pending transactions.
2. If appropriate, click **Test Transaction Configuration** to verify your entries.

Continue to the next section of the Service Provider Configuration page to configure tracked events.

Tracked Event Configuration

When event collection is enabled, it allows you to track statistics in real time thereby helping to maintain expected or agreed-upon levels of service. Event collection is enabled by default, as shown in Figure 17-3. Clearing the **Enable event collection** check box disables collection.

Figure 17-3 Service Provider Configuration (Tracked Events, Account Indexes, and Callout Configuration)



To set the time zone and specify collection intervals for service provider tracked events, follow these steps:

1. Select the **Time zone** from the list.

   Select the time zone to use when recording tracked events, or select **Set to Server Default** to use the time zone set on the server.

2. Select the **Time Scales to collect** options.

   Collection is aggregated over the following time intervals: every 10 seconds, every minute, every hour, daily, weekly, and monthly. Disable any of the intervals for which you do not want collection to occur.

Synchronization Account Indexes

When synchronizing resources in a Service Provider implementation, it may be necessary to define **Account Indexes** to properly correlate events sent by the resource to users in the Service Provider directory.

By default, resource events are required to contain a value for the attribute accountId which matches the accountId attribute in the directory. In some resources, accountId is not consistently sent. For example, delete events from ActiveDirectory contain only the ActiveDirectory generated account GUID.

Resources that do not include the accountId attribute must include a value for either of the following attributes.

- **guid** - This attribute typically contains a system generated unique identifier.
- **identity** - This attribute is normally the same as accountId for all resources except LDAP resources, where identity contains the full DN of the object.

If you need to correlate using either guid or identity you must define an account index for those attributes. An index is simply the selection of one or more directory user attributes that may be used to store resource specific identities. Once the identities are stored in the directory, they can be used in search filters to correlate synchronization events.

To define account indexes, first determine which resources will be used for synchronization, and which of those require an index. Then edit the Resource definition for the Service Provider directory and add attributes in the schema map for the GUID or identity attributes for each of the Active Sync resources. For example, if you were synchronizing from ActiveDirectory, you might define an attribute named AD-GUID mapped to an unused directory attribute such as manager.

After you have defined all of the index attributes in the Service Provider resource, follow these steps:

1. In the Synchronization Account Indexes area of the configuration page, click the **New Index** button.

   The form expands to contain a resource selection field, followed by two attribute selection fields. The attribute selection fields remain empty until a resource is selected

2. Select a **Resource** from the list.

   The attributes fields now contain values defined in the schema map for the selected resource.

3. Select the appropriate index attribute for either the **Guid Attribute** or the **Full Identity Attribute**.

   It is not usually necessary to set both. If both are set, the software first attempts to correlate using the GUID, then the full identity.

4. You may click **New Index** again to define index attributes for other resources.

5. To delete an index, click the **Delete** button to the right of the **Resource** selection field.

Deleting an index only removes the index from the configuration, it does not modify all of the existing directory users that may currently have values stored in the index attributes.

NOTE Deleting an index only removes the index from the configuration, it does not modify all of the existing directory users that may currently have values stored in the index attributes.

Callout Configuration

Select this option in the Callout Configuration section to enable callouts. When callouts are enabled, the callout mappings appear enabling you to select pre-operational and post-operational options for each transaction type listed.

By default, the pre- and post-operation options are set to None.

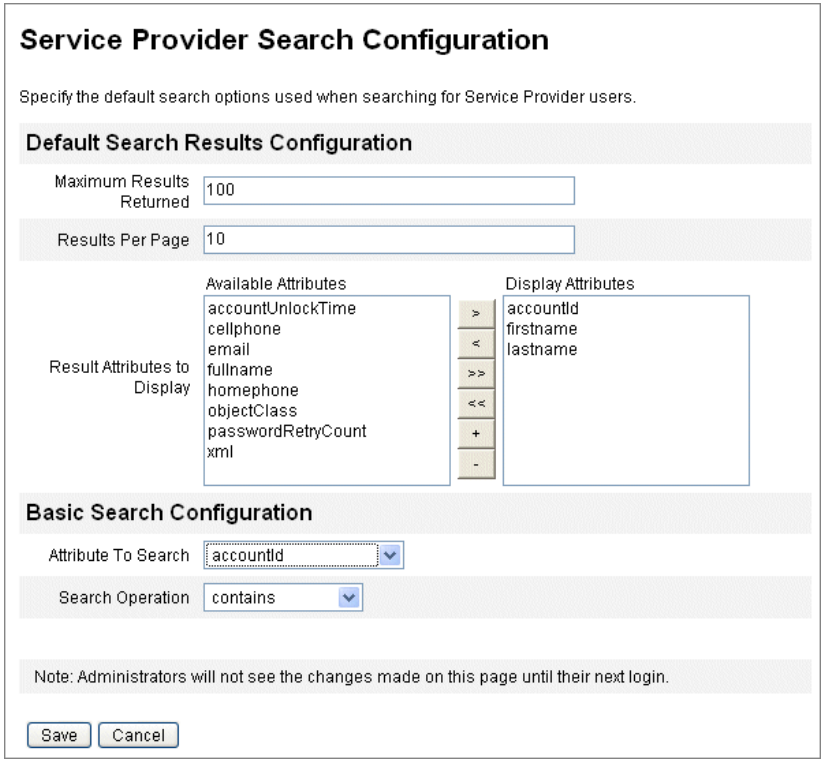
If you specify post-operation callouts, use the **Wait for post-operation callout** option to specify that the transaction must wait for the post-operation callout processing to complete before finishing. This ensures that any dependent transaction is executed only after the post-operation callout has successfully completed.

NOTE After completing your selections for all sections on the Service Provider Configuration page, click **Save** to complete the configuration.

Edit User Search Configuration

Use this page, shown in Figure 17-4, to configure the default search settings for searches made by delegated administrators on the Manage Service Provider Users page. These defaults apply to all users of the Manage Service Provider Users page, but they can be overridden on a per-session basis.

Figure 17-4 Search Configuration



To configure the default search settings for searching Service Provider users, follow these steps:

1. Click **Service Provider** from the menu bar.
2. Click **Edit User Search Configuration**.
3. Enter a number for **Maximum Results Returned** (default 100).
4. Enter a number for **Results Per Page** (default 10).

5. Select the **Available Attributes** next to **Result Attributes to Display** using the arrow keys.
6. Select the **Attribute to search** from the list.
7. Select the **Search Operation** from the list.
8. Click **Save**.

NOTE Changes made to the search configuration do not take effect until you log off and log back on.

These configuration objects are not available if the Service Provider Directory has not been configured.

Transaction Management

A transaction encapsulates a single provisioning operation, for example creating a new user or assigning new resources. To ensure that these transactions complete when resources are unavailable, they are written to the Transaction Persistent Store.

The following topics in this section contain procedures for managing service provider transactions:

- Setting Default Transaction Execution Options
- Setting Transaction Persistent Store
- Set Advanced Transaction Processing Settings
- Monitoring Transactions

Setting Default Transaction Execution Options

These options control how transactions are executed, including synchronous/asynchronous processing and when they are persisted to the Transaction Persistent Store. They can be overridden in the IDMXUser view or through the form used to process it. For more information, see *Identity Manager Service Provider Deployment*.

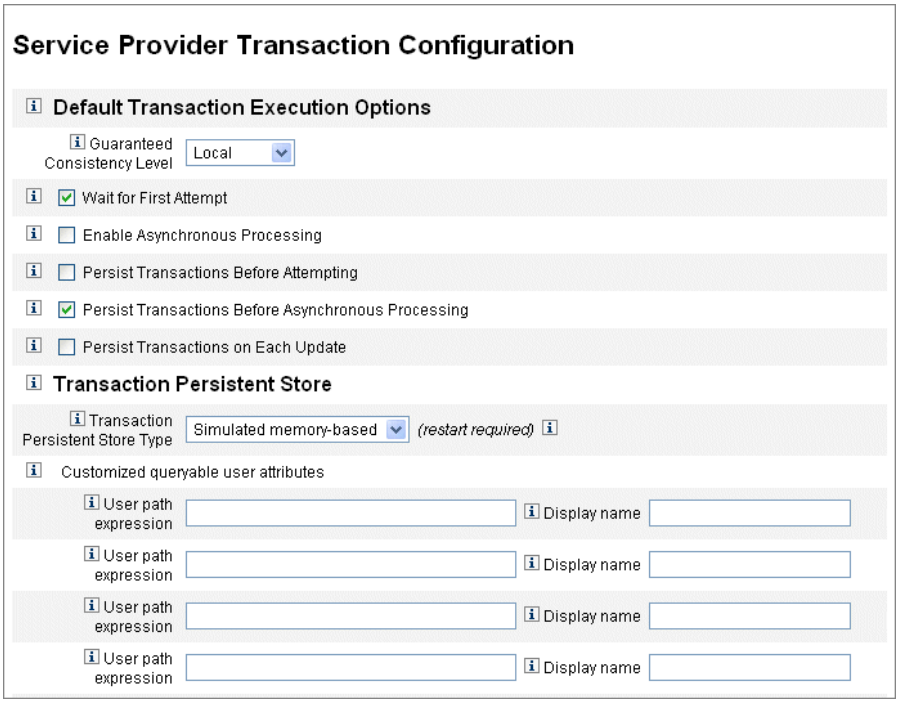
To configure service provider transactions, follow these steps:

1. Click **Service Provider > Edit Transaction Configuration.**

   The **Service Provider Transaction Configuration** page appears.

   Figure 17-5 shows the Default Transaction Execution options area.

Figure 17-5 Transaction Configuration



2. Select the **Guaranteed Consistency Level** from the following options to specify the level of transaction consistency for user updates:
   - **None** — No guaranteed ordering of resource updates for a user
   - **Local —** Resource updates for a user being processed by the same server are guaranteed to be ordered.
   - **Complete —** All resource updates for a user are guaranteed to be in order, across all servers. This option requires all transactions to be persisted before attempting the transaction or before asynchronous processing.
3. Select the following Default Transaction Execution options that you choose to enable:
   - **Wait for First Attempt —** dictates how control returns to the caller when an IDMXUser view object is checked in. If the option is enabled, the checkin operation is blocked until the provisioning transaction has completed a single attempt. If asynchronous processing is disabled, then the transaction either succeeds or fails when control is returned. If asynchronous processing is enabled, then the transaction continues to be retried in the background. If the option is disabled, the checkin operation returns control to the caller before attempting the provisioning transaction. Consider enabling this option.
   - **Enable Asynchronous Processing —** This option controls whether processing of provisioning transactions continues after the checkin call returns.

     Enabling asynchronous processing allows the system to retry transactions. It also improves throughput by allowing the worker threads configured in Set Advanced Transaction Processing Settings to run asynchronously. If you select this option, you should configure the retry intervals and attempts for the resources being provisioned to or updated via the synchronization input form.

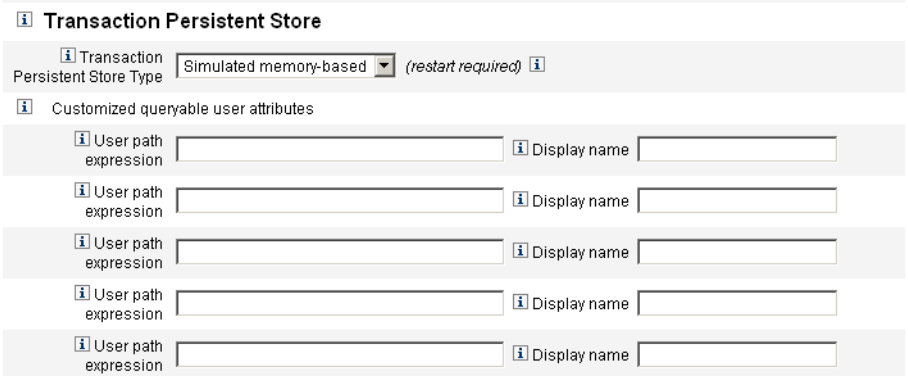
     When **Enable Asynchronous Processing** is selected, enter a **Retry Timeout** value. This is an upper bound expressed in milliseconds of how long the server retries a failed provisioning transaction. This setting complements the retry settings on the individual resources, including the Service Provider user LDAP directory. For example, if this limit is reached before the resource retry limits are reached, the transaction is aborted. If the value is negative, then the number of retries is only limited by the settings of the individual resources.

- **Persist Transactions Before Attempting —** If enabled, provisioning transactions are written to the Transaction Persistent Store before they are attempted. Enabling this option might incur unnecessary overhead because most provisioning transactions succeed on the first attempt. Consider disabling this option unless the **Wait for First Attempt** option is disabled. This option is not available if Complete consistency level is selected.
- **Persist Transactions Before Asynchronous Processing** (default selection) **—** If enabled, provisioning transactions are written to the Transaction Persistent Store before they are processed asynchronously. If the Wait for First Attempt option is enabled, then transactions that need to be retried are persisted before control is returned to the caller. If the Wait for First Attempt option is disabled, then transactions are always persisted before they are attempted. It is recommended to enable this option. This option is not available if Complete consistency level is selected.
- **Persist Transactions on Each Update —** If enabled, provisioning transactions are persisted after each retry attempt. This can aid in isolating problems because the Transaction Persistent Store, which is searchable from the **Search Transaction** page, is always up-to-date.

Setting Transaction Persistent Store

The options on the Service Provider Transaction Configuration page apply to the Transaction Persistent Store. The type of store can be configured as well as additional queryable attributes to expose in the store, as shown in the following figure.

Figure 17-6 Configuring Service Provider Transaction Persistent Store



To set options on the Service Provider Transaction Configuration page, follow these steps:

1. Select the desired **Transaction Persistent Store Type** from the list.

   If the **Database** option is selected, then the RDBMS configured on the main Service Provider configuration page is used for persisting provisioning transactions. This guarantees transactions that must be retried are not lost when a server is restarted. Selecting this option requires configuring the RDBMS on the main Service Provider configuration page. If the **Simulated memory-based** option is selected, then transactions that require retry are only stored in memory and are lost when the server restarts. Enable the **Database** option for production environments.

NOTE Memory-based transaction persistent store is not suitable for use in clustered environments.

When **Transaction Persistent Store Type** is changed, you must restart all running Identity Manager instances for the change to take effect.

2. If desired, enter **Customized queryable user attributes.**

   Select additional attributes of the IDMXUser object to expose in transaction summaries. These attributes are queryable from the search transaction page and appear in search results. They include:

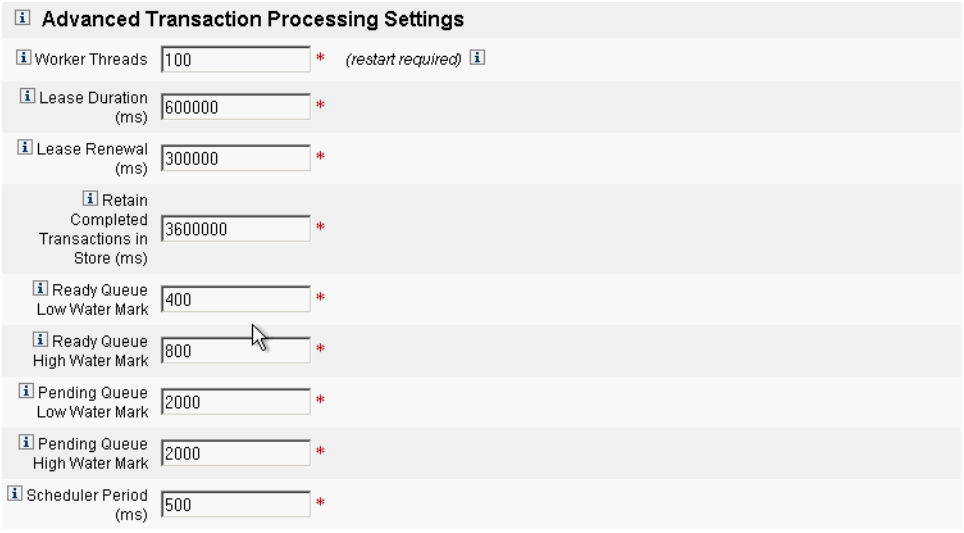
   - **User path expression** — Enter a path expression into the IDMXUser object.
   - **Display name** — Choose a display name corresponding to the path expression. This display name is shown on the transaction search page.

Set Advanced Transaction Processing Settings

These advanced options control the inner-workings of the transaction manager. Do not change the provided defaults unless performance analysis indicates they are not optimal. All entries are required.

Figure 17-5 illustrates the Advanced Transaction Processing Settings area on the Edit Transaction Configuration page.

Figure 17-7 Advanced Transaction Processing Settings



1. Enter the desired number of **Worker Threads (default 100).**

   This is the number of threads used to process transactions. This value limits the number of transactions that are processed concurrently. These threads are statically allocated at startup.

NOTE When the **Worker Threads** setting is changed, you must restart all running Identity Manager instances for the change to take effect.

2. Enter the desired **Lease Duration (ms) (default 600000).**

   This controls how long a server locks a transaction that it is retrying. The lease is renewed as needed. However, if the server does not shutdown cleanly, then another server is not able to lock the transaction until the original server's lease expires. The value should be at least one minute. Setting the value smaller can impact the load on the Transaction Persistent Store.

3. Enter the desired **Lease Renewal (ms)** time **(default 300000)**.

   This controls when the lease of a locked transaction is renewed. It is renewed when there are this many milliseconds remaining on the lease.

4. Enter the desired time to **Retain Completed Transactions in Store (ms) (default 360000)**.

   How many milliseconds to wait before removing completed transactions from the Transaction Persistent Store. Unless transactions are configured to be immediately persisted, the Transaction Persistent Store does not contain all completed transactions.

5. Enter the desired **Ready Queue Low Water Mark (default 400)**.

   When the transaction scheduler's queue of ready-to-run transactions falls below this limit, it refills the queue with any available ready-to-run transactions up to the high water limit.

6. Enter the desired **Ready Queue High Water Mark (default 800)**.

   When the transaction scheduler's queue of ready-to-run transactions falls below the low water mark, it refills the queue with any available ready-to-run transactions up to this limit.

7. Enter the desired **Pending Queue Low Water Mark (default 2000)**.

   The transaction scheduler's pending queue holds failed transactions that are pending a retry. If the size of the queue exceeds the high water mark, then all transactions beyond the low water mark, are flushed to the Transaction Persistent Store.

8. Enter the desired **Pending Queue High Water Mark (default 2000)**.

   The transaction scheduler's pending queue holds failed transactions that are pending a retry. If the size of the queue exceeds the high water mark, then all transactions beyond the low water mark, are flushed to the Transaction Persistent Store.

9. Enter the desired **Scheduler Period (ms)** (default 500).

   This is how often the transaction scheduler should run. When it runs, the transaction scheduler moves ready-to-run transactions from the pending queue to the ready queue, and performs other periodic duties such as persisting transactions to the Transaction Persistent Store.

10. Click **Save** to accept the settings.

Monitoring Transactions

Service Provider transactions are written to the Transaction Persistent Store. You can search for transactions in the Transaction Persistent Store to view the transaction status.

NOTE Using the Edit Transaction Configuration page (see Transaction Management), the administrator can control when transactions are persisted. For instance, they can be persisted immediately, even before they are attempted for the first time.

The Transactions Search page allows you to specify search conditions that enable you to filter the transactions to view based on specific criteria related to the transaction event, such as user, type, status, transaction ID, current state and success or failure of the transaction. This includes transactions that are still being retried, as well as transactions that have already completed. Transactions that have not completed can be cancelled preventing any further attempts.

To search transactions, follow these steps:

1. In the Administrator interface, click **Server Tasks** in the main menu.
2. Click **Service Provider Transactions** in the secondary menu.

   The **Service Provider Transaction Search** page opens, allowing you to specify search conditions.

NOTE The search returns only transactions that match *all* of the conditions selected below. This is similar to the **Accounts > Find Users** page.

3. If desired, select **User Name**.

   This allows you to search for transactions that apply only to users with the **accountId** that you enter.

NOTE If you have configured any Customized queryable user attributes on the Service Provider Transaction Configuration page, then they appear here. For example, you could choose to search based on Last Name or Full Name if these were configured as customized queryable user attributes.

4. If desired, select search for **Type**.

   This allows you to search for transactions of the selected type or types.

5. If desired, select search for **State**.

   This allows you to search for transactions in the following selected state or states:

   - **Unattempted** transactions have not yet been attempted.
   - **Pending retry** transactions have been attempted one or more times, have had one or more errors, and are scheduled to be retried up to the retry limits configured for the individual resources.
   - **Success** transactions have completed successfully.
   - **Failure** transactions have completed with one or more failures.

6. If desired, select to search for **Attempts**.

   This allows you to search for transactions based on how many times they have been attempted. Failed transactions are retried up to the retry limits configured for the individual resources.

7. If desired, select to search for **Submitted**.

   This allows you to search for transactions based on when they were initially submitted in increments of hours, minutes, or days.

8. If desired, select to search for **Completed**.

   This allows you to search for transactions based on when they were completed in increments of hours, minutes, or days.

9. If desired, select to search for **Cancelled Status**.

   This allows you to search for transactions based on whether or not they have already been cancelled.

10. If desired, select to search for **Transaction ID**.

    This allows you to search for transactions based on their unique id. Use this option to find a transaction based on the id value you enter, which appears in all audit log records.

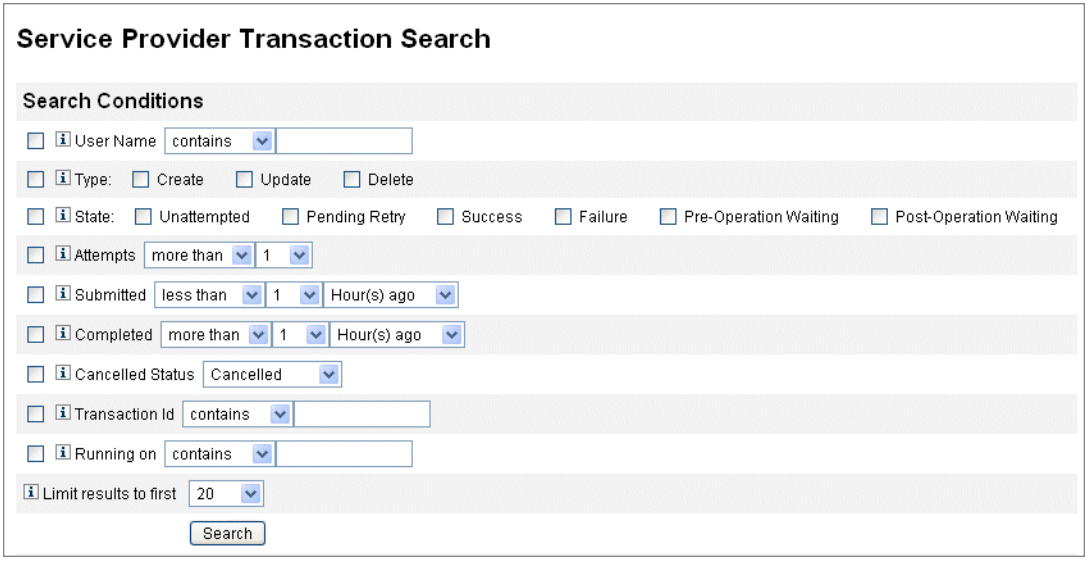
11. If desired, select to search for **Running On** (which Server.)

    This allows you to search for transactions based on the Service Provider server where they are running. The server's identifier is based on its machine name unless it has been overridden in the `Waveset.properties` file.

12. Limit the search to results to first number of entries selected from the list.

    Only results up to the specified limit are returned. No indication is made if additional results are available.

Figure 17-8 Search Transactions



13. Click **Search**.

    The search results are displayed.

14. If desired, click **Download All Matched Transactions** at the bottom of the results page. This saves the results to an XML formatted file.

NOTE You can cancel transactions returned in the search results. Select the transaction in the results table and click **Cancel Selected**. You cannot cancel transactions that have completed or have already been cancelled.

Delegated Administration

Delegated administration for Service Provider users is enabled through the use of Identity Manager *admin roles*, or through the organization-based authorization model.

Delegation Through Organization Authorization

Identity Manager provides delegation of administrative duties through the organization-based authorization model, by default. Keep the following in mind when creating delegated administrators in an organization-based authorization model:

- Service provider administrators are Identity Manager users with specific capabilities and controlled organizations.
- The values of the users' organization attributes can either be the name of the Identity Manager organization or the object ID. This depends on the setting of the **Identity Manager Organization Attribute Name Contains ID** field in the Identity Manager Main Configuration screen.
- You can create an Identity Manager hierarchy and place organizations in that hierarchy in the way you want to delegate the administration of those organizations. Use specific identification for the organizations instead of the organizations' simple names.
- Service Provider users have their organization taken from user attributes in the directory server.
    - You must set attributes in the schema map for the directory server resource.
    - The comparison of attributes is by *exact match* to an administrator's controlled organization list. The value stored in the directory must match the organizations name, not the entire hierarchy. If an administrator controls `Top:orgA:sub1`, then `sub1` must be the value stored in the organization attribute for the Service Provider user.
    - If the attribute is not set or does not correspond to an Identity Manager organization, the Service Provider user is treated as a member of the Top organization. This requires that the Service Provider administrators have Service Provider user capabilities in `Top` to manage these users.
- Attribute settings determine the scope for searches by Service Provider administrators.

- To create a delegated administrator account, you first create an Identity Manager administrator and then add Service Provider administrator capabilities. There are capabilities specific to Service Provider tasks which can be assigned to the user (on the **Security** Tab of the **Edit User** page). The controlled organizations specify which Service Provider users the administrator can modify. Any resources available to Service Provider users are available to all Identity Manager administrators.

NOTE For more information about Identity Manager delegated administration, see "Delegated Administration" in Chapter 6, "Administration."

Delegation Through Admin Role Assignment

For granting fine-grain capabilities and scope of control on Service Provider users, use a Service Provider User Admin Role. The Admin Roles can be configured to be dynamically assigned to one or more Identity Manager or Service Provider Users at login time.

Rules can be defined and assigned to Admin Roles that specify the capabilities (such as `Service Provider Create User`) granted to users assigned the admin role.

To use Admin Role delegation for service provider users, you must enable it in the Identity Manager system configuration object (page 214).

If delegation through Admin Role assignment is enabled, then the IDM Organization Attribute Name in the Service Provider Configuration is not required.

Enabling Service Provider Admin Role Delegation

To enable service provider admin role delegation (Service Provider delegated administration), open the system configuration object for modification (page 214) and set the following property to `true`:

`security.authz.external.`*app name*`.`*object type*

where *app name* is the Identity Manager application (such as Administrator Interface) and *object type* is `Service Provider Users`

This property can be enabled per Identity Manager application (for example, for the Administrator Interface or User Interface) and per object type. Currently, the only supported object type is `Service Provider Users`. The default value is `false`.

For example, to enable Service Provider Delegated Administration for Identity Manager administrators, set the following attribute in the System Configuration configuration object to "true":

`security.authz.external.Administrator Interface.Service Provider Users`

If Service Provider Delegated Administration is disabled (set to false) for a given Identity Manager or Service Provider application, the organization-based authorization model is used.

When Service Provider Delegated Administration is enabled, tracked events capture information about the number and duration of authorization rules executed. These statistics are available in the dashboard.

Configuring a Service Provider User Admin Role

To configure a Service Provider User Admin Role, create an admin role and specify the scope of control, capabilities, and to whom it should be assigned.

NOTE Before creating a Service Provider User Admin Role, define the search context, search filter, after search filter, capabilities, and user assignment rules for the admin role. You must specify the `authType` for the rule to use these rules—that is, SPEUsersSearchContextRule, SPEUsersSearchFilterRule, SPEUsersAfterSearchFilterRule, CapabilitiesOnSPEUserRule, UserIsAssignedAdminRoleRule, SPEUserIsAssignedAdminRoleRule.

Identity Manager provides sample rules that you can use to create these rules for Service Provider User Admin Roles. These rules are available in `sample/adminRoleRules.xml` in the Identity Manager installation directory.

For more information about creating these rules for your environment, see *Identity Manager Service Provider Deployment*.

To configure a Service Provider User Admin Role, follow these steps:

1. In the Administrator interface, click **Security** on the menu, then click **Admin Roles**.

   The Admin Roles page opens.

2. Click **New...**.

   The Create Admin Role page opens.

3. Specify a name for the admin role and select **Service Provider Users** for the type.

4. Specify the **Scope of Control**, **Capabilities**, and **Assign To Users** options, as described in the following sections.

Specifying the Scope of Control

The scope of control for the service provider user admin role specifies which service provider users a given Identity Manager administrator, Identity Manager end user, or Identity Mananger service provider end user is allowed to see. It is enforced when a request is made to list Service Provider Users in the directory.

You can specify one or more of the following settings for the Service Provider User Admin Role scope of control:

- **User search context** — specify whether a rule or text string is to be used to begin a search.

  If None is specified, the default search context will be the base context specified in the Identity Mananger Resource configured as the Service Provider User directory.

- **User search filter** — specify whether a rule or a text string that is to be applied for the search filter.

  The text string specified or returned by the selected rule should be an LDAP-compliant search filter string that represents the set of users, within the search context, that will be controlled by users assigned this Admin Role. The specified filter will be combined with the user specified search filter to ensure that users returned from the search do not include any users that users assigned this AdminRole are not authorized to list.

- **After user search filter rule** — select a rule that will be applied after the User search filter is applied.

  This rule is run after the initial LDAP search is performed against the Service Provider User directory and evaluates the results to determine which distinguished names (dn) the requesting user is allowed to access.

  This type of rule can be used when you need to determine if a user should be in the requesting user's scope of control using non-LDAP user attributes (for example, group membership), or when the filter decision needs to be made using a repository other than the Service Provider User directory (for example, an Oracle database or RACF).

Specifying Capabilities

Capabilities for the Service Provider User Admin Role specify which capabilities and rights the requesting user has on the Service Provider User for which access is being requested. It is enforced when a request is made to view, create, modify, or delete a Service Provider User.

On the **Capabilities** tab, select the **Capabilities Rule** to apply for this admin role.

Assigning Admin Roles To Users

Service Provider User Admin Roles can be dynamically assigned to service provider users by specifying a rule that will be evaluated at login time to determine whether to assign the authenticating user the Admin Role.

Click the **Assign To Users** tab, and select the rule to apply for the assignment.

NOTE Dynamic assignment of Admin Roles to users must be enabled for each login interface (for example, the User interface and the Administrator interface) by setting the following System Configuration object (page 214) to `true`:

`security.authz.checkDynamicallyAssignedAdminRolesAtLoginTo.`*`logininterface`*

The default for all interfaces is `false`.

Delegating Service Provider User Admin Roles

By default, Service Provider Users can assign (or *delegate*) Service Provider User Admin Roles assigned to them to other Service Provider Users in their scope of control.

In fact, any Identity Manager User with capabilities to edit Service Provider Users can assign the Service Provider User Admin Roles assigned to them to the service provider users in their scope of control.

A Service Provider User Admin Role can also include a list of *Assigners* who can assign the Admin Role regardless of scope of control. These direct assignments can ensure that at least one known user account can assign the Admin Role.

Administering Service Provider Users

This section contains procedures and information for administering service provider users through Identity Manager. It contains the following topics:

User Organizations

With Service Provider, the value of an attribute on the user determines to which organization the user is assigned. This is specified by the Identity Manager **Organization Attribute Name** field in the Service Provider Main configuration (see Initial Configuration). However, the names of those organizations must match the value of a user attribute assigned in the directory server.

If the Identity Manager **Organization Attribute Name** is defined, then a multi-select list of available organizations appears on the Create User and Edit User pages. The short organization names are displayed by default. You can modify the Service Provider User Form to display the full organization path.

You may pick which attribute becomes the organization name attribute. The organization name attribute is then used in the Service Provider user administration pages to constrain which administrators can search for and manage that user.

NOTE There are now account ID and password policies for Service Provider and resource accounts.

The **Service Provider System Account Policy** is available from the main Policies table.

Create Users and Accounts

All service provider users must have an account in the Service Provider directory. If a user has accounts on other resources, then links to these accounts are stored in the user's directory entry, so information about these accounts is available when the user is viewed.

NOTE A sample Service Provider User Form for creating and editing users is provided. Customize this form to meet the requirements for managing users in your Service Provider environment. For more information, see *Identity Manager Workflows, Forms, and Views*

To create a Service Provider account., follow these steps:

1. In the Administrator interface, click **Accounts** on the menu bar.
2. Click the **Manage Service Provider Users** tab.
3. Click **Create User**.

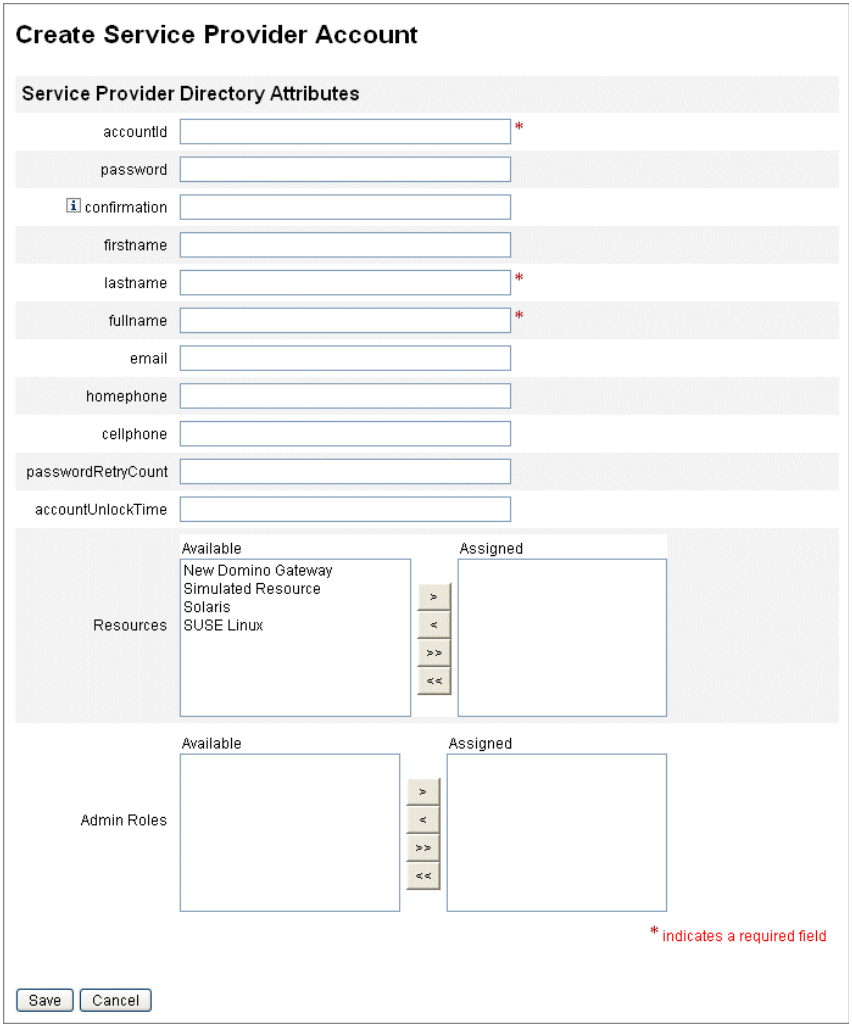
NOTE When using the default Service Provider User Form the actual fields that are displayed depend on the attributes configured in the Account Attributes table (Schema map) of the Service Provider directory resource. Also, when you assign resources to the user (such as a delegated administrator), you should see new sections added to the display where you can specify values for the attributes for those resources. You may also customize the fields.

4. Enter the following values as required:
   - **accountid** (this field is required)
   - **password**
   - **confirmation** (this is the password confirmation)
   - **firstname** (this field is required)
   - **lastname** (this field is required)
   - **fullname**
   - **email**
   - **home phone**

- **cell phone**
- **password retry count**
- **account unlock time**

5. Assign any desired Resources from the Available listing using the arrow keys.
6. The **Account Status** displays whether the account is locked or unlocked. Click this option to lock or unlock the account.

Figure 17-9 Create Service Provider Users and Accounts



NOTE This form automatically populates values for the resource account attributes based on the attributes defined for the directory account (at the top). For example, if the resource defines `firstName`, then the product populates it with the `firstName` value from the directory account. However, after this initial population, modifications to these attributes are not propagated to the resource accounts. If desired, customize the provided sample Service Provider User Form.

7. Click **Save** to create the user account.

Search Service Provider Users

Service Provider includes a configurable search capability to aid in administering user accounts. Only the users within your scope, (as defined by your organization, and perhaps other factors) are returned in a search.

To perform a basic search of service provider users, from the **Accounts** area in the Identity Manager interface, click **Manage Service Provider Users,** then enter the search value and click **Search.**

The following topics discuss the Service Provider search features:

- Advanced Search
- Search Results
- Delete, Unassign, or Unlink Accounts
- Set Search Options

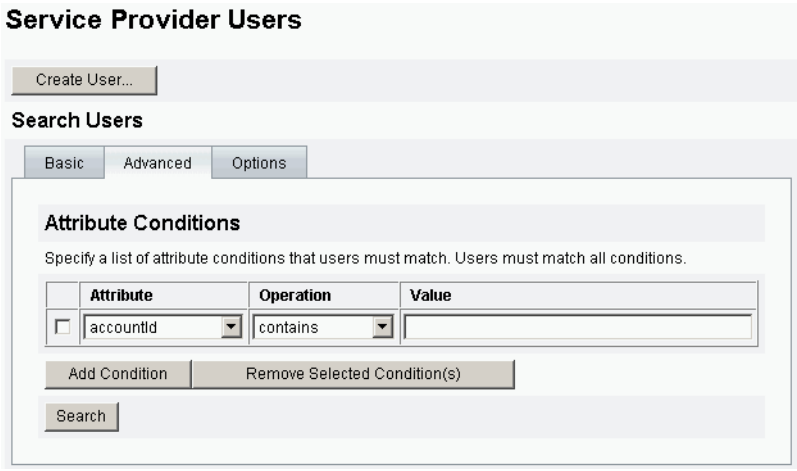
Advanced Search

To perform an advanced search of service provider users, from the Service Provider Users Search page, click **Advanced** and then complete the following actions:

1. Choose the desired **Attribute** from the list.
2. Choose the desired **Operation** from the list.

   You are specifying a set of conditions in order to filter the users returned from the search and that the users returned must meet all of the specified conditions.
3. Enter the desired search value, and then click **Search**.

Figure 17-10 Search Users



You can add or remove Attribute Conditions, using the following options:

- Click **Add Condition** and specify the new attribute.
- Select the item and click **Remove Selected Conditions**.

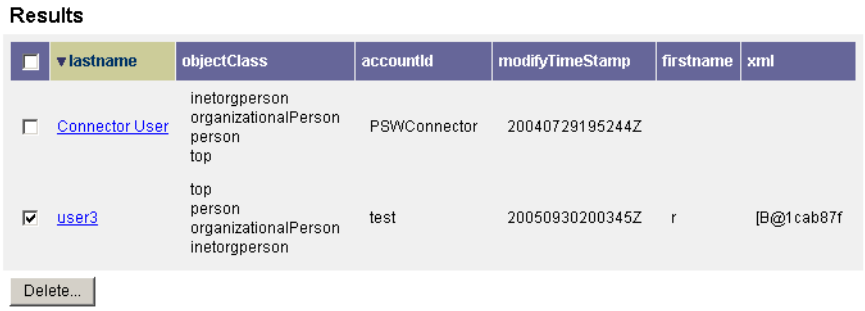
Search Results

Service Provider search results are displayed in a table, as depicted in Figure 17-11. The results can be sorted by any attribute by clicking on the column header for that attribute. The results displayed depend on the attributes you selected.

The arrow buttons navigate to the first, previous, next, and last pages of results. You can jump to a specific page by entering the number in the text box and pressing Enter.

To edit a user, click the user name in the table.

Figure 17-11 Example of Search Results



The search results page enables you to delete users or unlink resource accounts, by selecting one or more users and clicking the **Delete** button. This action brings up a delete user page and presents additional options (see "Delete, Unassign, or Unlink Accounts.")

Link Accounts

Service Provider may be installed in environments in which users have accounts on multiple resources. The account linking feature of Service Provider enables you to assign existing resource accounts to Service Provider users in an incremental fashion. The account linking process is controlled by the Service Provider linking policy, which defines a link correlation rule, a link confirmation rule, and a link verification option.

To link user accounts, follow these steps:

1. In the Administrator interface, click **Resources** in the menu bar.
2. Select the desired resource.
3. Select **Edit Service Provider Linking Policy** from the Resources Action menu.
4. Select a link correlation rule. This rule searches for accounts on the resource that the user may own.
5. Select a link confirmation rule. This rule eliminates any resource accounts from the list of potential accounts that the link correlation rule selects.

NOTE If the link correlation rule selects no more than one account, then the link confirmation rule is not required.

---

6. Select **Link verification required** to link the target resource account to the Service Provider user.

Delete, Unassign, or Unlink Accounts

To delete, unassign, or unlink user accounts, follow these steps:

1. Click **Accounts** from the menu bar.
2. Click **Manage Service Provider Users**.
3. Perform a basic or advance search.
4. Select the desired user or users.
5. Click the **Delete** button.
6. If desired, select one of the global options:
   - **Delete All resource accounts**

NOTE	Deleting a resource deletes the account, but the resource assignment still exists. A subsequent update of the user recreates the account. Delete always implies an unlink of the resource account.

   - **Unassign All resource accounts**

NOTE	Unassigning a resource removes that resource assignment. Unassign implies an unlink of the resource account. The resource account is not deleted when the resource is unassigned.

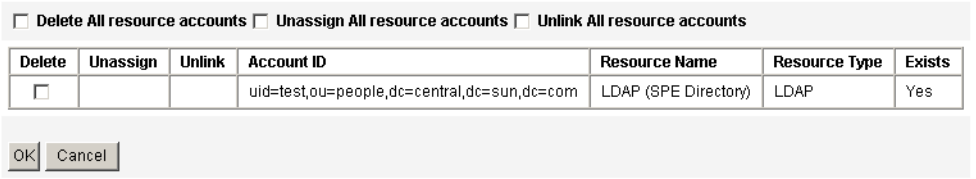
   - **Unlink All resource accounts**

NOTE	Unlinking removes the link between a user and the resource account, but this does not delete the account. The resource assignment is not removed either, so a subsequent update to the user relinks the account or creates a new account on the resource.

7. Alternatively, select an action for one or more resource accounts in the **Delete**, **Unassign**, or **Unlink** columns.

8. After selecting the desired user accounts, click **OK**.

Figure 17-12 Delete, Unassign, or Unlink Accounts



Set Search Options

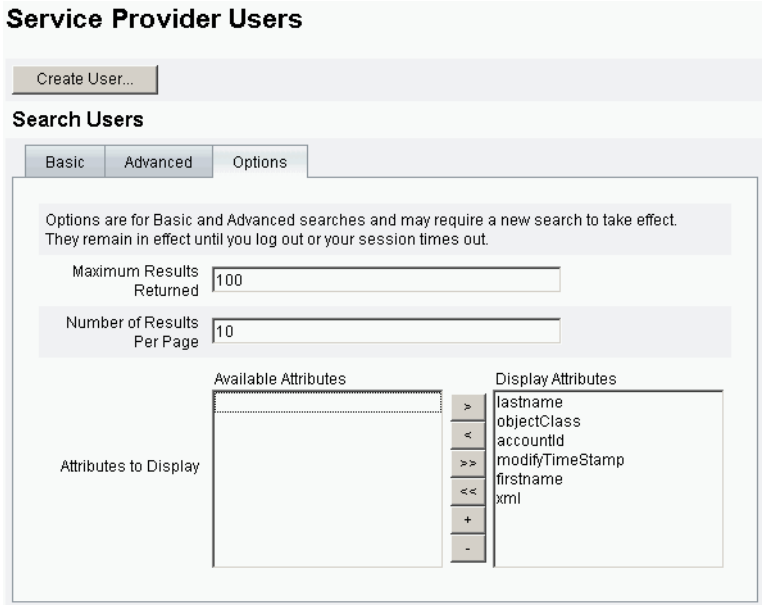
To set search options for service provider users, follow these steps:

1. In the Administrator interface, click **Accounts** in the menu bar.
2. Click **Service Provider**.
3. Click **Options**.

NOTE These options are only valid for the current login session. The options effect how the search results are displayed, that they effect both the basic and advanced search results, and that some settings only take effect on new searches.

4. Enter the **Maximum Results Returned**.
5. Enter the **Number of Results Per Page**.
6. Choose the desired **Display Attribute** from the **Available Attributes** using the arrow keys.

Figure 17-13 Set Search Options for Service Provider Users



End-User Interface

The bundled sample end-user pages provide examples for registration and self-service typical in xSP environments. The samples are extensible and can be customized. You may change the look and feel, modify navigation rules between pages, or display locale-specific messages for your deployment. For further information about customizing end-user pages see *Identity Manager Service Provider Deployment*.

In addition to auditing self-service and registration events, notification to the affected user can be sent using e-mail templates. Examples of using account ID and password policies, as well as account lockout, are also provided. Application developers can also leverage Identity Manager forms. The modular authentication service implemented as a servlet filter can be extended or replaced if necessary. This allows integration with access management systems like the Sun Access Manager.

Sample

The bundled sample end-user pages allow the user to register and maintain basic user information through a series of easy-to-navigate screens and receive email notification of their actions.

The example pages include the following features:

- Login (and logout) including authentication via challenge questions
- Registration and enrollment
- Password changing
- User name changing
- Challenge questions changing
- Notification address changing
- User name forgotten handling
- Password forgotten handling
- E-mail notification
- Auditing

NOTE Identity Manager uses a validation table for registration. Only users in that table are allowed to register. For example, when user Betty Childs registers, an entry for Betty Childs with email address bchilds@example.com, is found in the validation table and registration is accepted.

The pages are easy to customize for your deployment. The following may be customized:

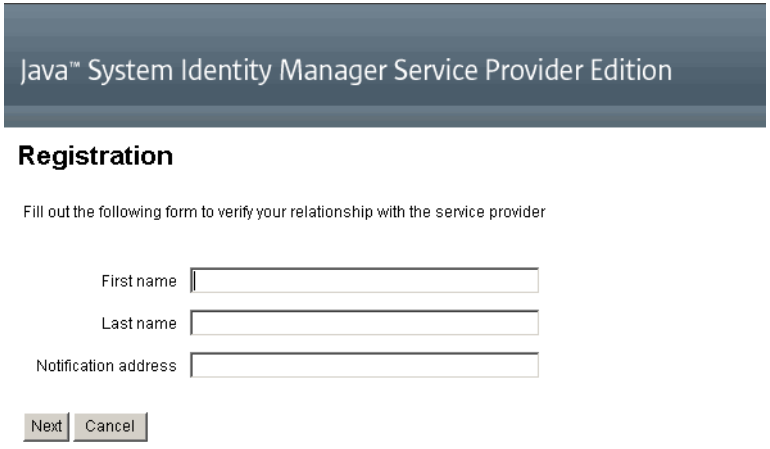
- Branding
- Configuration options (for example, the number of failed login attempts)
- Adding/removing pages

For more information on customizing the pages see *Identity Manager Service Provider Deployment*.

Registration

New users are asked to register. During registration users can set their login, challenge questions, and notification information.

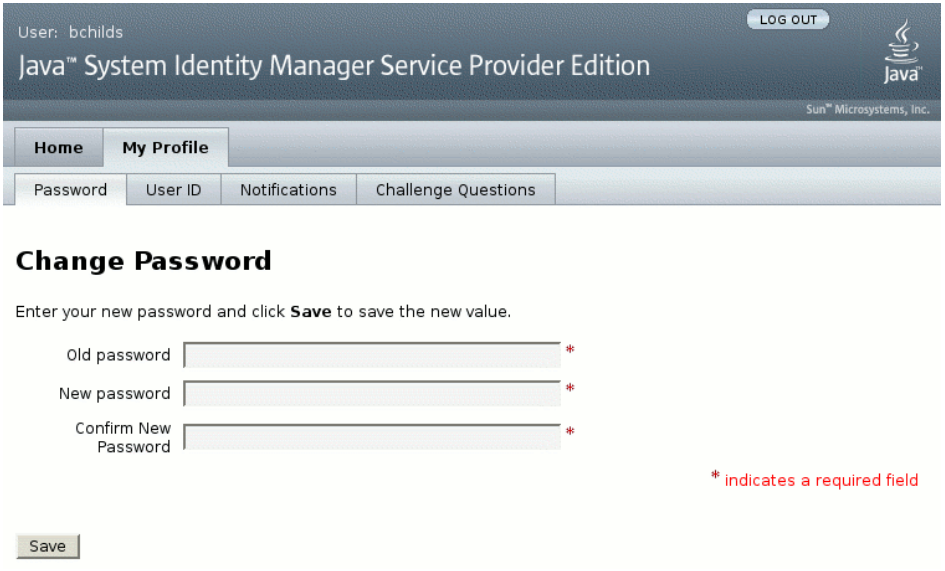
Figure 17-14 Registration Page



Home and Profile Screens

Figure 17-15 shows the end user home tab and Profile page. A user may change their login ID and password, manage notification, and create challenge questions.

Figure 17-15 My Profile Page



Synchronization

Synchronization for service provider users is enabled through the Synchronization Policy. To synchronize changes to attributes on resources with Identity Manager for service provider users, you must configure Service Provider Synchronization. The following topics explain how to enable synchronization in a service provider implementation:

- Configure Synchronization
- Monitor Synchronization
- Start and Stop Synchronization
- Migrate Users

NOTE Service Provider synchronization is configured from the list of resources in the **Resources** area of Identity Manager.

Configure Synchronization

To configure Service Provider synchronization, you edit the Synchronization Policy for resources as described in "Configuring Synchronization" on page 290.

When editing the Synchronization Policy, the following options must be specified to enable the synchronization processes for service provider users.

- Select **Service Provider User** as the Target Object Type.
- In the Scheduling Settings section, select **Enable Synchronization**.

Follow the instructions in "Configuring Synchronization" on page 290 to specify other options as appropriate for your environment. The default synchronization interval for Service Provider synchronization tasks defaults to 1 minute.

NOTE The confirmation rule and form must use the IDMXUser view and not the Identity Manager input user view (see *Identity Manager Service Provider Deployment* for more information).

This is required because confirmation rules access a user view for each user identified in the correlation rule, impacting synchronization performance.

Click **Save** to save the policy definition. If synchronization is not disabled in the policy, it will be scheduled as specified. If disable synchronization is specified, the synchronization service is stopped, if currently running. If enabled, synchronization will be started when the Identity Manager server is restarted, or when **Start for Service Provider** is selected under the Synchronization Resource Action.

Monitor Synchronization

Identity Manager provides the following methods for monitoring Service Provider synchronization.

- View the synchronization status in the description field on the Resource list.
- Use the JMX interface to monitor synchronization metrics.

Start and Stop Synchronization

Service Provider synchronization is enabled by default when you configure Identity Manager for a service provider implementation.

To disable Service Provider Active Sync, follow these steps:

1. In the Administrator interface, click **Resources** on the menu.

   The List Resources page opens.

2. In the Service Provider area, select the resource and click **Edit Synchronization Policy** to edit the policy.

3. Clear the **Enable Synchronization** check box.

4. Click **Save**.

   When the policy is saved synchronization stops.

To stop synchronization without disabling it, select **Stop for Service Provider** from the Synchronization resource action.

NOTE If you stop synchronization by using the resource action, without disabling synchronization, it will be started again when any Identity Manager server is started.

Migrate Users

The Service Provider functionality contains an example user migration task and associated scripts. This task migrates existing Identity Manager users to the Service Provider User directory. This section describes how to use the example migration task. You are encouraged to modify this example for use in your situation.

To migrate existing Identity Manager users, follow these steps:

1. In the Administrator interface, click **Server Tasks** on the menu.

   The Find Tasks page opens.

2. Click **Run Tasks** in the secondary menu.

3. Click **SPE Migration**.

4. Enter a unique **Task Name**.

5. Select a **Resource** from the list.

   This is a resource in Identity Manager that represents the Service Provider directory server. Links to this resource found in Identity Manager users are not migrated.

6. Enter an **Identity Attribute**.

   This is the Identity Manager user attribute that contains the short unique identity for the directory user.

7. Select an **Identity Rule** from the list.

   This is an optional rule that may calculate the name of the directory user from attributes of the Identity Manager user. The Identity rule can calculate a simple name (typically uid) which is then processed through the identity template of the Resource to form the directory server distinguished Name (DN.) The rule may also return a full specified DN which avoids the id template.

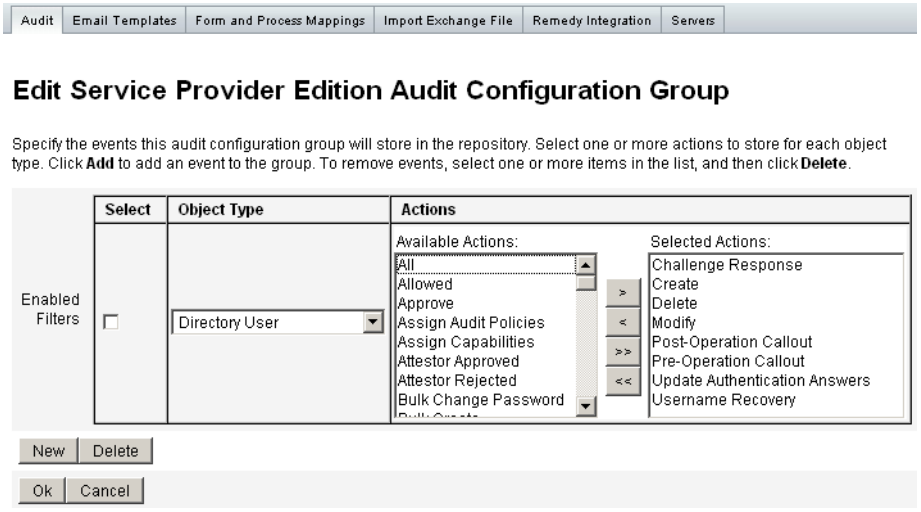
8. Click **Launch** to start the background migration task.

Configuring Service Provider Audit Events

In a service provider implementation, Identity Manager's audit logging system audits events related to extranet user activities. Identity Manager provides the Service Provider Edition audit configuration group (enabled by default) that specifies the audit events logged for service provider users. See Figure 17-16.

For more information about audit logging, and modifying events in the Service Provider Edition audit configuration group, see Chapter 10, "Audit Logging."

Figure 17-16 Edit Service Provider Audit Configuration Group Page



Appendix A

lh Reference

Usage

Use the following syntax to invoke the Identity Manager command-line interface and execute Identity Manager commands:

```
lh { $class | $command } [ $arg [$arg... ] ]
```

Usage Notes

- To display command usage help, type `lh` (do not supply any arguments).
- Setting the path environment variables:
  - When using the `lh` command, you should set `JAVA_HOME` to the JRE directory that contains a `bin` directory with the Java executable. This location differs depending on your installation.

    If you have a standard JRE from Sun (without the JDK), a typical directory location is `C:\Program Files\Java\jre1.5.0_14` (or similar). This directory contains the `bin` directory with the Java executable. In this case, set `JAVA_HOME` to `C:\Program Files\Java\jre1.5.0_14`.

    A full JDK installation has more than one Java executable. In this case, set `JAVA_HOME` to the embedded `jre` directory, which contains the correct `bin/java.exe` file. For a typical installation, set `JAVA_HOME` to `C:\java\jdk1.5.0_14\jre`.

- Set the `WSHOME` variable to the Identity Manager installation directory, as follows:

  `set WSHOME=<path_to_identity_manager_directory>`

  For example, to set the variable to the default installation directory:

  `set WSHOME=C:\Program Files\tomcat\webapps\idm`

NOTE Make sure the value of the WSHOME variable does NOT contain the following:

- Quotation marks (“ “)
- A backslash at the end of the path (\)

Do not use quotation marks, even if the path to the application deployment directory contains spaces.

On UNIX systems, you must also export the path variables, as follows:

`export WSHOME`

`export JAVA_HOME`

- To run the command in 64-bit mode, uncomment the `FLAGS="$FLAGS -d64"` line in the `lh` script.
- On Windows, start the Identity Manager command-line interface by typing the following at a command line:

  `%WSHOME%\bin\lh`
- On Unix, start the Identity Manager command-line interface by typing the following at a command line:

  `$WSHOME/bin/lh`

class

Must be a fully qualified class name, such as `com.waveset.session.WavesetConsole`.

commands

Must be one of the following commands:

- `assessment` — May be used during upgrades. Supports subcommands that report on all modified objects and report on all installed version of Identity Manager. See the *Identity Manager Upgrade* book for details.
- `config` — Starts the Business Process Editor.
- `console` — Starts the Identity Manager console.
- `genReports` — Generates a set of random data that can be used to demonstrate Identity Manager report functionality.
- `import` — Imports an Identity Manager object. Specify the `-s` option for strict mode. When strict mode is enabled, reference checking during import is less forgiving.
- `js` — Invokes a JavaScript program.
- `javascript` — Same as js.
- `msgtool` — Generates a custom message catalog based off of `WPMessages.properties`. This catalog can be manipulated to make custom changes to text or languages.
- `script` — Executes JavaScript or BeanShell.
- `setRepo` — Sets the Identity Manager index repository.
- `setup` — Starts the Identity Manager setup process, which allows you to set the license key, define the Identity Manager index repository, and import configuration files.
- `spml`—Launches the SPML browser.
- `syslog [options]` — Extracts records from the system log. See "syslog command" on page 645 for details.
- `waveset` — An alias for the `console` command. See `console`, above.
- `xmlparse` — Validates XML for Identity Manager objects.
- `xpress [options]` *Filename* — Evaluates an expression. Valid option is `-trace` (enables trace output).

Examples

- `lh com.waveset.session.WavesetConsole`
- `lh console`
- `lh console –u $user –p` *`PathtoPassword`*`.txt`
- `lh setup -U` *`Administrator`* `-P` *`PathtoPassword`*`.txt`
- `lh setRepo –c -A` *`Administrator`* `-C` *`PathtoPassword`*`.txt`
- `lh setRepo –t` *`LocalFiles`* `–f $WSHOME`

syslog command

Usage

```
syslog [options]
```

Options

Use these *options* to include or exclude information:

Table A-1 Syslog Command Options

Option	Description
`-d` *Number*	Shows records for the previous *Number* days (default=1).
`-E`	Shows only records with error severity level or above.
`-F`	Shows only records with fatal severity level.
`-i` *LogID*	Shows only records with a specified syslog ID. Syslog IDs are displayed on some error messages and reference a specific System Log entry.
`-W`	Shows only records with warning severity level or above (default).
`-X`	Includes reported cause of error, if available.

Appendix B

Audit Log Database Schema

This appendix provides information about audit data schema values for the supported database types and audit log database mappings.

Oracle

Table B-4 lists the data schema values for the Oracle database type:

[a]

Table B-1 Data Schema Values for the Oracle Database Type (Page 1 of 3)

Database Column	Value
id	VARCHAR(50) NOT NULL
name	VARCHAR(128) NOT NULL
repomod	TIMESTAMP
resourceName	VARCHAR(128)
accountName	VARCHAR(50)
objectType	CHAR(2)
objectName	VARCHAR(128)
action	CHAR(2)

Table B-1 Data Schema Values for the Oracle Database Type (Page 2 of 3)

Database Column	Value
actionDateTime	CHAR(21)
actionStatus	CHAR(1)
interface	VARCHAR(50)
server	VARCHAR(128)
subject	VARCHAR(128)
reason	CHAR(2)
message	VARCHAR(255) or CLOB (See note[1] at end of table.)
acctAttrChanges	VARCHAR(4000) or CLOB
acctAttr01label	VARCHAR(50)
acctAttr01value	VARCHAR(128)
acctAttr02label	VARCHAR(50)
acctAttr02value	VARCHAR(128)
acctAttr03label	VARCHAR(50)
acctAttr03value	VARCHAR(128)
acctAttr04label	VARCHAR(50)
acctAttr04value	VARCHAR(128)
acctAttr05label	VARCHAR(50)
acctAttr05value	VARCHAR(128)
parm01label	VARCHAR(50)
parm01value	VARCHAR(128) or CLOB (See note[1] at end of table.)
parm02label	VARCHAR(50)
parm02value	VARCHAR(128) or CLOB (See note[1] at end of table.)
parm03label	VARCHAR(50)
parm03value	VARCHAR(128) or CLOB (See note[1] at end of table.)
parm04label	VARCHAR(50)
parm04value	VARCHAR(128) or CLOB (See note[1] at end of table.)
parm05label	VARCHAR(50)
parm05value	VARCHAR(128) or CLOB (See note[1] at end of table.)
sequence	CHAR(19)
xmlSize	NUMBER(19,0)

Table B-1 Data Schema Values for the Oracle Database Type (Page 3 of 3)

Database Column	Value
xml	BLOB

[1]The column length limit for these columns is configurable. The default data type is VARCHAR and the default size limit is noted in parentheses. See "Audit Log Configuration" on page 405 for information on how to adjust the size limit.

DB2

Table B-2 lists the data schema values for the DB2 database type:

Table B-2 Data Schema Values for the DB2 Database Type (Page 1 of 2)

Database Column	Value
id	VARCHAR(50) NOT NULL
name	VARCHAR(128) NOT NULL
repomod	TIMESTAMP
resourceName	VARCHAR(128)
accountName	VARCHAR(50)
objectType	CHAR(2)
objectName	VARCHAR(128)
action	CHAR(2)
actionDateTime	CHAR(21)
actionStatus	CHAR(1)
interface	VARCHAR(50)
server	VARCHAR(128)
subject	VARCHAR(128)
reason	CHAR(2)
message	VARCHAR(255) or CLOB (See note[1] at end of table.)
acctAttrChanges	CLOB(16M)
acctAttr01label	VARCHAR(50)
acctAttr01value	VARCHAR(128)
acctAttr02label	VARCHAR(50)

Table B-2 Data Schema Values for the DB2 Database Type (Page 2 of 2)

Database Column	Value
acctAttr02value	VARCHAR(128)
acctAttr03label	VARCHAR(50)
acctAttr03value	VARCHAR(128)
acctAttr04label	VARCHAR(50)
acctAttr04value	VARCHAR(128)
acctAttr05label	VARCHAR(50)
acctAttr05value	VARCHAR(128)
parm01label	VARCHAR(50)
parm01value	VARCHAR(128) or CLOB (See note[1] at end of table.)
parm02label	VARCHAR(50)
parm02value	VARCHAR(128) or CLOB (See note[1] at end of table.)
parm03label	VARCHAR(50)
parm03value	VARCHAR(128) or CLOB (See note[1] at end of table.)
parm04label	VARCHAR(50)
parm04value	VARCHAR(128) or CLOB (See note[1] at end of table.)
parm05label	VARCHAR(50)
parm05value	VARCHAR(128) or CLOB (See note[1] at end of table.)
sequence	CHAR(19)
xmlSize	DECIMAL(19,0)
xml	CLOB(16M)

[1]The column length limit for these columns is configurable. The default data type is VARCHAR and the default size limit is noted in parentheses. See "Audit Log Configuration" on page 405 for information on how to adjust the size limit.

MySQL

Table B-3 lists the data schema values for the MySQL database type:

Table B-3 Data Schema Values for the MySQL Database Type (Page 1 of 3)

Database Column	Value
id	VARCHAR(50) BINARY NOT NULL

Table B-3 Data Schema Values for the MySQL Database Type (Page 2 of 3)

Database Column	Value
name	VARCHAR(128) BINARY NOT NULL
repomod	TIMESTAMP
resourceName	VARCHAR(128)
accountName	VARCHAR(255)
objectType	CHAR(2)
objectName	VARCHAR(128)
action	CHAR(2)
actionDateTime	CHAR(21)
actionStatus	CHAR(1)
interface	VARCHAR(50)
server	VARCHAR(128)
subject	VARCHAR(128)
reason	CHAR(2)
message	VARCHAR(255) or CLOB (See note[1] at end of table.)
acctAttrChanges	TEXT
acctAttr01label	VARCHAR(50)
acctAttr01value	VARCHAR(128)
acctAttr02label	VARCHAR(50)
acctAttr02value	VARCHAR(128)
acctAttr03label	VARCHAR(50)
acctAttr03value	VARCHAR(128)
acctAttr04label	VARCHAR(50)
acctAttr04value	VARCHAR(128)
acctAttr05label	VARCHAR(50)
acctAttr05value	VARCHAR(128)
parm01label	VARCHAR(50)
parm01value	VARCHAR(128) or CLOB (See note[1] at end of table.)
parm02label	VARCHAR(50)
parm02value	VARCHAR(128) or CLOB (See note[1] at end of table.)
parm03label	VARCHAR(50)

Table B-3 Data Schema Values for the MySQL Database Type (Page 3 of 3)

Database Column	Value
parm03value	VARCHAR(128) or CLOB (See note[1] at end of table.)
parm04label	VARCHAR(50)
parm04value	VARCHAR(128) or CLOB (See note[1] at end of table.)
parm05label	VARCHAR(50)
parm05value	VARCHAR(128) or CLOB (See note[1] at end of table.)
sequence	CHAR(19)
xmlSize	BIGINT
xml	MEDIUMTEXT

[1]The column length limit for these columns is configurable. The default data type is VARCHAR and the default size limit is noted in parentheses. See "Audit Log Configuration" on page 405 for information on how to adjust the size limit.

SQL Server

Table B-4 lists the data schema values for the SQL Server database type:

Table B-4 Data Schema Values for the SQL Server Database Type (Page 1 of 2)

Database Column	Value
id	NVARCHAR(50) NOT NULL
name	NVARCHAR(128) NOT NULL
repomod	DATETIME NOT NULL CURRENT_TIMESTAMP
resourceName	NVARCHAR(128)
accountName	NVARCHAR(255)
objectType	NCHAR(2)
objectName	NVARCHAR(128)
action	NCHAR(2)
actionDateTime	NCHAR(21)
actionStatus	NCHAR(1)
interface	NVARCHAR(50)
server	NVARCHAR(128)

Table B-4 Data Schema Values for the SQL Server Database Type (Page 2 of 2)

Database Column	Value
subject	NVARCHAR(128)
reason	NCHAR(2)
message	NVARCHAR(255) or CLOB (See note[1] at end of table.)
acctAttrChanges	NTEXT
acctAttr01label	NVARCHAR(50)
acctAttr01value	NVARCHAR(128)
acctAttr02label	NVARCHAR(50)
acctAttr02value	NVARCHAR(128)
acctAttr03label	NVARCHAR(50)
acctAttr03value	NVARCHAR(128)
acctAttr04label	NVARCHAR(50)
acctAttr04value	NVARCHAR(128)
acctAttr05label	NVARCHAR(50)
acctAttr05value	NVARCHAR(128)
parm01label	NVARCHAR(50)
parm01value	NVARCHAR(128) or CLOB (See note[1] at end of table.)
parm02label	NVARCHAR(50)
parm02value	NVARCHAR(128) or CLOB (See note[1] at end of table.)
parm03label	NVARCHAR(50)
parm03value	NVARCHAR(128) or CLOB (See note[1] at end of table.)
parm04label	NVARCHAR(50)
parm04value	NVARCHAR(128) or CLOB (See note[1] at end of table.)
parm05label	NVARCHAR(50)
parm05value	NVARCHAR(128) or CLOB (See note[1] at end of table.)
sequence	NTEXT
xmlSize	NUMERIC(19,0)
xml	NTEXT

[1]The column length limit for these columns is configurable. The default data type is VARCHAR and the default size limit is noted in parentheses. See "Audit Log Configuration" on page 405 for information on how to adjust the size limit.

Audit Log Database Mappings

Table B-5 contains the mappings between stored audit log database keys and the display string to which they map in the audit report output. Identity Manager stores items that are used as constants as short database keys to save space in the repository. The product interface does not display these mappings. Instead, you see them only when examining the output of a dump of the audit report results.

Table B-6 on page 656 contains the auditable action database keys, Table B-7 on page 659 contains the action status keys, and Table B-8 on page 659 contains the reason codes that are stored in the database as keys.

Table B-5 Object Key-Type Database Keys

Type Name	English Text	DbKey
AccessReview	AccessReview	AV
AccessReviewWorkflow*	Access Review Workflow	AW
AccessScan	AccessScan	AS
Account	Account	AN
AdminGroup	Capability	AG
Administrator	Administrator	AD
AdminRole	Admin Role	AR
Application	Resource Group	AP
AttributeDefinition	AttributeDefinition	AF
AttrParse	AttrParse	AT
AuditConfig	AuditConfig	AC
AuditPolicy	AuditPolicy	CP
BeanPod	Bean Pod	BP
ComplianceViolation	ComplianceViolation	CV
Configuration	Configuration	CN
DataExporter	Data Exporter	DE
Discovery	Discovery	DS
Email*	Email	EM
EmailTemplate	EmailTemplate	ET
EncryptionKey	EncryptionKey	KY
Event	Event	EV

Table B-5 Object Key-Type Database Keys

Type Name	English Text	DbKey
Extract	Extract	ER
ExtractTask	ExtractTask	EX
IDMXUser*	Directory User	UX
LighthouseAccount*	Identity System Account	LA
LoadConfig	LoadConfig	LD
LoadTask	LoadTask	LT
Log	Log	LG
LoginApp	LoginApp	LP
LoginConfig	LoginConfig	LC
LoginModGroup	LoginModGroup	LF
MetaView	Meta View	MV
ObjectGroup	Organization	OG
Policy	Policy	PO
ProvisioningTask	ProvisioningTask	PT
RemediationWorkflow*	Remediation Workflow	RW
RemedyConfig	RemedyConfig	RC
Resource	Resource	RS
ResourceAccount*	Resource Account	RA
ResourceAction	ResourceAction	RN
ResourceForm	ResourceForm	RF
ResourceObject	ResourceObject	RE
RiskReportTask	RiskReportTask	RR
Role	Role	RL
Rule	Rule	RU
SnapShot	SnapShot	SS
SysLog	SysLog	SL
System	System	SY
TaskDefinition	TaskDefinition	TD
TaskInstance	TaskInstance	TI
TaskResult	TaskResult	TR

Table B-5 Object Key-Type Database Keys

Type Name	English Text	DbKey
TaskResultPage	ResultPage	TP
TaskSchedule	TaskSchedule	TS
TaskTemplate	TaskTemplate	TT
TestNotification*	Test Notification	TN
User	User	US
UserEntitlement	UserEntitlement	UE
UserForm	UserForm	UF
WorkflowCase*	Workflow Case	WC
WorkItem	WorkItem	WI
XmlData	XmlData	XD

* Extended Types

Table B-6 Action Database Keys

Action Name	English Text	DbKey
Allowed*	Allowed	AL
Approve	Approve	AP
Assign Audit Policies	Assign Audit Policies	AA
Assign Capabilities	Assign Capabilities	AC
AttestorApproved*	Attestor Approved	TA
AttestorRejected*	Attestor Rejected	AR
AttestorRemediate*	Remediation Requested	AF
AttestorRescan*	Rescan Requested	AN
Bulk Change Password	Bulk Change Password	BW
Bulk Create	Bulk Create	BC
Bulk Delete	Bulk Delete	BD
Bulk Deprovision	Bulk Deprovision	BP
Bulk Disable	Bulk Disable	BF
Bulk Enable	Bulk Enable	BE
Bulk Modify	Bulk Modify	BM

Table B-6 Action Database Keys

Action Name	English Text	DbKey
Bulk Reset Password	Bulk Reset Password	BR
Bulk Unassign	Bulk Unassign	BU
Bulk Unlink	Bulk Unlink	BL
Bypass Verify	Bypass Verify	BV
CancelReconcile*	Cancel Reconcile	CR
challengeResponse*	Challenge Response	CD
Change Password	Change Password	CP
Connect	Connect	CN
Control Active Sync	Control Active Sync	CA
Create	Create	CT
CredentialsExpired*	Credentials Expired	CE
Debug	Debug	DB
Delegate	Delegate	DG
Delete	Delete	DL
Deprovision	Deprovision	DP
Disable	Disable	DS
Disconnect	Disconnect	DC
Enable	Enable	EN
End Activity	End Activity	EA
End Process	End Process	PE
End Workflow	End Workflow	EW
Execute	Execute	LN
Expired*	Expired	EX
Export	Export	EP
Fixed*	Fixed	FX
Import	Import	IM
List	List	LI
Lock	Lock	LK
Login	Login	LG
Logout*	Logout	LO

Table B-6 Action Database Keys

Action Name	English Text	DbKey
Mitigated*	Mitigated	VM
Modify	Modify	MO
Modify Active Sync	Modify Active Sync	MA
NativeChange*	Native Change	NC
Notify*	Notify	NO
PostOperation*	Post-Operation Callout	PT
PreOperation*	Pre-Operation Callout	PP
Prioritize*	Prioritize	PR
Provision	Provision	PV
Recurring*	Recurring	RC
Reject	Reject	RJ
Remediated*	Remediated	VR
Rename	Rename	RE
RequestReconcile*	Request Reconcile	RR
ResetPassword	ResetPassword	RP
Run Debugger	Run Debugger	RD
ScanBegin*	Scan Begin	SB
ScanEnd*	Scan End	SE
StartActivity*	Start Activity	SA
StartProcess*	Start Process	SP
StartWorkflow*	Start Workflow	SW
Terminate*	Terminate	TR
Unassign	Unassign	UA
Unlink	Unlink	UN
Unlock	Unlock	UL
updateAuthenticationAnswers*	Update Authentication Answers	AQ
usernameRecovery*	Username Recovery	UR
View	View	VW
View Only	View Only	VO

* Extended Actions

Table B-7 Action Status Database Keys

Result	DbKey
Success	S
Failure	F

Table B-8 Reasons Stored as Keys

Reason Name	English Text	DbKey
PolicyViolation	Violation of policy {0}: {1}	PV
InvalidCredentials	Invalid Credentials	CR
InsufficientPrivileges	Insufficient Privileges	IP
DatabaseAccessFailed	Database Access Failed	DA
AccountDisabled	Account Disabled	DI

Appendix C

User Interface Quick Reference

Table C-1 is a quick reference to commonly performed Identity Manager tasks. It shows the primary Identity Manager interface location where you will go to begin each task, as well as alternate locations or methods (if available) that you can use to perform the same task.

Table C-1 Identity Manager Interface Task Reference (Page 1 of 5)

To do this:	Go to:	Or:
Managing Identity Manager Users		
Create and edit users	**Accounts** tab, **List Accounts** selection	**Accounts** tab, **Find Users** selection (User Account Search Results page)
Approve user account creation	**Work Items** tab**, Approvals** subtab	
Set up user authentication (policies)	**Security** tab, **Policies** selection	
Change user passwords	**Passwords** tab, **Change User Password** selection	**Accounts** tab, **List Accounts** selection **Accounts** tab, **Find Users** selection (User Account Search Results page) Identity Manager User interface
Reset user passwords	**Passwords** tab, **Reset User Password** selection	**Accounts** tab, **List Accounts** selection **Accounts** tab, **Find Users** selection (User Account Search Results page)
Find users	**Accounts** tab, **Find Users** selection	**Passwords** tab, **Change User Password** selection
Enable or disable users	**Accounts** tab, **List Accounts** selection	**Accounts** tab, **Find Users** selection (User Account Search Results page)

Table C-1 Identity Manager Interface Task Reference (Page 2 of 5)

To do this:	Go to:	Or:
Unlock users	**Accounts** tab, **List Accounts** selection	**Accounts** tab, **Find Users** selection (User Account Search Results page)
Managing Identity Manager Administrators		
Set up delegated administration (through organizations)	**Accounts** tab, **List Accounts** selection, Create User page	
Assign capabilities	**Accounts** tab, **List Accounts** selection, Create or Edit User page **Security** subtab	
Assign capabilities (through admin roles)	**Accounts** tab, **List Accounts** selection, Create or Edit User page **Security** subtab	
Set up approvers (to validate account creation)	**Accounts** tab, **List Accounts** selection, Create Organization page	
	Roles tab, Create Roles page	
Configuring Identity Manager		
Create and manage resources (Resource Wizard)	**Resources** tab	
Manage resource groups	**Resource** tab, **List Resource Groups** selection	
Create and manage roles	**Roles** tab	
Find roles	**Roles** tab, **Find Roles** selection	
Edit capabilities	**Security** tab, **Capabilities** selection	
Create and edit admin roles	**Security** tab, **Admin Roles** selection, Create/Edit Admin Role page	
Set up email templates	**Configure** tab, **Email Templates** selection	
Set up password, account, and naming policies; assign policies to organizations	**Security** tab, **Policies** selection	
Loading and Synchronizing Accounts and Data		
Import data files (such as XML-format forms)	**Configure** tab, **Import Exchange File** selection	

Table C-1 Identity Manager Interface Task Reference (Page 3 of 5)

To do this:	Go to:	Or:
Load resource accounts	**Account** tab, **Load from Resource** selection	
Load accounts from file	**Account** tab, **Load from File** selection	
Compare Identity Manager users with resource accounts	**Resources** tab, **Reconcile with Resources** selection	
Auditing and Managing Compliance		
Disable or enable auditing	**Configure** tab, **Audit** selection	
Set up audit events to capture	**Configure** tab, **Audit** selection	
Define audit policies (create, edit, delete)	**Compliance** tab, **Manage Policies** selection	
Assign audit policies	**Accounts** tab, **Compliance** selection	
Define remediators and assign remediation workflows for an audit policy	**Compliance** tab, **Manage Policies** subtab	
Respond to policy violation remediation requests	**My Work Items** tab, **Remediations** selection	
Mitigate policy violations	**Work Items** tab, **Remediations** subtab	
Review remediated policy violations	**Work Items** tab, **Remediations** subtab	
Generate audit policy reports	**Reports** tab, **Run Report** subtab	
Perform an audit scan on one or more users or organizations	**Accounts** tab, select **Scan** from the User Actions or Organization Actions list	
Set up Periodic Access Reviews	**Compliance** tab, **Manage Access Scans** selection	
Monitor Periodic Access Reviews	**Compliance** tab, **Access Reviews** selection	
View Audit reports	**Reports** tab, **Auditor Report** type selection	
Edit administrator audit capabilities	**Security** tab, **Capabilities** subtab	

Table C-1 Identity Manager Interface Task Reference (Page 4 of 5)

To do this:	Go to:	Or:
Set up email templates for audit notification	**Configure** tab, **Email Templates** subtab	
Import data files/rules (such as XML-format forms)	**Configure** tab, **Import Exchange File** subtab	
Define an access review scan	**Compliance** tab, **Manage Scans** subtab	
Run an access review	**Compliance** tab, **Access Reviews** subtab	
Terminate an access review	**Compliance** tab, **Access Reviews** subtab	
Schedule an access review	**Server Tasks** tab, **Manage Schedule** subtab	
Set up periodic access reviews	**Compliance** tab, **Manage Access Scans** subtab	
Monitor access review status	**Compliance** tab, **Access Reviews** subtab	
Configure attestors	**Compliance** tab, **Manage Access Scans** subtab	
Perform Attestor duties (review and certify user entitlements)	**Work Items** tab**, My Work Items** tab, **Attestation** subtab	
Risk Analysis, and Reporting		
Run and manage reports	**Reports** tab, **Run Reports** selection to create, run, and download reports; **View Reports** to view report results.	
Define and run risk analysis reports	**Reports** tab, **Risk Analysis** selection	
View graphical reports	**Reports** tab, **View Dashboards** selection	
Review separation-of-duties report	**Reports** tab, **Run Report** subtab	

Table C-1 Identity Manager Interface Task Reference (Page 5 of 5)

To do this:	Go to:	Or:
Managing Identity Manager Tasks		
Run a defined task (or process)	**Server Tasks** tab, **Run Tasks** selection	
Schedule a task	**Server Tasks** tab, **Manage Schedule** selection	
View Task results	**Server Tasks** tab, **Find Tasks** or **All Tasks** selection	
Suspend or terminate a task	**Server Tasks** tab, **All Tasks** selection	
Managing Service Provider Users		
Manage Service Provider Users	**Accounts** tab, **Manage Service Provider Users** selection	
Manage Service Provider Transactions	**Server Tasks** tab, **Service Provider Transactions** selection	
Configure Service Provider features	**Service Provider** tab, **Edit Main Configuration** selection	
Configure Transaction defaults	**Service Provider** tab, **Edit Transaction Configuration** selection	
Create or edit Service Provider policies	**Security** tab, **Policies** selection	

Appendix D

Capabilities Definitions

This appendix is organized into the following sections:

- Task-Based Capabilities Definitions
- Functional Capabilities Definitions

For general information about capabilities, see "Understanding and Managing Capabilities" on page 238.

NOTE All capabilities grant the user or administrator access to the **Passwords** > **Change My Password** and **Change My Answers** tabs.

Task-Based Capabilities Definitions

This section describes each of the task-based capabilities that can be assigned to users. It also lists the tabs and subtabs that can be accessed with each capability. Capabilities are listed in alphabetical order by name.

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 1 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Access Review Detail Report Administrator	Create, edit, delete, and execute Access Review Detail Reports	**Reports > Run Reports** tab, **View Reports** tab- Access Review Detail Reports only **Reports > View Dashboards**
Access Review Summary Report Administrator	Create, edit, delete, and execute Access Review Summary Reports	**Reports -** Access Review Summary Reports only **Reports > View Dashboards**

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 2 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Account Administrator	Perform all operations on users, including assigning capabilities. Does not include bulk operations.	**Accounts** - **List Accounts**, **Find Users**, **Extract to File**, **Load from File**, **Load from Resource** tabs **Passwords** - All subtabs **Work Items - Approvals** subtab **Tasks** - All subtabs
Admin Report Administrator	Create, edit, delete, and run administrator reports.	**Reports** - **Manage Reports**, **Run Reports** subtabs (Administrator report only)
Admin Role Administrator	Create, edit, and delete admin roles.	**Security - Admin Roles** subtab
Application Administrator	Create, edit, and delete Application roles.	**Tasks** - **Find Tasks**, **All Tasks**, **Run Tasks** subtabs (synchronize roles) **Roles** - All subtabs
Approver Administrator	Approve or reject requests initiated by other users.	**Default only**
Asset Administrator	Create, edit, and delete Asset roles.	**Tasks** - **Find Tasks**, **All Tasks**, **Run Tasks** subtabs (synchronize roles) **Roles** - All subtabs
Assign Audit Policies	Assign audit policies to user accounts and organizations.	**Accounts** - **Edit User Audit Policy** from the User Actions list. **Accounts - Edit Organization Audit Policy** from the Organization Actions list.
Assign Organization Audit Policies	Assign audit policies to organizations only.	**Accounts** - **Edit Organization Audit Policy** from the Organization Actions list; **List Accounts** tab
Assign User Audit Policies	Assign audit policies to users only.	**Accounts** - **Edit User Audit Policy** from the User Actions list; **List Accounts** tab; **Find Users** tab
Assign User Capabilities	Change user capabilities assignments (assign and unassign).	**Accounts** - **List Accounts** (Edit only), **Find Users** subtabs. Must be assigned with another user administrator capability (for example, Create User or Enable User).
Audit Policy Administrator	Create, modify, and delete audit policies.	**Compliance - Manage Policies**
Audit Policy Scan Report Administrator	Create, modify, delete, and execute the Audit Policy Scan Report.	**Reports** - Audit Policy Scan reports only

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 3 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Audit Report Administrator	Create, modify, delete, and execute audit reports.	**Reports** - Audit report only
Audited Attribute Report Administrator	Create, modify, delete, and execute the Audited Attribute Report.	**Reports** - Audited Attribute reports only
AuditLog Report Administrator	Create, modify, delete, and execute the AuditLog Report.	**Reports** - AuditLog reports only
Auditor Access Scan Administrator	Create, edit, and delete Periodic Access Review scans	**Compliance - Manage Access Scans**
Auditor Administrator	Set up, manage, and monitor audit policies, audit scans and user compliance.	**Compliance -** All subtabs **Reports** - Run Reports, View Reports, and manage Auditor Reports **Accounts** - Edit User Audit Policies and Edit Organization Audit Policies actions.
Auditor Attestor	Required to attest other users' attestations while organization security is enabled.	**Default only**
Auditor Periodic Access Review Administrator	Manage Periodic Access Reviews (PAR), manage access scans, manage attestations, manage PAR reports.	**Compliance - Manage Access Scans, Access Review** subtabs
Auditor Remediator	Remediate, mitigate, and forward audit policy violations.	**Remediations** - All subtabs
Auditor Report Administrator	Create, modify, delete, and execute any of the Auditor Reports.	**Reports** - all actions on auditor reports
Auditor View User	View compliance information associated with user.	**Accounts** - **List Accounts**, **Find Users** tabs
AuditPolicy Violation History Administrator	Create. modify, delete, and execute the AuditPolicy Violation History report.	**Reports** - AuditPolicy Violation History reports only
Bulk Account Administrator	Perform regular and bulk operations on users, including assigning capabilities.	**Accounts** - All subtabs **Passwords** - All subtabs **Approvals** - All subtabs **Tasks** - All subtabs
Bulk Change Account Administrator	Perform regular and bulk operations except delete on existing users, including assigning capabilities.	**Accounts** - **List Accounts**, **Find Users**, **Launch Bulk Actions** subtabs. Cannot create or delete users. **Passwords** - All subtabs **Approvals** - All subtabs **Tasks** - All subtabs

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 4 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Bulk Change Resource Password Administrator	Change the password for the specified resource connection account on the specified resources.	**Resources -Launch Bulk Actions** subtab
Bulk Change User Account Administrator	Perform regular and bulk operations except delete on existing users.	**Accounts** - **List Accounts, Find Users, Launch Bulk Actions** subtabs. Cannot create, delete, or assign capabilities to users. **Passwords** - All subtabs **Tasks** - All subtabs
Bulk Create User	Assign resources and initiate user create requests (on individual users and by using bulk operations).	**Accounts** - **List Accounts** (Create only), **Find Users**, **Launch Bulk Actions** subtabs **Tasks** - All subtabs
Bulk Delete User	Delete Identity Manager user accounts; deprovision, unassign, and unlink resource accounts (on individual users and by using bulk operations).	**Accounts** - **List Accounts** (Create only), **Find Users**, **Launch Bulk Actions** subtabs Tasks - All subtabs
Bulk Delete IDM User	Delete existing Identity Manager user accounts (on individual users and by using bulk operations).	**Accounts** - **List Accounts** (Delete only), **Find Users**, **Launch Bulk Actions** subtabs **Tasks** - All subtabs
Bulk Deprovision User	Delete and unlink existing resource accounts (on individual users and by using bulk operations).	**Accounts** - **List Accounts** (Deprovision only), **Find Users**, **Launch Bulk Actions** subtabs **Tasks** - All subtabs
Bulk Disable User	Disable existing users and resource accounts (on individual users and by using bulk operations).	**Accounts** - **List Accounts** (Disable only), **Find Users**, **Launch Bulk Actions** subtabs **Tasks** - All subtabs
Bulk Enable User	Enable existing users and resource accounts (on individual users and by using bulk operations).	**Accounts** - **List Accounts** (Enable only), **Find Users**, **Launch Bulk Actions** subtabs **Tasks** - All subtabs
Bulk Reset Resource Password Administrator	Reset the password for the specified resource connection account on the specified resources.	**Resources -Launch Bulk Actions** subtab

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 5 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Bulk Unassign User	Unassign and unlink existing resource accounts (on individual users and by using bulk operations).	**Accounts** - **List Accounts** (Unassign only), **Find Users**, **Launch Bulk Actions** subtabs **Tasks** - All subtabs
Bulk Unlink User	Unlink existing resource accounts (on individual users and by using bulk operations).	**Accounts** - **List Accounts** (Unlink only), **Find Users**, **Launch Bulk Actions** subtabs **Tasks** - All subtabs
Bulk Update User	Update existing users and resource accounts (on individual users and by using bulk operations).	**Accounts** - **List Accounts** (Update only), **Find Users**, **Launch Bulk Actions** subtabs **Tasks** - All subtabs
Bulk User Account Administrator	Perform all regular and bulk operations on users.	**Accounts** - All subtabs **Passwords** - All subtabs **Tasks** - All subtabs
Business Role Administrator	Create, edit, and delete Business Roles.	**Tasks** - **Find Tasks**, **All Tasks**, **Run Tasks** subtabs (synchronize roles) **Roles** - All subtabs
Capability Administrator	Create, modify, and delete capabilities.	**Configure** - **Capabilities** subtab
Change Account Administrator	Perform all operations except delete on existing users, including assigning capabilities. Does not include bulk operations	**Accounts** - All subtabs. Cannot delete users. **Passwords** - All subtabs **Approvals** - All subtabs **Tasks** - All subtabs **Reports** - Create admin and user reports, run and edit admin reports, run AuditLog reports in scope. Cannot run admin and user reports on out-of-scope organizations.
Change Active Sync Resource Administrator	Change active sync resource parameters.	**Tasks** - **Find Tasks**, **All Tasks**, **Run Tasks** subtabs **Resources** - For Active Sync resources: Edit actions menu, Edit Active Sync Parameters

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 6 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Change Password Administrator	Change user and resource account passwords.	**Accounts - List Accounts, Find Users** subtabs (Change Password only) **Passwords** - All subtabs **Tasks** - All subtabs. Export Password Scan task only (from **Run Tasks** subtab)
Change Password Administrator (Verification Required)	Change user and resource account passwords following successful validation of the user's authentication question answers.	**Accounts - List Accounts, Find Users** subtabs (Change Password only; verification required before action) **Passwords** - All subtabs **Tasks** - All subtabs. Export Password Scan task only (from **Run Tasks** subtab)
Change Resource Password Administrator	Change resource administrator account passwords.	**Tasks -** All subtabs **Resources - List Resources** subtab. Change resource password only (from **Manage Connection-->Change Password** in the actions menu)
Change User Account Administrator	Perform all operations except delete on existing users. Does not include bulk operations	**Accounts** - **List Accounts, Find Users** subtabs. Cannot create, delete, or assign capabilities to users. **Passwords** - All subtabs **Tasks** - All subtabs
Configure Audit	Configure the events and configuration groups audited in the system.	**Configure** - **Audit Events** subtab
Configure Certificates	Configure trusted certificates and CRLs.	**Security - Certificates** subtab
Control Active Sync Resource Administrator	Control Active Sync resource state (such as start, stop, and refresh)	**Tasks** - **Find Tasks**, **All Tasks**, **Run Tasks** **Resources** - For Active Sync resources: Active Sync actions menu (all selections)
Create User	Assign resources and initiate user create requests. Does not include bulk operations	**Accounts** - **List Accounts** (Create only), **Find Users** subtabs **Tasks** - All subtabs
Data Warehouse Administrator	Configure Data Exporter and run the Data Warehouse Exporter Launcher task.	**Configure** - **Warehouse** subtab
Data Warehouse Query	Configure and run forensic queries	Compliance / Forensic Query

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 7 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Debug	Access and execute operations from the Identity Manager debug pages.	The Identity Manager debug pages cannot be accessed from the menu. To access the debug pages, type the following URL into your browser: `http://<AppServerHost>:<Port>/idm/debug`
Delete User	Delete Identity Manager user accounts; deprovision, unassign, and unlink resource accounts. Does not include bulk operations.	**Accounts** - **List Accounts** (Delete only), **Find Users** subtabs **Tasks** - All subtabs
Delete IDM User	Delete Identity Manager user accounts. Does not include bulk operations.	**Accounts** - **List Accounts** (Delete only), **Find Users** subtabs **Tasks** - All subtabs
Deprovision User	Delete and unlink existing resource accounts. Does not include bulk operations.	**Accounts** - **List Accounts** (Deprovision only), **Find Users** subtabs **Tasks** - All subtabs
Disable User	Disable existing users and resource accounts. Does not include bulk operations	**Accounts** - **List Accounts** (Disable only), **Find Users** subtabs **Tasks** - All subtabs
Enable User	Enable existing users and resource accounts. Does not include bulk operations	**Accounts** - **List Accounts** (Enable only), **Find Users** subtabs **Tasks** - All subtabs
End User Administrator	View and modify the rights to object types specified in the End User capability and the End User Controlled Organizations rule.	NA
IDM Schema Configuration	View and configure the effective schema for Users or Roles using the Identity Manager configuration object `IDM Schema Configuration`.	NA
Import User	Import users from defined resources.	**Accounts** - **Extract to File**, **Load from File**, **Load from Resource** subtabs
Import/Export Administrator	Import and export all types of objects.	**Configure** - **Import Exchange File** subtab
IT Role Administrator	Create, edit, and delete IT Roles.	**Tasks** - **Find Tasks**, **All Tasks**, **Run Tasks** subtabs (synchronize roles) **Roles** - All subtabs
Login Administrator	Edit the set of login modules for a given login interface.	**Configure** - **Login** subtab

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 8 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Organization Administrator	Create, edit, and delete organizations.	**Accounts** - **List Accounts** subtab (Edit and create organizations and directory junctions, delete organizations only)
Organization Approver	Approve requests for new organizations.	**Work Items - Approvals** subtab
Organization Violation History Administrator	Create. modify, delete, and execute the Organization Violation History report.	**Reports** - Organization Violation History reports only
Password Administrator	Change and reset user and resource account passwords.	**Accounts** - **List Accounts** (list, change, and reset passwords only), **Find Users** subtabs **Passwords** - All subtabs **Tasks** - All subtabs
Password Administrator (Verification Required)	Change and reset user and resource account passwords following successful validation of the user's authentication question answers.	**Accounts** - **List Accounts** (list, change, and reset passwords only; verification required before action succeeds), **Find Users** subtabs **Passwords** - All subtabs **Tasks** - All subtabs
Policy Administrator	Create, edit, and delete Policies.	**Configure** - **Policy** subtab
Policy Summary Report Administrator	Create, modify, delete, and execute the Policy Summary Report.	**Reports** - Policy Summary reports only
Product Registration	Register an installation of Identity Manager with Sun Microsystems or create a local service tag.	**Configure** - **Product Registration** subtab
Reconcile Administrator	Edit reconciliation policies and control reconciliation tasks.	**Server Tasks** - All subtabs (View reconcile task). **Resources** - **List Resources** subtab
Reconcile Report Administrator	Create, edit, delete, and run reconciliation reports.	**Reports** - **Run Reports** (Account Index report only), **Manage Reports** subtabs
Reconcile Request Administrator	Manage reconciliation requests.	**Tasks** - All subtabs **Resources** - **List Resources** subtab (list and reconciliation features only)
Remedy Integration Administrator	Modify Remedy integration configuration.	**Tasks** - All subtabs (view tasks, run role synchronization) **Configure** - **Remedy Integration** subtab
Rename User	Rename existing users and resource accounts.	**Accounts** - List Accounts subtab (list all accounts in scope, rename users)

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 9 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Report Administrator	Configure audit settings and run all report types.	**Tasks** - All subtabs (view tasks, run role synchronization) **Reports** - All subtabs
Reset Password Administrator	Reset user and resource account passwords.	**Accounts - List Accounts, Find Users** subtabs (Reset Password only) **Passwords** - All subtabs **Tasks** - All subtabs. Export Password Scan task only (from **Run Tasks** subtab)
Reset Password Administrator (Verification Required)	Reset user and resource account passwords following successful validation of the user's authentication question answers.	**Accounts - List Accounts, Find Users** subtabs (Reset Password only; verification required before action succeeds) **Passwords** - All subtabs **Tasks** - All subtabs. Export Password Scan task only (from **Run Tasks** subtab)
Reset Resource Password Administrator	Reset resource administrator account passwords.	**Tasks** - **Find Tasks**, **All Tasks**, **Run Tasks** subtabs **Resources - List Resources** subtab. Reset resource password only (from **Manage Connection -->Reset Password** in the actions menu)
Resource Administrator	Create, modify, and delete resources.	**Reports** - Resource user report, resource group report returns error on out-of-scope resources. **Resources** - **List Resources** subtab (edit global policy, edit parameters, resource groups. Cannot manage connection or resource objects).
Resource Approver	Approve resource assignments	**Work Items - Approvals** subtab
Resource Group Administrator	Create, edit, and delete resource groups.	**Resources** - **List Resource Groups** subtab
Resource Object Administrator	Create, modify, and delete resource objects.	**Tasks** - **Find Tasks**, **All Tasks**, **Run Tasks** subtabs (view tasks involving resource objects). **Resources** - **List Resources** subtab (list and manage resource objects only)

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 10 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Resource Password Administrator	Change and reset resource proxy account passwords.	**Tasks** - **Find Tasks**, **All Tasks**, **Run Tasks** subtabs **Resources - List Resources** subtab. Change resource password only (from **Manage Connection-->Change Password** in the actions menu)
Resource Report Administrator	Create, edit, delete, and run resource reports.	**Reports** - All subtabs (resource reports only)
Resource Violation History Administrator	Create. modify, delete, and execute the Resource Violation History report.	**Reports** - Resource Violation History reports only
Risk Analysis Administrator	Create, edit, delete, and run risk analysis.	**Risk Analysis** - All subtabs
Role Administrator	Create, modify, and delete roles.	**Tasks** - **Find Tasks**, **All Tasks**, **Run Tasks** subtabs (synchronize roles) **Roles** - All subtabs
Role Approver	Approve role assignments	**Work Items - Approvals** subtab
Role Report Administrator	Create, edit, delete, and run resource reports.	**Reports** - Role reports only
Run Access Review Detail Report	Run the Access Review Detail Report	**Reports** - Access Review Detail Report only
Run Access Review Summary Report	Run the Access Review Summary Report	**Reports** - Access Review Summary Report only
Run Admin Report	Run administrator reports.	**Reports** - Admin reports only
Run Audit Policy Scan Administrator	Run and manage the Audit Policy Scan Report	Reports - Audit Policy Scan report only
Run Audit Policy Scan Report	Run the Audit Policy Scan Report.	**Reports** - Audit Policy Scan reports only
Run Audit Report	Run audit reports.	**Reports** - AuditLog and Usage reports only
Run Audited Attribute Report	Execute the Audited Attribute Report.	**Reports** - Audited Attribute reports only **Reports > View Dashboards**
Run Auditor Report	Run any Auditor Report.	**Reports** - any auditor report **Reports > View Dashboards**
Run AuditLog Report	Execute the AuditLog Report.	**Reports** - AuditLog reports only

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 11 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Run AuditPolicy Violation History	Execute the Organization Violation History report.	**Reports** - AuditPolicy Violation History reports only **Reports > View Dashboards**
Run Policy Summary Report	Execute the Policy Summary Report.	**Reports** - Policy Summary reports only
Run Organization Violation History	Execute the Organization Violation History report.	**Reports** - Organization Violation History reports only **Reports > View Dashboards**
Run Reconcile Report	Run reconciliation reports.	**Reports** - AuditLog and Usage reports only
Run Resource Report	Run resource reports.	**Reports** - AuditLog and Usage reports only
Run Resource Violation History	Execute the Resource Violation History report.	**Reports** - Resource Violation History reports only
Run Risk Analysis	Run risk analysis.	**Reports -** Run Risk Analysis, View Risk Analysis subtabs
Run Role Report	Run role reports.	**Reports** - Role reports only
Run Separation of Duties Report	Run a Separation of Duties Report	**Report**s - Separation of Duties Report only **Reports > View Dashboards**
Run Task Report	Run task reports.	**Reports** - Task reports only
Run User Access Report	Execute the Detailed User Report.	**Reports** - User Access reports only **Reports > View Dashboards**
Run User Report	Run user reports.	**Reports** - User reports only
Run Violation Summary Report	Execute the Violation Summary report.	**Reports** - Violation Summary reports only **Reports > View Dashboards**

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 12 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Security Administrator	Create users with capabilities; manage encryption keys, login configuration, and policies.	**Accounts** - **List Accounts** (delete, create, update, edit, change and edit passwords), **Find Users** subtabs (audit report)
		Passwords - All subtabs
		Tasks - **Find Tasks**, **All Tasks**, **Run Tasks** subtabs
		Reports - All subtabs
		Resources - **List Resources** (list and control resource objects)
		Security - **Policies**, **Login** subtabs
Separation of Duties Report Administrator	Create, edit, run, and delete a Separation of Duties Report.	**Report**s - all actions for Separation of Duties Report only
Service Provider Admin Role	Manage Service Provider Admin Roles and the associated rules.	**Security - Admin Roles** tab
Service Provider Administrator	Create, edit, and manage service provider users and transactions; configure the transaction database and tracked events.	**Accounts - Manage Service Provider Users** subtab
		Server Tasks > Service Provider Transactions tab
		Reports > View Dashboards tab
		Reports > Dashboard Configuration tab
		Service Provider - all subtabs
Service Provider Create User	Create user accounts for service provider (extranet) users.	**Accounts - Manage Service Provider Users** subtab
Service Provider Delete User	Delete a service provider user account.	**Accounts - Manage Service Provider Users** subtab
Service Provider Update User	Update a service provider user account.	**Accounts - Manage Service Provider Users** subtab
Service Provider User Administrator	Manage service provider (extranet) users.	**Accounts > Manage Service Provider Users** - all subtabs
Service Provider View User	View service provider (extranet) user account information.	**Accounts - Manage Service Provider Users** subtab
SPML Access	Allows access to the Service Provisioning Markup Language (SPML) features in Identity Manager.	**Security - Capabilities** subtab
Task Report Administrator	Create, edit, delete, and run task reports.	**Reports** - Task Report only.

Table D-1 Identity Manager Task-Based Capabilities Definitions (Page 13 of 13)

Capability	Allows the Administrator/User to:	Can Access These Tabs and Subtabs:
Unassign User	Unassign and unlink existing resource accounts. Does not include bulk operations.	**Accounts** - **List Accounts** (Unassign only), **Find Users** subtabs **Tasks** - All subtabs
Unlink User	Unlink existing resource accounts. Does not include bulk operations.	**Accounts** - **List Accounts** (Unlink only), **Find Users** subtabs **Tasks** - All subtabs
Unlock User	Unlock existing user's resource accounts that support unlock. Does not include bulk operations.	**Accounts** - **List Accounts** (Unlock only), **Find Users** subtabs **Tasks** - **Find Tasks**, **All Tasks**, **Run Tasks** subtabs
Update User	Edit existing users and initiate user update requests.	**Accounts** - Edit and update users **Tasks** - Manage existing tasks (from the **All Tasks** subtab)
User Access Report Administrator	Create, run, edit, and delete a User Access Report	**Reports** - User Access Report only **Reports > View Dashboards**
User Account Administrator	All operations on users.	**Accounts** - **List Accounts**, **Find Users**, **Extract to File**, **Load from File**, **Load from Resource** subtabs. Cannot assign user capabilities (**Security** form tab on **List Accounts** subtab). **Tasks** - **Find Tasks**, **All Tasks**, **Run Tasks** subtabs
User Report Administrator	Create, edit, delete, and run user reports.	**Reports** - Run user reports.
View User	View individual user details.	**Accounts** - Select users from the list to view individual user account information. No change actions allowed.
Violation Summary Report Administrator	Create. modify, delete, and execute the Violation Summary report.	**Reports** - Violation Summary reports only **Reports > View Dashboards**
Waveset Administrator	Perform system-wide tasks, such as modification of system configuration objects.	**Server Tasks** - All subtabs. Synchronize roles, edit source adapter template, and schedule reports **Reports** - All subtabs **Resources** - List Resources (list only; no change actions allowed) **Configure** - **Audit**, **Email Templates**, **Form and Process Mappings**, and **Servers** subtabs

Functional Capabilities Definitions

Functional capabilities consist of task-based capabilities, as well as other functional capabilities.

Account Administrator

- Approver Administrator
  - Organization Approver
  - Resource Approver
  - Role Approver
- Assign User Capabilities
- SPML Access
- User Account Administrator
  - Create User
  - Delete User
    - Delete IDM User
    - Deprovision User
    - Unassign User
    - Unlink User
  - Disable User
  - Enable User
  - Password Administrator
    - Change Password Administrator
    - Reset Password Administrator
  - Rename User
  - Unlock User
  - Update User
  - View User
  - Import User

Admin Role Administrator

Auditor Administrator

- Assign Audit Policies
  - Assign Organization Audit Policies
  - Assign User Audit Policies
- Audit Policy Administrator
  - Auditor View User
- Auditor Periodic Access Review Administrator
  - Auditor Access Scan Administrator
- Auditor Report Administrator
- Password Administrator
- User Account Administrator
- Assign User Capabilities

Auditor Report Administrator

- Access Review Detail Report Administrator
  - Run Access Review Detail Report
- Access Review Summary Report Administrator
  - Run Access Review Summary Report
- Audit Policy Scan Report Administrator
  - Run Audit Policy Scan Report
- Audited Attribute Report Administrator
  - Run Audited Attribute Report
- AuditPolicy Violation History Administrator
  - Run Audit Policy Violation History Report
- Organization Violation History Administrator
  - Run Organization Violation History Report
- Policy Summary Report Administrator

- Resource Violation History Administrator
  - Run Resource Violation History Report
- Run Auditor Report
- Separation of Duties Report Administrator
  - Run Separation of Duties Report
- User Access Report Administrator
  - Run User Access Report
- Violation Summary Report Administrator

Auditor View User

- View User

Bulk Account Administrator

- Approver Administrator
- Assign User Capabilities
- Bulk User Account Administrator
  - Bulk Create User
  - Bulk Delete User
    - Bulk Delete IDM User
    - Bulk Deprovision User
    - Bulk Unassign User
    - Bulk Unlink User
  - Bulk Disable User
  - Bulk Enable User
  - Password Administrator
  - Rename User
  - Unlock User
  - View User
  - Import User

Bulk Change Account Administrator

- Approver Administrator
- Assign User Capabilities
- Bulk Change User Account Administrator
  - Bulk Disable User
  - Bulk Enable User
  - Bulk Update User
  - Password Administrator
  - Rename User
  - Unlock User
  - View User

Bulk Resource Administrator

- Change Active Sync Resource Administrator
- Control Active Sync Resource Administrator
- Resource Group Administrator

Bulk Resource Password Administrator

- Bulk Change Resource Password Administrator
- Bulk Reset Resource Password Administrator

Capability Administrator

Change Account Administrator

- Approver Administrator
- Assign User Capabilities
- Change User Account Administrator
  - Password Administrator
    - Change Password Administrator
    - Reset Password Administrator
  - Disable User

- Enable User
- Rename User
- Unlock User
- Update User
- View User

Configure Certificates

Data Warehouse Administrator

Data Warehouse Query

Debug

End User Administrator

IDM Schema Configuration

Import/Export Administrator

License Administrator

Login Administrator

Meta View Administrator

Organization Administrator

Password Administrator (Verification Required)

- Change Password Administrator (Verification Required)
- Reset Password Administrator (Verification Required)

Policy Administrator

Product Registration

Reconcile Administrator

- Reconcile Request Administrator

Remedy Integration Administrator

Report Administrator

- Admin Report Administrator
  - Run Admin Report
- Audit Report Administrator
  - Run Audit Report
- Auditor Report Administrator
  - Access Review Detail Report Administrator
    - Run Access Review Detail Report
  - Access Review Summary Report Administrator
    - Run Access Review Summary Report
  - Audit Policy Scan Report Administrator
    - Run Audit Policy Scan Report
  - Audited Attribute Report Administrator
    - Run Audited Attribute Report
  - AuditLog Report Administrator
    - Run AuditLog Report
  - AuditPolicy Violation History Administrator
    - Run AuditPolicy Violation History
  - Organization Violation History Administrator
    - Run Organization Violation History
  - Policy Summary Report Report Administrator
    - Run Policy Summary Report
  - Reconcile Report Administrator
    - Run Reconcile Report
  - Resource Violation History Administrator
    - Run Resource Violation History

- Run Auditor Report
  - Run Access Review Detail Report
  - Run Access Review Summary Report
  - Run Audit Policy Scan Report
  - Run Audited Attribute Report
  - Run AuditLog Report
  - Run AuditPolicy Violation History
  - Run Organization Violation History
  - Run Policy Summary Report
  - Run Resource Violation History
  - Run Separation of Duties Report
  - Run User Access Report
  - Run Violation Summary Report
- Separation of Duties Report Administrator
  - Run Separation of Duties Report
- User Access Report Administrator
  - Run User Access Report
- Violation Summary Report Administrator
  - Run Violation Summary Report

- Reconcile Report Administrator
  - Run Reconcile Report
- Resource Report Administrator
  - Run Resource Report
- Risk Analysis Administrator
  - Run Risk Analysis
- Role Report Administrator
  - Run Role Report

- Task Report Administrator
  - Run Task Report
- User Report Administrator
  - Run User Report
- Configure Audit

Resource Administrator

- Change Active Sync Resource Administrator
- Control Active Sync Resource Administrator
- Resource Group Administrator

Resource Object Administrator

Resource Password Administrator

- Change Resource Password Administrator
- Reset Resource Password Administrator

Role Administrator

- Application Administrator
- Asset Administrator
- Business Role Administrator
- IT Role Administrator

Security Administrator

Service Provider Administrator

- Service Provider User Administrator
  - Service Provider Create User
  - Service Provider Delete User
  - Service Provider Update User
  - Service Provider View User

Service Provider Admin Role Administrator

Waveset Administrator

Glossary

access review An audited process that enables managers or other responsible parties to review and certify user access privileges. User entitlement records can be automatically approved or rejected, or, they can be manually attested. Also see *attestation*.

account attribute Account attributes provide a way for Identity Manager administrators to create a standard set of names that map to attributes on managed resources. For example, an Identity Manager attribute named *fullname* might map to the *displayName* attribute on Active Directory resources, and the *cn* attribute on LDAP resources. Any changes to the user's *fullname* attribute in Identity Manager, is then passed to the user's *displayName* and *cn* attributes on the user's remote resource accounts.

admin role Unique set of capabilities for each set of organizations assigned to an administrative user.

administrator Person who configures Identity Manager or is responsible for operational tasks, such as creating users and managing access to resources.

administrator interface User interface used by administrators to configure and manage Identity Manager.

Application (Role) One of the four role types in Identity Manager, the Application role-type is a collection of resources, and/or resource groups, and/or specific applications on resources, that users need in order to do their jobs. Application roles cannot be assigned directly to users, but can be assigned to IT Roles and Business Roles.

approval The process of granting or denying a user access request to a role, a resource, or an organization. An Identity Manager administrator with permission to view and respond to an approval work item is called an *approver*.

approver User with administrative capabilities responsible for approving or rejecting access requests.

Asset (Role) One of the four role types in Identity Manager, the Asset role-type is (typically) reserved for non-connected and/or non-digital resources that require manual provisioning—for example, mobile phones and portable computers. Asset roles cannot be assigned directly to users, but can be assigned to IT Roles and Business Roles.

attest An action performed by an attestor during an access review to confirm that a user entitlement is appropriate.

attestation The process of certifying that a specific user has the appropriate privileges on the appropriate resources at a specific point in time. An Identity Manager user with permission to view and respond to an attestation work item is called an *attestor*. Identity Manager rules determine whether a user entitlement record needs to be manually attested, or if it can be automatically approved or rejected.

attestation task A logical collection of user entitlement reviews requiring attestation. User entitlements are grouped into a single attestation task if they are assigned to the same attestor and produced from the same access review instance.

attestor User who accepts responsibility for certifying (*attesting*) that a user entitlement is appropriate. An attestor has extended privileges in Identity Manager that are necessary to manage user entitlements requiring attestation.

Business Role One of the four role types in Identity Manager, Business Roles are used to organize into groups the access rights that people who do similar tasks in an organization need. The Business Role role-type is made up of one or more Asset roles, Application roles, and/or IT Roles. Business Roles are meant to be directly assigned to users.

business process editor (BPE) Graphical view of Identity Manager forms, rules, and workflow provided with Identity Manager versions prior to 7.0. The BPE has been replaced by the Identity Manager IDE in the current versions of Identity Manager. See *Identity Manager IDE*.

capability A group of access rights for user accounts that governs actions performed in Identity Manager; a low-level access control within Identity Manager.

delegation The process of temporarily assigning future work items to one or more other users for a specified period of time.

directory junction Hierarchically related set of organizations that mirrors a directory resource's actual set of hierarchical containers. Each organization in a directory junction is a *virtual organization*.

entitlement See *user entitlement*

escalation timeout A time range specified for a work item request in which the assigned work item owner has to respond before the Identity Manager process sends it to the next assigned responder.

form Object associated with a Web page that contains rules about how a browser should display user view attributes on that page. Forms can incorporate business logic, and are often used to manipulate view data before it is presented to the user.

IDE *See* Identity Manager IDE.

Identity Manager IDE The Identity Manager Integrated Development Environment (IDE) is an application that enables you to view, customize, and debug Identity Manager objects in your deployment. The IDE is available as a NetBeans plug-in.

identity template Defines the user's resource account name.

IT Role One of the four role types in Identity Manager, the IT Role role-type is a collection of roles (Assets, Applications, and/or other nested IT Roles), as well as resources, and/or resource groups. In some configurations, IT Roles can be directly assigned to users, but usually IT Roles are assigned to Business Roles, which are assigned to users.

organization Identity Manager container used to enable administrative delegation.

Organizations define the scope of entities (such as user accounts, resources, and administrator accounts) an administrator controls or manages. Organizations provide a "where" context, primarily for Identity Manager administrative purposes.

periodic access review An access review that is performed at periodic intervals, for example, every calendar quarter.

policy Establishes limitations for Identity Manager accounts.

Identity Manager policies establish user, password, and authentication options, and are tied to organizations or users. Resource password and account ID policies set rules, allowed words, and attribute values, and are tied to individual resources.

reconciliation An Identity Manager feature that periodically compares resource accounts in Identity Manager with accounts that reside on the resources themselves. Reconciliation correlates account data and highlights differences.

remediation The process of correcting compliance violations discovered by Identity Manager's auditing feature. Identity Manager audits data across the enterprise to ensure compliance with internal and external policies and regulations. An administrator with permission to view and respond to policy violations is called a *remediator*.

remediator An Identity Manager user specified as the assigned remediator for an audit policy.

When Identity Manager detects a compliance violation that requires remediation, it creates a remediation work item and sends the work item to the remediator's work item list.

resource In Identity Manager, a resource stores information about how to connect to a remote resource or system on which accounts are created. Remote resources to which Identity Manager provides access include mainframe security managers, databases, directory services, applications, operating systems, ERP systems, messaging platforms, and more.

resource adapter Identity Manager component that provides a link between the Identity Manager engine and the resource.

This component enables Identity Manager to manage user accounts on a given resource (including create, update, delete, authenticate, and scan capabilities) as well as utilize that resource for pass-through authentication.

resource adapter account Credentials used by an Identity Manager resource adapter to access a managed resource.

resource group Collection of resources used to order the creation, deletion, and update of user resource accounts.

resource wizard Identity Manager tool that steps through the resource creation and modification process, including setup and configuration of resource parameters, account attributes, identity template, and Identity Manager parameters.

role A role is an Identity Manager object that allows resource access rights to be grouped and efficiently assigned to users. Roles are organized into four role types: Business Roles, IT Roles, Application Roles, and Assets. IT Roles, Applications, and Assets organize resource entitlements into groups. These three groups are then assigned to Business Roles so that users can access the resources they need to do their jobs.

rule Object in the Identity Manager repository that contains a function written in XPRESS, XML Object, or JavaScript languages. Rules provide a mechanism for storing frequently used logic or static variables for reuse within forms, workflows, and roles.

schema List of user account attributes for a resource.

schema map Map of resource account attributes to Identity Manager account attributes for a resource.

Identity Manager account attributes create a common link to multiple resources and are referenced by forms.

service provider users Extranet users, or customers of a service provider that are distinguished separately from the service provider company's personnel or intranet users.

user Person who holds an Identity Manager system account. Users can hold a range of capabilities in Identity Manager. Those with extended capabilities are Identity Manager *administrators*.

user account Account created using Identity Manager.

Can refer to either an Identity Manager account, or an account on a remote resource managed by Identity Manager. The user account setup process is dynamic. Information or fields to be completed depend on the resources provided to the user directly or indirectly through role assignment.

user entitlement In Identity Manager, an auditable access privilege granted to a user on a resource or system that enforces access restrictions.

user interface In Identity Manager, the user interface allows users without administrative capabilities to perform a range of self-service tasks such as changing passwords, setting answers to authentication questions, and managing delegated assignments. Also known as the *end-user interface*

virtual organization Organization defined within a directory junction. *See* directory junction.

workflow A logical, repeatable process during which documents, information, or tasks are passed from one participant to another. Identity Manager workflows comprise multiple processes that control creation, update, enabling, disabling, and deletion of user accounts.

work items an action request generated by an Identity Manager workflow, form, or procedure. Approvals, change-approvals, attestations, and remediations are four kinds of work item.

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