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JASPERREPORTS SERVER

ADMINISTRATOR GUIDE

RELEASE 5.6

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Chapter 1 Overview of JasperReports Server Administration

JasperReports Server builds on JasperReports Library as a comprehensive family of Business Intelligence (BI) products, providing robust static and interactive reporting, report server, and data analysis capabilities. These capabilities are available as either stand-alone products, or as part of an integrated end-to-end BI suite utilizing common metadata and providing shared services, such as security, a repository, and scheduling.

The heart of the Jaspersoft BI Suite is the server, which provides the ability to:

- Easily view and explore your data in the web-based drag-and-drop Ad Hoc Editor interface.
- Efficiently and securely manage many reports.
- Interact with reports, including sorting, filtering, formatting, entering parameters and drilling on data.
- Arrange reports and web content to create appealing, data-rich Jaspersoft Dashboards that quickly convey business trends.

Jaspersoft OLAP is an optional component of JasperReports Server, controlled by licence and described in its own user guide.

While the Ad Hoc Editor lets users create simple reports, more complex reports can be created outside of the server. You can use Jaspersoft iReport Designer (hereafter called “iReport”) or write your own JRXML code to create a report that can be run in the server. Jaspersoft recommends that you use iReport unless you have a thorough understanding of the JasperReports Library file structure. See the *JasperReports Server User Guide* for more information.

Jaspersoft provides several other source of information to help extend your knowledge of JasperReports Server:

- Our Ultimate Guides document advanced features, best practices, and numerous examples. Customers can download them freely from the Jaspersoftonline store.
- Our free Business Intelligence Tutorials let you learn at your own pace, and cover topics for developers, administrators, business users, and data integrators. The tutorials are available online in the Professional Services section of our website.

Our free samples, which are installed with JasperReports Library,Jaspersoft iReport Designer, and JasperReports Server, are documented online. The samples documentation can be found on our community website.

This administrator guide describes features that are only available to users who have administrator roles. Many of the configuration procedures also assume you have unlimited access to the JasperReports Server host computer.

This chapter contains the following sections:

- **Overview of Organizations**
- **Overview of the Repository**

- **Overview of Users and Roles**
- **Overview of Security**
- **Administrator Login**
- **Administrator Pages**

This section describes functionality that can be restricted by the software license for JasperReports Server. If you don't see some of the options described in this section, your license may prohibit you from using them. To find out what you're licensed to use, or to upgrade your license, contact Jaspersoft.

JasperReports Server is a component of both a community project and commercial offerings. Each integrates the standard features such as security, scheduling, a web services interface, and much more for running and sharing reports. Commercial editions provide additional features, including Ad Hoc charts, flash charts, dashboards, Domains, auditing, and a multi-organization architecture for hosting large BI deployments.

1.1 Overview of Organizations

The architecture of the commercial version of JasperReports Server is built on organizations, which are logical entities within JasperReports Server that have their own users, roles, and branches of the repository. As with any business structure or hierarchy, organizations may have suborganizations, which in turn may have suborganizations, and so on.

In the default JasperReports Server installation, there is a single organization that mimics the simple structure of older versions of JasperReports Server. If you want to deploy multiple organizations, there are certain design considerations you must be aware of.

Organizations are not available in the community version of JasperReports Server.

1.1.1 Single Default Organization

After a default installation, JasperReports Server contains a single organization in which you can deploy your reports. For example, if you install the sample data, you see a single organization that holds all sample resources, users, and roles.

Single organizations are designed to handle most business cases and are straightforward to administer. Even in a single organization, there is a system admin and an organization admin that share administrative duties. If the needs of your business call for more organizations, you must manage several levels of administrators and possibly create shared resources in the repository. The following sections provide use cases and explain the functioning of multiple levels of administrators.

1.1.2 Multiple Organizations

There are many scenarios for defining multiple organizations in JasperReports Server. For instance:

- An application provider, such as a software-as-a-service (SaaS) company or a computer department, has a hosted application being offered to many customers. It integrates JasperReports Server in its application in order to offer dashboards, reports, and analysis. There are a number of common reports and data sources that are useful across customers, but there are customer specific reports, as well. Machines and databases are shared by customers, according to the provider's own architecture, but within the functionality provided by

JasperReports Server, each customer is a separate organization. Customers can manage their own users in the hosted application, and JasperReports Server maps the application's authentication scheme to the correct organization. The organization mechanism provides the full power of JasperReports Server to each of the provider's customers, while ensuring that their data and reports are secure.

- A company has many departments but wants to consolidate the BI environment so that all departments are sharing a common BI infrastructure. Corporate IT only needs to deploy and maintain a single instance of JasperReports Server, and each department is represented by an organization that manages its own users. For security and simplicity, the departments do not share databases, except in the case of sub-departments, such as Accounts Payable being a sub-department of Finance. Users access JasperReports Server directly, logging in with their department name and user name. Organization administrators have defined the data sources and Domains specific to the needs of their department's users.

The organization feature is flexible enough to accommodate any combination of these scenarios and many like it. In all cases, administrators can configure secure environments for any number of organizations, and end-users experience a powerful BI platform that is tailored to their needs.

Each organization or hierarchy of organizations co-exists independently in the same instance of JasperReports Server, which isolates neighboring organizations from each other but allows parent organizations to have full control over their suborganizations. Users may access only the data and resources in their organization or a suborganization, and administrators may define roles and set permissions to further restrict access.

1.1.3 Levels of Administrators

Each organization has an administrator who can manage users, roles, and repository permissions in that organization. The administration of organizations is hierarchical, meaning that the administrator can also manage all users and roles in suborganizations of any level.

There are essentially three levels of administration:

- The system administrator – Also called *system admin*. The ID of the system admin is `superuser`. He exists at the root level, outside all organizations. The system admin manages the JasperReports Server installation, creates top-level organizations, and configures server-wide settings. The system admin can create, modify, and delete users, roles, and repository objects of any organization.
- The administrator of a top-level organization – Also called *organization admin*. The organization admin manages all users, roles, and repository objects in an entire organization, including any suborganizations. The default login name of the organization admin is `jasperadmin`.
- The administrator of a suborganization – Functionally equivalent to an organization admin, but due to the hierarchy of organizations, manages a limited set of user, roles, and repository objects and may be overridden by a top-level organization admin.

The most important distinction is between the system admin and organization admin. Even in the case of a single default organization, there is a system admin for server settings, and an organization admin for the single organization. The system admin can manage all users and the entire repository, but sometimes it is more convenient to use the organization admin to do this because the organization admin sees the repository in the same way as the organization users.

When there are suborganizations, the administrator of the parent organization can either manage their users and roles, or delegate those tasks to an administrator in each suborganization. The administrator of a suborganization is limited to accessing resources and managing users and roles in the suborganization, thereby maintaining the security of the parent organization and any of the parent's other suborganizations.

1.2 Overview of the Repository

The repository is a hierarchical structure of folders where JasperReports Server, administrators, and users store resources for creating, running, and viewing reports. In its appearance and function, the repository resembles a file system with a structure of folders containing files. However, the repository is actually implemented as a database that is private to the server instance. As a result, it lacks a few of the functions of a file system.

1.2.1 Folder Structure

The root of the repository tree structure is accessible only to the system admin logged in as `superuser` (as shown in **Figure 1-1**) in the commercial edition, or `jasperadmin` in the community edition. The tree contains the folders for each organization (in the commercial edition), and folders for certain configuration settings.

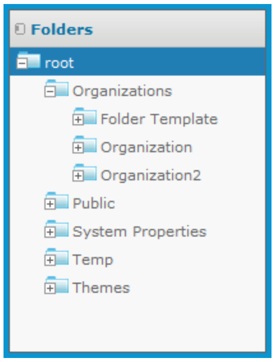


Figure 1-1 Root of the Repository Showing Default Folders

In the repository, each organization has its own branch, contained in a folder named after the organization. Each organization's top-level folder also contains a folder called Organizations so that suborganizations can be created.

Figure 1-1 shows the superuser's view, starting at root. In the Organizations folder there is a folder for the default organization, which is named Organization. This figure also shows a second top-level organization. Commercial edition users logged in as `jasperadmin` will see a similar structure.

JasperReports Server automatically restricts every user's access to their own organization's branch of the repository. System admins (`superuser`) can view and create folders in all organizations, while organization admins (`jasperadmin`) can only view and create folders in the organizations they administer. In general, Jaspersoft recommends that you avoid placing resources directly in the root or organization folder. Instead, use folders for various resource types, as in the sample data.

1.2.2 Resources

Resources are stored in the repository and used as input for creating reports and performing analysis. Some resources, such as images, fonts, or JRXML files created in iReport, are uploaded from files. Others, such as data sources and Domains, are created in JasperReports Server itself. Of course, dashboards, view, and reports can also be saved in the repository to be run as often as needed, and output such as PDF or HTML can be saved in the repository as well.

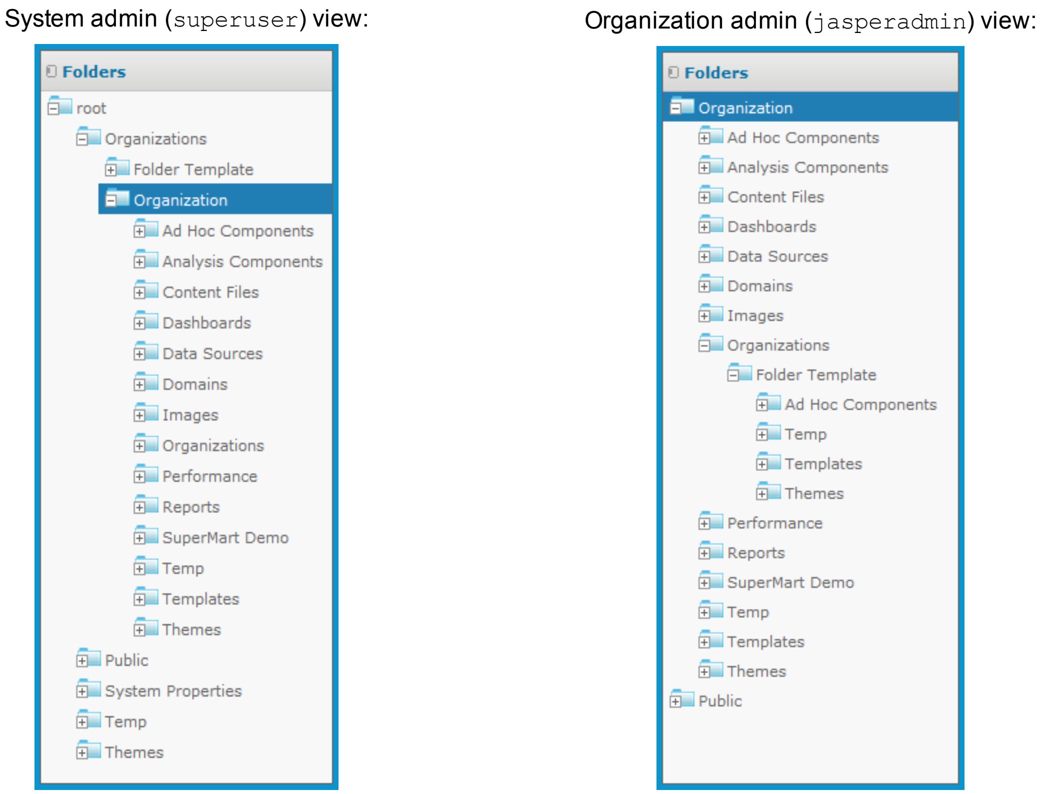
All resources, including folders, have a unique ID, a name, and an optional description. The ID of a resource, along with the ID of its enclosing folders creates a path that can be used to reference resources. The name and description appear in the user interface when browser or searching the repository.

Resources are stored in an internal format that is not accessible to users or administrators, although certain objects can be downloaded to your file system in an output format such as XML. Any resource may be exported with the `js-export` utility, but the resulting files are for backup or transfer to another JasperReports Server instance and cannot be modified.

JasperReports Server restricts access to folders and resources based on organizations, user names, and roles. The system admin and organization admin can define permissions as explained in **1.3, "Overview of Users and Roles," on page 17**.

1.2.3 Sample Data

When you install the sample data in JasperReports Server, the default organization (Organization) has sample content. In **Figure 1-2**, you can see the folders containing the sample resources, as seen by the system admin and default organization admin.



System admin (`superuser`) view:

Folders

- root
  - Organizations
    - Folder Template
    - Organization
      - Ad Hoc Components
      - Analysis Components
      - Content Files
      - Dashboards
      - Data Sources
      - Domains
      - Images
      - Organizations
      - Performance
      - Reports
      - SuperMart Demo
      - Temp
      - Templates
      - Themes
  - Public
  - System Properties
  - Temp
  - Themes

Organization admin (`jasperadmin`) view:

Folders

- Organization
  - Ad Hoc Components
  - Analysis Components
  - Content Files
  - Dashboards
  - Data Sources
  - Domains
  - Images
  - Organizations
    - Folder Template
      - Ad Hoc Components
      - Temp
      - Templates
      - Themes
  - Performance
  - Reports
  - SuperMart Demo
  - Temp
  - Templates
  - Themes
- Public

Figure 1-2 System Admin and Organization Admin Views of Sample Data

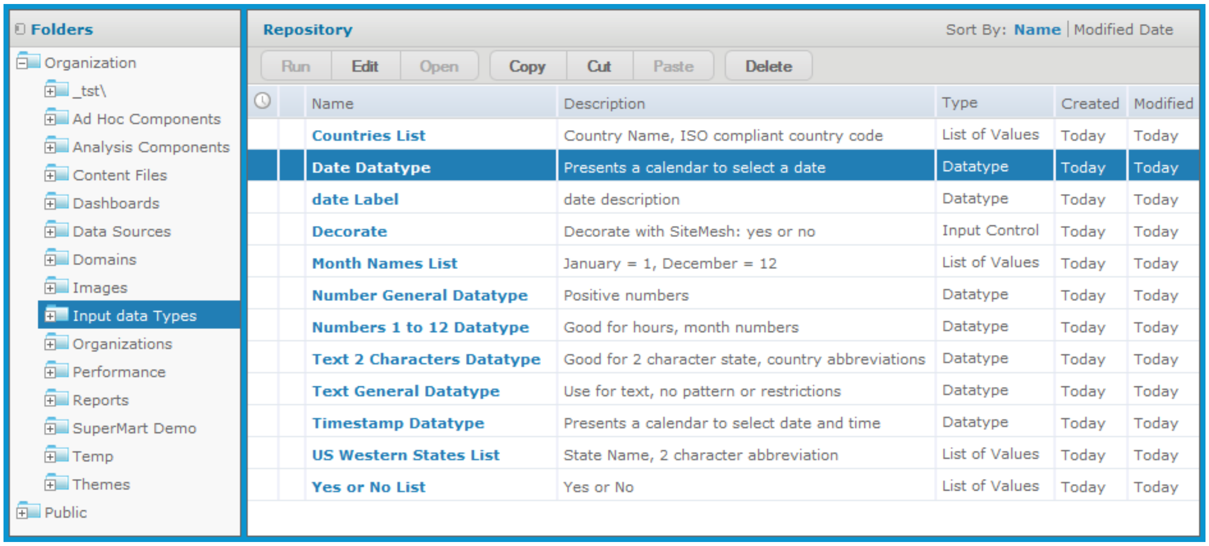
The sample data includes dashboards, reports, Domains, data sources, and many of their components, such as input types and image files. Each type of content is stored in a separate folder, making it easy to locate. The Supermart Demo folder contains a complete example of dashboards, reports, and resources for various business scenarios in a fictional grocery store company.

The Public folder is a special system folder that appears at the root and in every organization folder. Its contents are shared with all organizations. The system admin should manage the Public folder and set permissions so that users can access shared resources (such as data sources, logos, and report templates) but not modify them.

1.2.4 Browsing and Searching

Users and administrators can browse or search the repository, depending on what action they want to perform and how resources are organized. When browsing the folders and their contents, administrators have more actions available, such as creating resources. Searching the repository finds specific resources faster.

- Browse - On the Home page, click **View > Repository**.

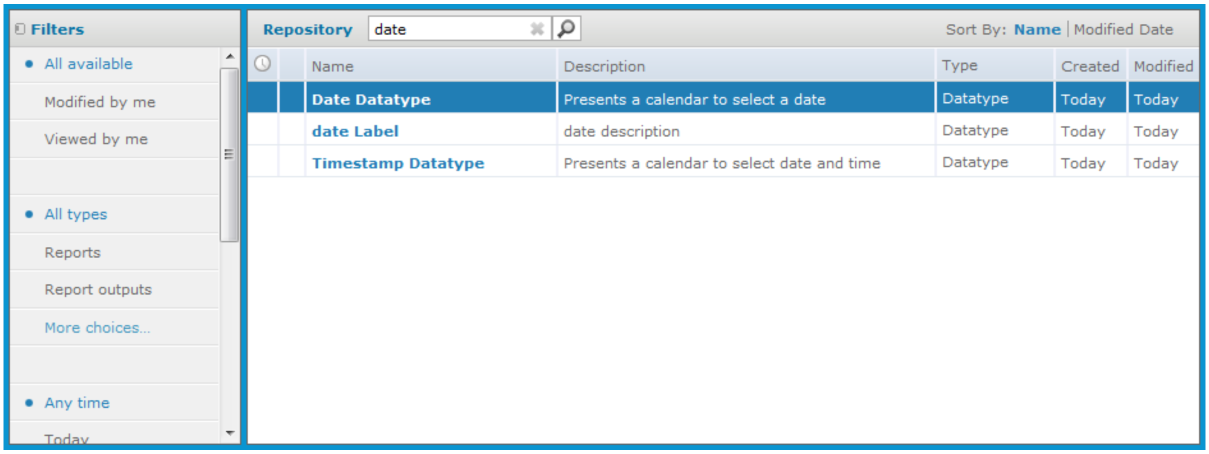


Name	Description	Type	Created	Modified
Countries List	Country Name, ISO compliant country code	List of Values	Today	Today
Date Datatype	Presents a calendar to select a date	Datatype	Today	Today
date Label	date description	Datatype	Today	Today
Decorate	Decorate with SiteMesh: yes or no	Input Control	Today	Today
Month Names List	January = 1, December = 12	List of Values	Today	Today
Number General Datatype	Positive numbers	Datatype	Today	Today
Numbers 1 to 12 Datatype	Good for hours, month numbers	Datatype	Today	Today
Text 2 Characters Datatype	Good for 2 character state, country abbreviations	Datatype	Today	Today
Text General Datatype	Use for text, no pattern or restrictions	Datatype	Today	Today
Timestamp Datatype	Presents a calendar to select date and time	Datatype	Today	Today
US Western States List	State Name, 2 character abbreviation	List of Values	Today	Today
Yes or No List	Yes or No	List of Values	Today	Today

Figure 1-3 Browsing the Repository

In Browse mode, the Folders panel on the left lists the folders in the repository and the Repository panel lists the contents of the selected folder. The tool bar in the Repository panel allows you to perform actions such as **Copy**, **Cut**, **Paste**, and **Delete**; select several resources in a same folder to perform actions in bulk. Search mode does not have the tool bar.

- Search - Enter a search term in the search field at the top of any page, or select **View > Search Results**.



Name	Description	Type	Created	Modified
Date Datatype	Presents a calendar to select a date	Datatype	Today	Today
date Label	date description	Datatype	Today	Today
Timestamp Datatype	Presents a calendar to select date and time	Datatype	Today	Today

Figure 1-4 Searching the Repository

The filters in the left-hand panel allow users to refine their search. The **View > Reports** and **View > OLAP Views** also use the search feature with preset filters to find all reports and all OLAP views to which the user has access.

For more information on browsing and searching the repository, see the *JasperReports Server User Guide*.

1.3 Overview of Users and Roles

User accounts and role membership provide authentication and authorization mechanisms to implement access control in JasperReports Server. Users enter an organization name if required, a login name, and a password in order to access JasperReports Server. Administrators assign named roles to users and then create role-based permissions to further restrict access to objects in the repository and to data in Domains.

In the commercial version of JasperReports Server, both users and roles are associated with the organizations in which they are defined, and they follow the same hierarchical model. Users and roles defined in an organization may be granted or denied access to any repository folder or object in the organization or its suborganizations. However, the administrator of the suborganization has no visibility of the roles and users in the parent organization, even if they are used in access permission within the suborganization.

User names and role names are unique within an organization, but not necessarily among suborganizations or across all organizations in the server. For example, the default organization administrator is called `jasperadmin` in every organization. Because the organization must be given when logging in, JasperReports Server can distinguish between every user. In some cases such as web services, a user is identified by the unique string `username|organization_ID`.

In the community edition of JasperReports Server, there is only a single default organization. All user and role names belong to this organization.

Access to the repository is defined directly on the repository resources. Administrators may define a level of access, such as read-write, read-only or no access, and each permission may be based either on a user name or on a role name.

1.3.1 Administering Users and Roles

Administrators perform the following actions to manage users in their organization:

- Create, modify, and delete users.
- Set user account properties such as name, email, and setting the password. However, no administrator can ever view a user's existing password in clear text.
- Login as any user in the organization to test permissions.
- Create, modify, and delete roles.
- Assign roles to users.
- Set access permissions on repository folders and resources.

1.3.2 Delegated Administration

JasperReports Server enables three levels of delegated administration:

- The hierarchical structure of organizations means administrators in each organization are limited to actions within their organization. But this only applies to multiple organizations where it makes sense to have subordinate administrators.
- The Administer permissions allows a user to view and set permissions on a folder or resource. This allows a power-user to manage her own section of the repository, but not to create or manage users.
- Granting `ROLE_ADMINISTRATOR`, `ROLE_SUPERUSER`, or both allows a user to see the management interface and create users and roles. This is true delegated administration, whereby a user other than `superuser` or `jasperadmin` has the same abilities.

In the case of true delegated administration, there are three factors that determine the scope of a user's administrative privileges:

- `ROLE_ADMINISTRATOR` – JasperReports Server confers the organization-level privileges to any user with this role. This includes managing users, roles, and permissions in the repository, as well as creating resources in the repository. When a user with this role logs in, the server displays the additional menus to access the admin pages and manage repository resources. Any administrator, who by definition has this role, can assign it to any other user.
- `ROLE_SUPERUSER` – When a user already has `ROLE_ADMINISTRATOR`, this additional role grants access to the system configuration functions. Only a system admin can assign this role to another user; organization admins cannot see or assign this role.

  In a multi-organization environment, `ROLE_SUPERUSER` should not be given to organization admins or organization users, because this allows access to the Ad Hoc cache shared by all organizations. In the case of a single organization such as in the default installation, you may assign this role to the organization admins to grant access to system settings without granting privileges to create top-level organizations or other system administrators.
- The user's organization – Regardless of roles, an administrator is always limited in scope to the organization in which the user account is created, including any suborganizations thereof. In no case can a user, even with the `ROLE_SUPERUSER`, ever view or modify any organization, user, role, or folder outside of the organization to which the user belongs.

Any administrator can grant `ROLE_ADMINISTRATOR` to any user. That user then becomes equivalent to an organization admin of the organization in which he belongs. In order to delegate system administration, the existing system admin must first create other users at the root level, outside of any organization. The system admin can then assign both `ROLE_ADMINISTRATOR` and `ROLE_SUPERUSER` to grant them system admin privileges. For further information about these roles, see **3.5, "Permissions," on page 57**.

1.4 Overview of Security

JasperReports Server ensures that people can only access the data they are allowed to see. The mechanisms that define organizations, users, roles, and repository resources work together to provide complete access control that includes:

- Authentication – Restricts access to identified users and protects that access with passwords. Defines roles for grouping users and assigning permissions. Authentication is further explained in the next section.
- Authorization – Controls access to repository objects, pages, and menus based on users and roles. Authorization is further explained in a following section.
- Data level security (commercial version only) – Defines row and column level permissions to access your data. Row and column level permissions can be defined and enforced in Domains. For more information, refer to the *JasperReports Server User Guide*. If you implement Jaspersoft OLAP, you can use roles to secure your data at any level of an analysis schema's hierarchy. For more information, refer to the *Jaspersoft OLAP User Guide*.

Administrators must keep security in mind at all times when managing organizations, user, roles, and resources, because the security mechanism behind each of these rely on the others.

1.4.1 Authentication

The first part of security is to define user accounts and secure them with passwords. Users must log in with their user ID and password so that they have an identity in JasperReports Server. The server stores user definitions, including encrypted passwords, in a private database. Administrators create, modify, and delete user accounts through the administrator pages, as described in **2.2, "Managing Users," on page 29**.

JasperReports Server also implements roles that can be assigned to any number of users. Roles let administrators create groups or classes of users that are granted similar permissions. A user may belong to any number of roles and receive the privileges from each of them. The server stores role definition in its private database, and administrators create, modify, and delete roles through the administrator pages, as described in **2.3, "Managing Roles," on page 36**.

JasperReports Server relies on the open source Spring security framework; it has many configurable options for:

- External authentication services such as LDAP (used by Microsoft Active Directory and Novell eDirectory)
- Single sign-on using JA-SIG's Central Authentication Service (CAS)
- Java Authentication and Authorization Service (JAAS)
- Container security (Tomcat, Jetty)
- SiteMinder
- Anonymous user access (disabled by default)

JasperReports Server also supports these encryption and authentication standards:

- HTTPS, including requiring HTTPS
- HTTP Basic
- HTTP Digest
- X509

The Spring framework is readily extensible to integrate with custom and commercial authentication services and transports.

Authentication occurs by default through the web user interface, forcing login, and/or through HTTP Basic authentication for web services, such as Jaspersoft iReport Designer and for XML/A traffic. The server can automatically synchronize with an external authentication service. The external users don't need to be created manually in the server first. Both users and roles are created automatically in the server from their definitions in an external authentication service. For an overview of the authentication system and details about external authentication, see the *JasperReports Server Authentication Cookbook*.

1.4.2 Authorization Overview

With a user's identity and roles established, JasperReports Server controls the user's access in these ways:

Menu options and pages	The menus that appear in JasperReports Server depend on the user's roles. For example, only users with the administrator role can see the **Manage** menu and access the administrator pages. By modifying the server's configuration, you can modify access to menus, menu items, and individual pages. Refer to the *JasperReports Server Source Build Guide* and *JasperReports Server Ultimate Guide* for more information.
Organization scope	Users belong to organizations and are restricted to seeing resources within their organization. Organizations have their own administrators, but they see only the users, roles, and resources from their organization. When JasperReports Server is configured with multiple organizations, they are effectively isolated from each other, although the system admin can share resources through the Public folder. For more information, see **"Multiple Organizations in the Repository" on page 55**.
Resource permissions	Administrators can define access permissions on every folder and resource in the repository. Permissions can be defined for every role and every user, or they can be left undefined so they are inherited from the parent folder. For example, user may have read-write access to a folder where they create reports, but the administrator can also create shared reports in the same folder that are set to read-only. The possible permissions are: no access, execute only, read-only, read-delete, read-write-delete, and administer (see **"Permissions" on page 57**). Permissions are enforced when accessing any resource either directly through the repository interface, indirectly when called from a report, or programmatically through the web services. Permissions are cumulative, meaning that a user has the most permissive access that is granted to any of the roles to which the user belongs.
Administrator privileges	JasperReports Server distinguishes between reading or writing a resource in the repository and viewing or editing the internal definition of a resource. For security purposes, granting a user read or write permission on a resource does not allow viewing or editing the resource definition. For example, users need execute or read permission on a data source to run reports that use it, but they cannot view the data source's definition which includes a database password. Also, only administrators may interact with theme folders to upload, download, and activate CSS files that control the user interface.

Data-level security	Data-level security defines what data can be retrieved and viewed in a report, based on the username and roles of the user who runs the report. For example, a management report could allow any user to see the management hierarchy, managers would see the salary information for their direct employees, and only human resource managers would see all salary values. Data-level security in Domains is explained in the *JasperReports Server User Guide*. Data-level security through OLAP views is covered in the *Jaspersoft OLAP User Guide*. Note: This type of security is only available in the commercial edition of JasperReports Server.
Profile attributes	Profile attributes are name-value pairs associated with a user account. They can provide additional information about the user, and they can also be used to restrict access to data through Domain security files and OLAP schemas. For information on defining profile attributes, see **"Editing Profile Attributes" on page 34**.

1.5 Administrator Login

Administrators log in on the standard login page, using the following default passwords:

Commercial editions:	system admin: username `superuser` and password `superuser` organization admin: username `jasperadmin` and password `jasperadmin`
Community project:	system admin: username `jasperadmin` and password `jasperadmin`

For security reasons, always change the default administrator passwords immediately after installing JasperReports Server. For instructions, see **2.2.3, "Editing a User," on page 33**.

For more information about options on the Login page and logging in with multiple organizations, see the *JasperReports Server User Guide*.

The first time you log in as an administrator, you may be prompted to opt-into the Heartbeat program. You should also set the administrator passwords and email.

1.5.1 JasperReports Server Heartbeat

When you login to JasperReports Server for the first time after installation, users of the commercial edition may be prompted to opt into the server's Heartbeatprogram. It reports specific information to Jaspersoft about your implementation: the operating system, JVM, application server, database (type and version), and JasperReports Server edition and version number. By tracking this information, Jaspersoft can build better products that function optimally in your environment. No personal information is collected.

To opt into the program, click **OK**. To opt out, clear the check box then click **OK**.

1.5.2 Administrator Email

After logging in for the first time, you should set the email on the `superuser` and `jasperadmin` accounts to your email address. In very rare cases, the server may notify you by email about issues with your license.

This is also a good time to change the default passwords on the `superuser` and `jasperadmin` accounts as well.

To set the email and passwords on the administrator accounts, edit the user account information as described in **2.2.3, "Editing a User," on page 33**.

1.6 Administrator Pages

Administrators have access to special pages to manage the server. After logging in, click **View options** in the Admin box on the Getting Started page or select an item from the **Manage** menu on any page.

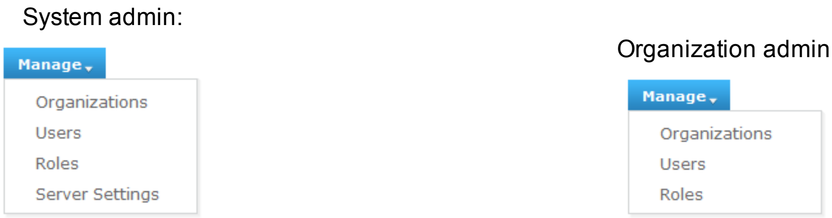
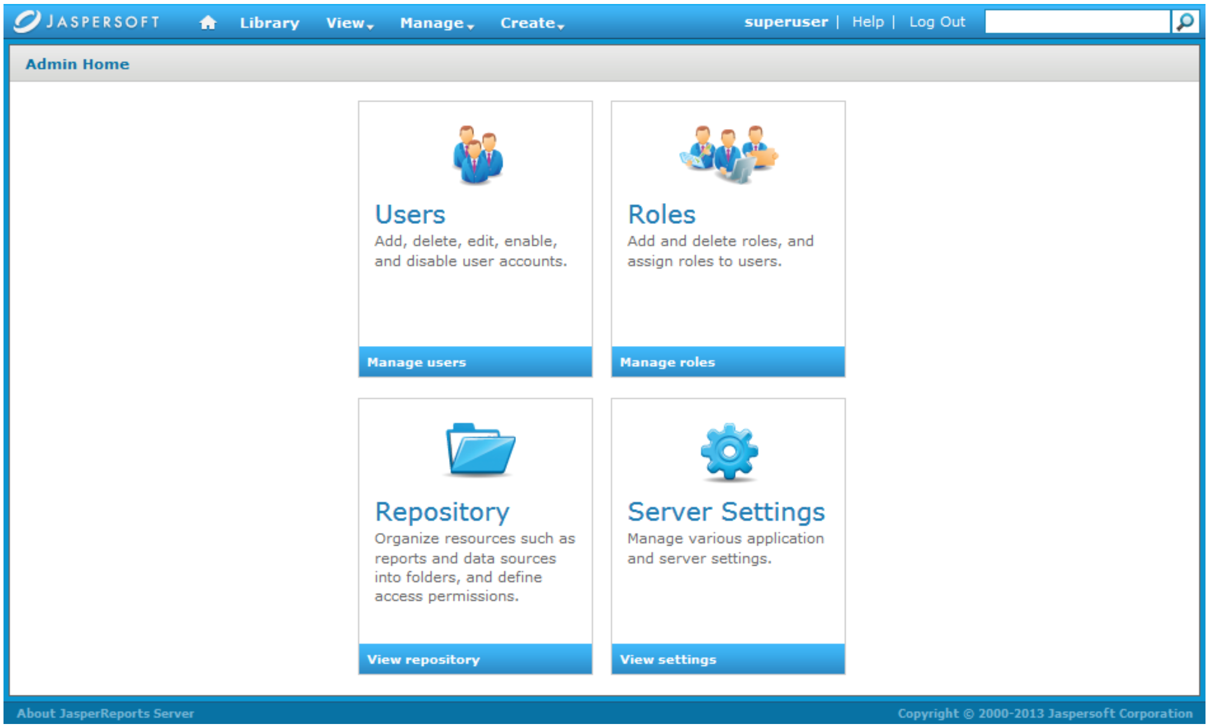


Figure 1-5 Different Manage Menus for Different Admins

In the commercial edition of JasperReports Server, the administrator controls are different for system and organization admins, as shown in **Figure 1-5**. Organization administrators can manage users, roles, and suborganizations, but only within their organization. System admins can manage top-level organizations, as well as users and roles in any organization. In addition, only system admins have access to the server-wide settings that apply to logs, Jaspersoft OLAP, and Ad Hoc cache and data policies.

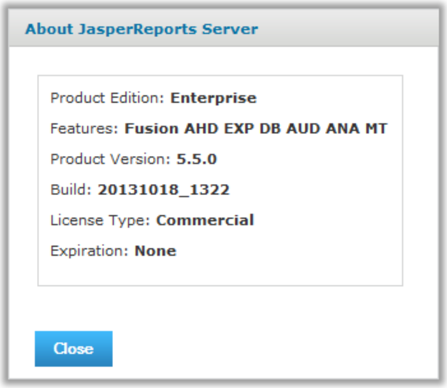
Figure 1-6 you can see the **Admin Home** page for system admins that includes the **View settings** button not available to organization admins.



JASPERSOFT
Library
View
Manage
Create
superuser | Help | Log Out
Admin Home
Users
Add, delete, edit, enable, and disable user accounts.
Manage users
Roles
Add and delete roles, and assign roles to users.
Manage roles
Repository
Organize resources such as reports and data sources into folders, and define access permissions.
View repository
Server Settings
Manage various application and server settings.
View settings
About JasperReports Server
Copyright © 2000-2013 Jaspersoft Corporation

Figure 1-6 Manage Server Page for System Admins in Commercial Editions (superuser)

As shown in **Figure 1-7**, the dialog that appears when you click the **About JasperReports Server** links in the footer of all pages. The dialog displays the product version number. It also shows the software build, your license type, and its expiration. Please have this information if you need to contact Jaspersoft for support.



About JasperReports Server

Product Edition: **Enterprise**

Features: **Fusion AHD EXP DB AUD ANA MT**

Product Version: **5.5.0**

Build: **20131018_1322**

License Type: **Commercial**

Expiration: **None**

Figure 1-7 About JasperReports Server Dialog

CHAPTER 2 ORGANIZATION, USER, AND ROLE MANAGEMENT

This section describes functionality that can be restricted by the software license for JasperReports Server. If you don't see some of the options described in this section, your license may prohibit you from using them. To find out what you're licensed to use, or to upgrade your license, contact Jaspersoft.

In a single-organization deployment, the administrator only needs to create the users and roles. In deployments with multiple organizations, administrators need to create organizations, populate them with users, and create the roles that they use afterwards to set access permissions.

In a deployment with multiple organizations, there can be administrators at every level of the hierarchy, as described in **1.3.2, "Delegated Administration," on page 18**. Part of any large deployment is to designate the administrators who are responsible for every task. For example, system administrators might set up the top-level organizations and default roles, but each organization's admin would then create and manage the users of their particular organization.

The interface in JasperReports Server for managing organizations (commercial edition users), users, and roles (both commercial and community editions) accommodates all levels of administrators and makes it easy for them to search among hundreds of users and roles, whether in a single organization or spread across many. The interface also enforces the scope of administrative privileges. For example, it insures that an organization administrator cannot see roles and users from parent organizations.

This chapter contains the following sections:

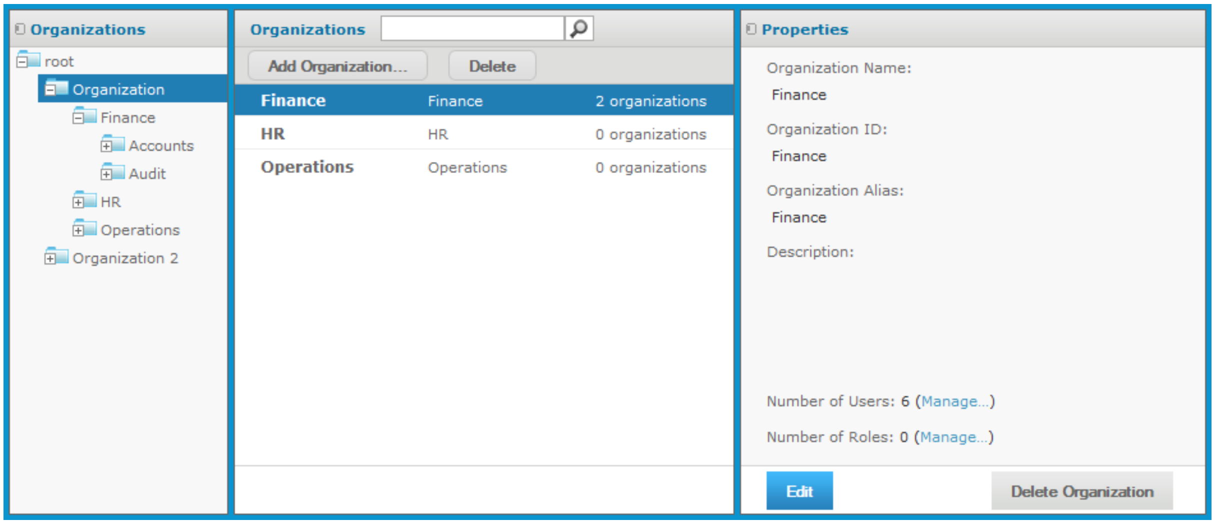
- **Managing Organizations**
- **Managing Users**
- **Managing Roles**

2.1 Managing Organizations

System admins and organization admins use the same pages for managing organizations, the only difference is that system admins can manage top-level organizations, whereas organization admins are limited to suborganizations.

Community edition users, and administrators of deployments with a default single organization can generally skip this section. However, this procedure can be used to change the name of the default organization.

Figure 2-1 shows the organizations that the system admin/superuser can view, that is, all the organizations in the repository. As shown in the Organizations panel on the left, the system admin's view begins at the root of the organization hierarchy and includes all defined organizations and suborganizations, so he can manage any organization or suborganization in the repository. In this example, there are two top-level organizations, and one of them has several suborganizations.



Finance	Finance	2 organizations
HR	HR	0 organizations
Operations	Operations	0 organizations

Organization Name: Finance

Organization ID: Finance

Organization Alias: Finance

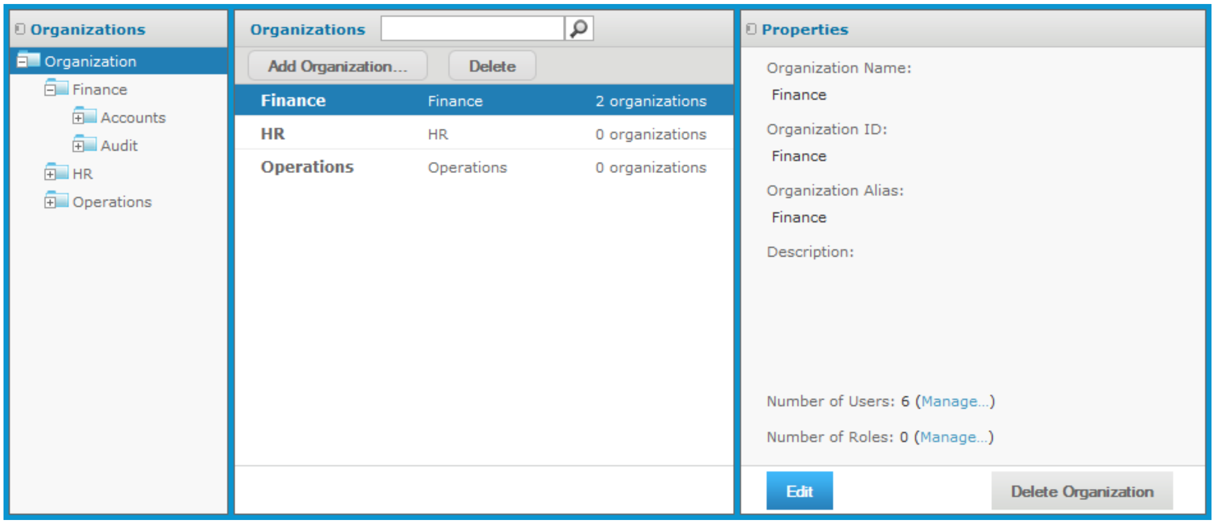
Description:

Number of Users: 6 (Manage...)

Number of Roles: 0 (Manage...)

Figure 2-1 System Admin View of Manage Organizations Page

Figure 2-2 shows the same repository as seen by the admin of Organization. It shows that this admin's view is limited to his own organization and its suborganizations, and he can access and manage only those.



Finance	Finance	2 organizations
HR	HR	0 organizations
Operations	Operations	0 organizations

Organization Name: Finance

Organization ID: Finance

Organization Alias: Finance

Description:

Number of Users: 6 (Manage...)

Number of Roles: 0 (Manage...)

Figure 2-2 Organization Admin View of Manage Organizations Page

2.1.1 Viewing Organization Properties

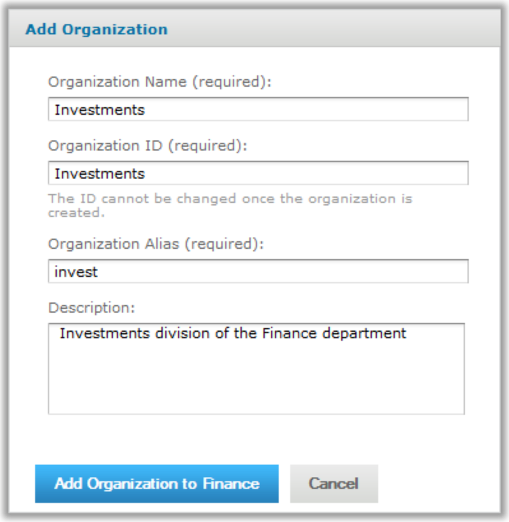
1. Log in as a user with administrative privileges for the organization.

2. Select **Manage > Organizations**.

   The organization management page appears, as shown in **Figure 2-1** or **Figure 2-2**.
3. To select an organization, click its parent in the left-hand Organizations panel, then select it in the center Organization panel. If there are many organizations, you can enter a search term to find a specific organization. However, the search term only searches the list of organization in the center Organizations panel.
4. Once an organization is selected, the Properties panel shows information about the organization:
   - Name – Display name of the organization that appears on the organization's top folder.
   - ID – Unique and permanent ID of the organization that is used for logging into the organization.
   - Alias – Unique but editable short name for the organization that can also be used when logging in.
   - Description – Optional description that only appears in this Properties panel.
   - Number of Users – Count of all users, including those in any suborganizations. Click **Manage** to see the list of users on the user management page.
   - Number of Roles – Counts all roles, including those in any suborganizations. The number of roles does not include the system roles (such as ROLE_USER) that appear at every organization level but are defined at the root level. Click **Manage** to see the list of roles on the role management page.

2.1.2 Creating an Organization

1. Log in as a user with administrative privileges for the parent of the new organization.
2. Click **Manage > Organizations**.
3. In the left-hand Organizations panel, expand the hierarchy of organizations to select the parent organization, for example Finance, then click **Add Organization** in the middle panel.
4. The Add Organization dialog appears.



Add Organization

Organization Name (required): Investments

Organization ID (required): Investments

The ID cannot be changed once the organization is created.

Organization Alias (required): invest

Description: Investments division of the Finance department

Figure 2-3 Adding an Organization

5. Enter the organization name; the server automatically fills in the ID and alias based on the name. You can change the ID and alias if you needed. The Description is optional. **Figure 2-3** shows sample values.
6. To save the new organization, click **Add Organization to <organization>**.

The new organization appears in the Organizations panels. When you select it in the center panel, its properties appear in the Properties panel on the right.

The properties panel shows the number of users and roles in the organization and links to manage them. By default, new organizations have the following:

- Two users with default passwords: the organization admin (`jasperadmin/jasperadmin`) and a sample user (`joeuser/joeuser`).

  For security reasons, always change the default passwords immediately after creating a new organization. For instructions, see **2.2, “Managing Users,” on page 29**.

- The organization has no roles of its own. The default users have the system-wide roles `ROLE_USER` and `ROLE_ADMINISTRATOR`.
- There is a folder created in the repository, under the parent’s Organization folder. The new organization folder contains a copy of the parent’s Organization/Folder Template folder. To manage the Organization folders, select **View > Repository**.

2.1.3 Default Folders for Organizations

Every organization contains a special folder named Organizations where suborganizations are created. The Organizations folder always contains a folder named Folder Template. When a new organization is created, the entire contents of the Folder Template is copied to create the new organization’s folders. Admins can add folders and resources in Folder Template, and these are also copied when additional organizations are created.

The default folders in the Folder Template are:

- Ad Hoc Components\Topics – The location where the Ad Hoc Editor looks for Topics to create new reports.
- Temp – A folder visible only administrators, used by the server to store temporary files.
- Templates – A folder to hold templates used when generating reports from Ad Hoc views.
- Themes – A special folder managed by the system to contain CSS files that define the user interface.

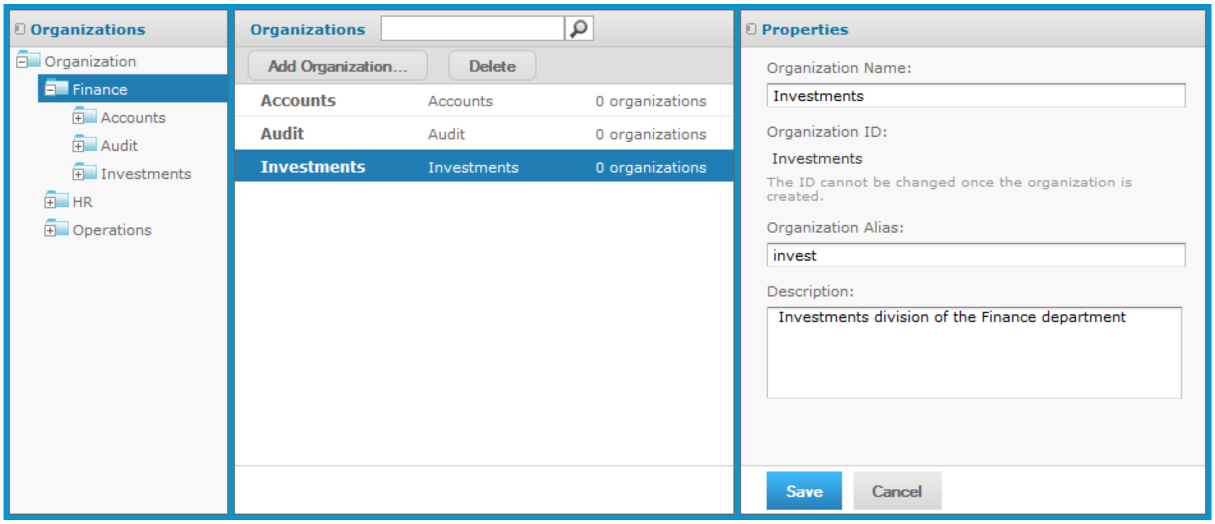
The Public folder visible in every organization is a special shared folder at the root level. The repository makes it accessible to every organization, but it is not within the organization folder.

There is a Folder Template at every level of the organization hierarchy, including the root. The system admin can add content to the top-level Folder Template for use in creating top-level organizations. Organization admins can add content to their respective Folder Template for use in creating suborganizations.

Finally, the Folder Template itself is copied into a new organization, so new suborganizations have the same default folders and resources as their parent.

2.1.4 Editing an Organization

1. Log in as a user with administrative privileges for the organization.
2. Click **Manage > Organizations**.
3. In the left-hand Organizations panels, select the organization’s parent. In the center Organizations panel, select the organization.
4. In the right-hand Properties panel, click **Edit**. The fields in the organization’s Properties panel become editable.



Accounts	Accounts	0 organizations
Audit	Audit	0 organizations
Investments	Investments	0 organizations

Organization Name: Investments

Organization ID: Investments

The ID cannot be changed once the organization is created.

Organization Alias: invest

Description: Investments division of the Finance department

Figure 2-4 Editing Properties of an Organization

5. Change the organization properties as needed. Changing the organization name changes the name of the organization's folder, as well, but no other data. The organization ID cannot be changed; it always has the value defined when the organization is created. The alias and description can be changed.
6. Click **Save** to keep your changes, or **Cancel** to quit without saving.

2.1.5 Deleting an Organization

1. Log in as a user with administrative privileges for the organization.
2. Click **Manage > Organizations**.
3. In the left-hand Organizations panels, select the organization's parent. In the center Organizations panel, select the organization.
4. In center Organizations panel, click **Delete**.

   Administrators cannot delete the organization to which they belong. Confirming the delete completely removes all users, roles, and folders of the organization and all of its suborganizations from JasperReports Server.

2.2 Managing Users

As with organizations, system admins can manage all users in all organizations, as well as create users outside of organizations, as described in **1.3.2, "Delegated Administration," on page 18**. Organization admins can manage only the users in the organizations they administer.

The default installation of JasperReports Server contains the following users:

Table 2-1 Default Users in JasperReports Server Installations

User Name	Default Password (case sensitive)	Organization	Description
superuser	superuser	*none*	Default system admin (commercial edition only).
anonymousUser	anonymoususer	*none*	Allows anonymous login; disabled by default. If you do not allow anonymous access, this user can be deleted.
jasperadmin	jasperadmin	Organization	Default organization admin in every organization.
joeuser	joeuser	Organization	Default end user in every organization.
demo	demo	Organization	Included for use with sample data.
CaliforniaUser	CaliforniaUser	Organization	Included for use with sample data.

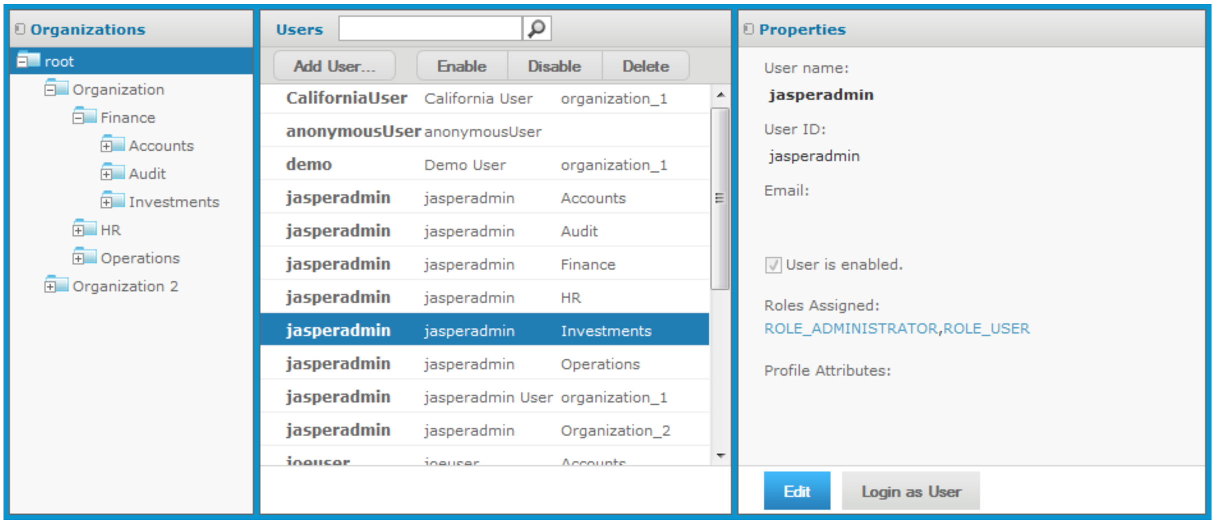
You should advise your users to change their passwords regularly. To configure periodic expiration of their passwords, refer to **"Configuring User Password Options" on page 142**.

Some editions of the server do not include all these users; for example, superuser is not created in the Community edition of the server, and demo and CaliforniaUser are created only when the sample data is installed.

2.2.1 Viewing User Properties

1. Log in as a user with administrative privileges for the user's organization.
2. Select **Manage > Users** or, on the Admin Home page, click **Users**.

   As shown in **Figure 2-5**, the Manage Users page displays the users in each organization and properties for the selected user.



CaliforniaUser	California User	organization_1
anonymousUser	anonymousUser	
demo	Demo User	organization_1
jasperadmin	jasperadmin	Accounts
jasperadmin	jasperadmin	Audit
jasperadmin	jasperadmin	Finance
jasperadmin	jasperadmin	HR
jasperadmin	jasperadmin	Investments
jasperadmin	jasperadmin	Operations
jasperadmin	jasperadmin User	organization_1
jasperadmin	jasperadmin	Organization_2
joeuser	joeuser	Accounts

User name:
jasperadmin

User ID:
jasperadmin

Email:

☑ User is enabled.

Roles Assigned:
ROLE_ADMINISTRATOR,ROLE_USER

Profile Attributes:

Figure 2-5 Manage Users Page

The list of users includes everyone in the chosen organization and its suborganizations. The same user ID may appear more than once in the Users panel, indicating that users with the same ID were created in different organizations. The third column gives the organization name of a particular user.

In this example, the system admin can see all users in all organizations by selecting the root of the Organization hierarchy. There are always multiple jasperadmin users in a hierarchy of organizations, because it is the default administrator ID in each organization that is created.

3. To locate a user:
   - To browse for users, expand the organization hierarchy in the left-hand panel, and select an organization. Scroll through the list of users, or choose a suborganization to reduce the list.
   - To search for a specific user, select the organization (or any parent organization) and enter a search string in the **Search** field of the Users panel. The search results show all users in the selected organization and suborganizations whose username contains the search string. If necessary, scroll through the results or refine your search.

     To stop the search, click ⊗
4. Select the user in the Users panel. The user's properties appear in the Properties panel.

   The properties include the user's name, user ID, email address, assigned roles, user status, and profile attributes. User status can be **Enabled** or **Disabled**; disabled users are displayed in gray text in the list of users. For convenience, the role names link to the role management page for each role.

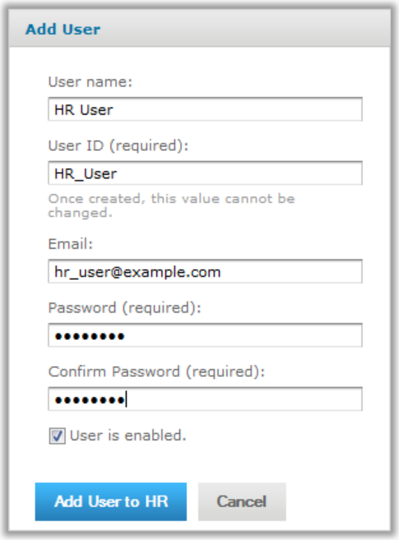
As the admin of a given organization, you can see the roles defined in your organization and its suborganizations but not the parent organization (except for certain system-wide roles). A user may have roles defined and assigned from a parent organization that are not visible to the administrator of the user's organization. For more information, see **"Managing Roles" on page 36**.

2.2.2 Creating a User

1. Log in as a user with administrative privileges for the organization to which the user will belong.

2. Select **Manage > Users** or, on the Admin Home page, click **Users**.
3. In the Organizations panels, select the organization to which the user will belong, then click **Add User**. For community edition admins, simply click **Add User**.

   The Add User dialog appears.



User name:
HR User
User ID (required):
HR_User
Once created, this value cannot be changed.
Email:
hr_user@example.com
Password (required):
••••••••
Confirm Password (required):
••••••••
☑ User is enabled.

Figure 2-6 Adding a User

4. Enter the following information:
   - User name – The full name of the person associated with the user account. The name is optional but recommended; it can be in any format or convention. JasperReports Server always displays the current user's name in the top right-hand corner of the screen.
   - User ID – Generated automatically from the user name; you can accept the suggested value or type your own. The user ID is used to log into JasperReports Server, and for administrators to manage users and resources. User IDs must be unique within an organization, but may exist in other organizations.
   - Email – The email address of the person. The email is optional but the address must be in a valid format.
   - Password and confirmation – Enter the same password in both fields.
   - User is enabled – Select the checkbox to enable the user right away.

     Users that are not enabled cannot log in. If you implement role-based permissions, you might want to delay enabling the user until you assign more roles. For more information on roles, see **"Managing Roles" on page 36**.
5. Click **Add User to <organization>** (**Add User** for community edition users) to create the user.

   The new user appears in the Users panel, unless you entered a search term that excludes it. If you want to assign roles to the user, click **Edit** in the Properties panel of the new user, as shown in the following section.

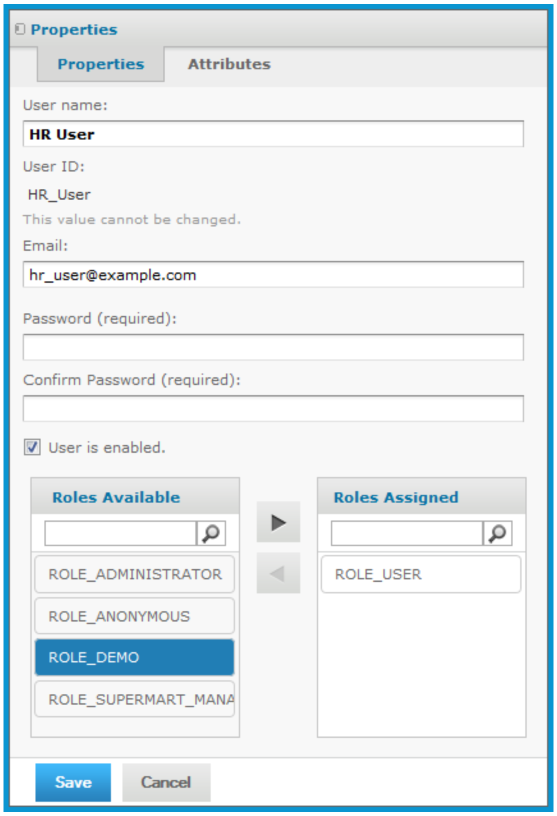
2.2.3 Editing a User

One way to assign roles is to add available roles to a given user. Alternatively, when you edit roles, you can assign any number of users to a given role.

1. Log in as a user with administrative privileges for the user's organization.
2. Click **Manage > Users** or, on the Admin Home page, click **Users**.
3. In the Organizations panel, select the user's organization. (Commercial users only. Community users skip to **step 4**.)

   The Users panel refreshes to display the users in the selected organization, including all children organizations.
4. In the Users panel, select the user.

   The information for chosen user account is displayed in the Properties panel.
5. In the Properties panel, click **Edit**.



User name: HR User

User ID: HR_User

This value cannot be changed.

Email: hr_user@example.com

Password (required):

Confirm Password (required):

☑ User is enabled.

Roles Available: ROLE_ADMINISTRATOR, ROLE_ANONYMOUS, ROLE_DEMO, ROLE_SUPERMART_MANA

Roles Assigned: ROLE_USER

Figure 2-7 Editing the Properties of a User

6. Modify the user name, email, password, and enabled status as needed.

   You cannot edit the user ID; it always has the value defined when the user is created originally.
7. To assign or remove roles from the user, select the roles, and click the arrow buttons between the Roles Available and Roles Assigned lists.

The Roles Available list includes any role in the organizations of the current administrator, as well as the special system-wide roles. For more information on creating and adding roles, see **"Managing Roles" on page 36**.

8. Click **Save** to keep your changes, or **Cancel** to quit editing without saving.
9. In the Properties panel, click **Login as User** to test the user's permissions, as explained in **3.5.7, "Testing User Permissions," on page 62**.

   Logging in as another user is also necessary when you are maintaining resources that use absolute references in the repository. For more information, see **3.4.3, "Referencing Resources in the Repository," on page 56**.

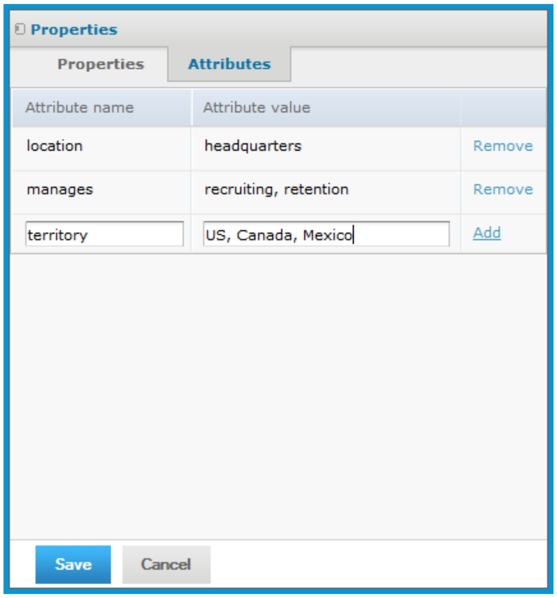
2.2.4 Editing Profile Attributes

Profile attributes are name-value pairs associated with a user account. They can provide additional information about the user, and they can also be used to restrict access to data through Domain security files and OLAP schemas. As of version 5.0, JasperReports Server provides a user interface to easily add, edit, and remove profile attributes from user accounts. Jaspersoft recommends using this interface instead of accessing the private repository database, as was required previously.

To add, edit, or remove profile attributes:

1. Log in as a user with administrative privileges for the user's organization.
2. Click **Manage > Users** or, on the Admin Home page, click **Users**.
3. In the Organizations panel, select the user's organization. (Commercial users only. Community users skip to **step 4**.)

   The Users panel refreshes to display the users in the selected organization, including all children organizations.
4. In the Users panel, select the user. The information for chosen user account is displayed in the Properties panel.
5. In the Properties panel, click **Edit** and select the **Attributes** tab at the top of the panel.

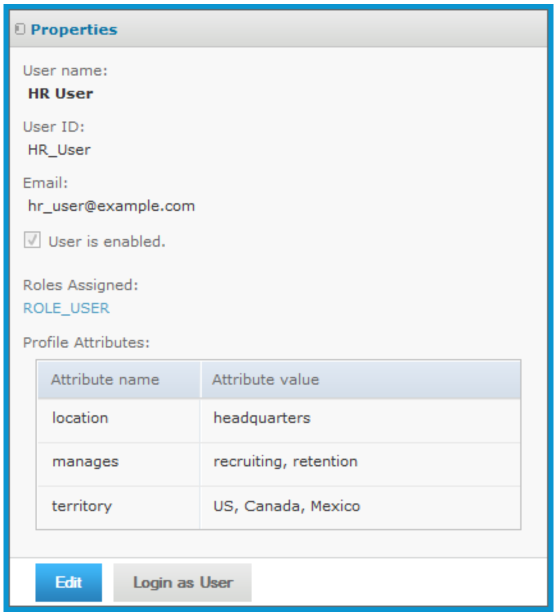


Attribute name	Attribute value	
location	headquarters	Remove
manages	recruiting, retention	Remove
territory	US, Canada, Mexico	Add

Figure 2-8 Editing the Attributes of a User

6. To create a new attribute, enter an attribute name and an attribute value, then click **Add**.

   Attributes may have multiple values specified as a comma-separated list in the value field. You cannot add two attributes with the same name.
7. To remove an existing attribute, click **Remove** in the corresponding row.
8. To edit an attribute, remove it and create it again with the desired value.
9. Click **Save**. The new attributes appear in a table in the user's Properties panel.



User name:
HR User

User ID:
HR_User

Email:
hr_user@example.com

☑ User is enabled.

Roles Assigned:
ROLE_USER

Profile Attributes:

Attribute name	Attribute value
location	headquarters
manages	recruiting, retention
territory	US, Canada, Mexico

Figure 2-9 Viewing the Attributes of a User

2.2.5 Enabling or Disabling Users in Bulk

Administrators sometimes need to prevent users from logging in by disabling the user accounts. For example, when performing configuration changes, you may want to lock out all users until the changes are finished. Bulk operations let administrators select any number of users, and `superuser` can select all users in the server, except himself.

1. Log in as a user with administrative privileges for the users' organization.
2. Click **Manage > Users** or, on the Admin Home page, click **Users**.
3. In the Organizations panel, select the users' organization; to enable or disable users in different organizations, select the common parent organization.
4. In the list of users, select all the users to enable or disable. Use Control-click and Shift-click to make multiple selections. If the list of users is too long, enter a search term to find users and enable or disable them individually.
5. Click **Enable** or **Disable** in the menu bar.

2.2.6 Deleting One or More Users

1. Log in as a user with administrative privileges for the user's organization.
2. Click **Manage > Users** or, on the Admin Home page, click **Users**.
3. In the Organizations panel, select the user's organization; to delete multiple users in different organizations, select the common parent organization.
4. In the list of users, select the user to delete. Use Control-click and Shift-click to make multiple selections. If the list of users is too long, enter a search term to find and select the user.
5. In the tool bar of the Users panel, click **Delete** and confirm the action.

2.3 Managing Roles

Roles define sets of users who are granted similar permissions. Administrators create roles, assigned them to users, and set permissions in the repository (see **3.5, "Permissions," on page 57**). By default, JasperReports Server includes the following roles; some are needed for system operation, some are included as part of the sample data:

Table 2-2 Default Roles in JasperReports Server Installations

Role	Description
ROLE_SUPERUSER	Commercial editions only. This role determines system admin privileges, as explained in section **"Delegated Administration" on page 18**. It is a system-level role, however the system admin may assign it to organization admins in single-organization deployments. Never delete this role, it is required for proper administration of the server.

Role	Description
ROLE_ADMINISTRATOR	This role determines organization admin privileges, as explained in section **"Delegated Administration" on page 18**. JasperReports Server automatically assigns this role to the default jasperadmin user in every new organization. It is a special system-level role that is visible in every organization and which organization admins may assign to other users. Never delete this role, it is required for proper administration of the server.
ROLE_USER	Every user that logs into JasperReports Server must have this role. The server automatically assigns this role to every user that is created, and it is required to log in. It is a special system-level role that is visible in every organization. Never delete this role, it is required to create users and allow them to log in.
ROLE_ANONYMOUS	When anonymous access is enabled, JasperReports Server automatically assigns this role to any agent accessing the server without logging in. It is a special system-level role that is visible in every organization. This role is also assigned to the default anonymous user. By default, anonymous access is disabled and this role isn't used. It is a system role that even the system admin can't delete.
ROLE_PORTLET	JasperReports Server assigns this role to users that are created automatically when a portal such as Liferay requests authentication for a connection. If the specified user name does not exist in the server, it is created, assigned the password of the user in the portal, and assigned the ROLE_PORTLET and ROLE_USER roles. If you do not use a portal server, this role can be deleted.
ROLE_DEMO	This role grants access to the SuperMart demo Home page, reports, and if you implement Jaspersoft OLAP, OLAP views. This role is assigned to the demo user in the default organization. These objects are available only if you installed the sample data when you installed JasperReports Server. It is a special system-level role that is visible in every organization When you no longer need the sample data, this role can be deleted.
ROLE_SUPERMART_ MANAGER	This role is used to assign permissions relative to the sample data. It is a special system-level role that is visible in every organization. It demonstrates data security features available in Jaspersoft OLAP. See the *Jaspersoft OLAP Ultimate Guide* for more information. When you no longer need the sample data, this role can be deleted.
ROLE_ETL_ADMIN	This role no longer governs any JasperReports Server permissions or functionality, unless your server is integrated with Talend Integration Suite Enterprise Edition (TIS EE). Otherwise, it does not appear in the server.

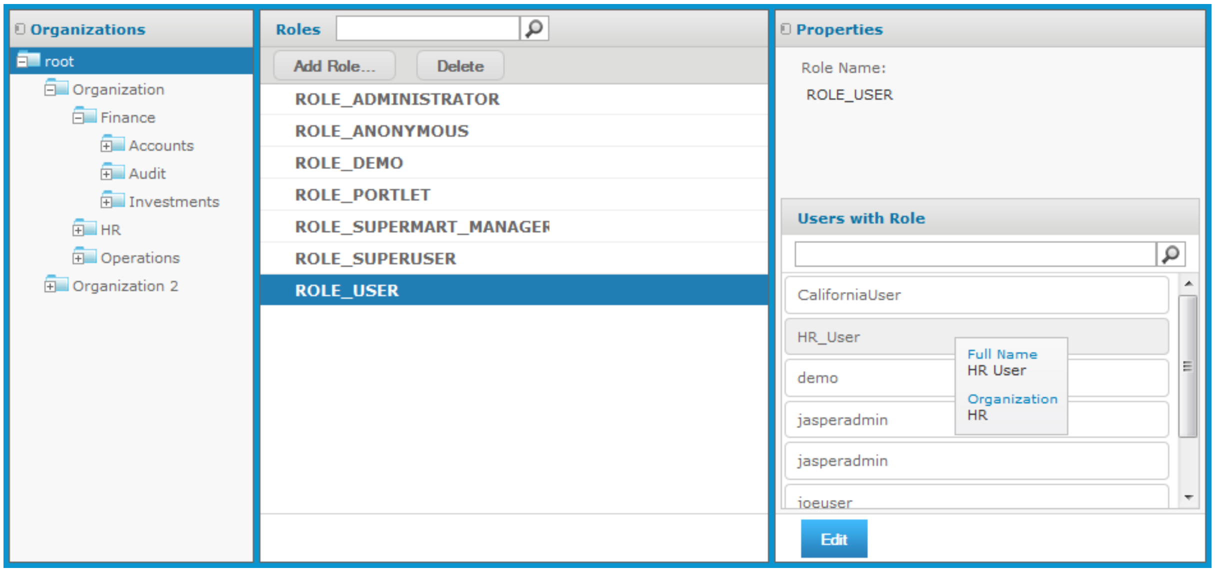
Except for the five special system-level roles visible in every organization, roles are defined within organizations. The same role ID can be defined in separate organizations, as long as it is unique within each organization. Admins can manage all roles in their organizations and any suborganization, but they can never see roles in a parent or sibling organization. JasperReports Server enforces this scheme to ensure that organizations are secure and only valid roles are assigned to users.

It is possible for an administrator to assign a role to a user in a suborganization, where the role is defined in a parent organization of the user. The admin of the user's organization cannot see the role when managing the user, but the admin of the role's organization can, and permissions associated with the role are properly enforced.

2.3.1 Viewing Role Properties

1. Log in as a user with administrative privileges for the role's organization. Community users log in as any user with administrative privileges.
2. Select **Manage > Roles** or, on the Admin Home page, click **Roles**.

   As shown in **Figure 2-10**, the Manage Roles page displays the roles in each organization and properties for each role.



Role Name:
ROLE_USER

Full Name
HR User
Organization
HR

Figure 2-10 Manage Roles Page

The list of roles includes all roles in the chosen organization and its suborganizations. The list of roles also includes the five default system-level roles. The same role name may appear more than once, indicating that roles with the same name were created in different organizations. The second column (blank in this figure) gives the organization name of a particular role.

In this example, the system admin can see all roles in all organizations by selecting the root of the Organization hierarchy.

3. To select a role, click its organization in the Organizations panel. (Commercial users only. Community users skip to step 4.)

   The Roles panel is displayed.
4. Click the role in the Roles panel.

   To filter the list of roles, enter a search string in the **Search** field of the Roles panel. The search results show all of the roles in the selected organization and suborganizations whose name contains the search string. If necessary, scroll through the new list or refine your search.

To stop the search, click ⊗

5. Select the role in the Roles panel. The role's properties appear in the Properties panel.

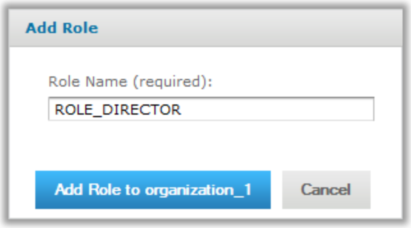
   The Properties panel shows the role name, the organization where it is defined, and the list of users to whom the role has been assigned. The list of users shows only their user IDs, but hovering over an ID displays a tooltip with the full name and organization, as shown in **Figure 2-10**.

When you view the properties of the special system-level roles, you only see the users with this role in your organization or any suborganization. An organization admin can never see users outside of his organization or its suborganizations.

2.3.2 Creating a Role

1. Log in as a user with administrative privileges for the organization in which the role will be used.
2. Select **Manage > Roles** or, on the Admin Home page, click **Roles**.
3. In the Organizations panels, select the organization to which the role will belong. (Commercial users only. Community users skip to step 4.)
4. Click **Add Role**.

   The Add Role dialog appears.



Add Role

Role Name (required): ROLE_DIRECTOR

Figure 2-11 Adding a Role

5. Enter the name of the role. Roles have no other properties or settings.
6. Click **Add Role to <organization>** (**Add Role** for community edition users) to create the role.

   The new role appears in the Roles panel, unless you entered a search term that excludes it. If you want to assign users to the role, click **Edit** in the Properties panel of the new role, as shown in the following section.

2.3.3 Assigning Users to a Role

The management interface for roles lets you assign multiple users to one role. To assign multiple roles to a single user, edit the user's properties with the procedure in **2.2.3, "Editing a User," on page 33**.

1. Log in as a user with administrative privileges for the organization in which the role is defined.
2. Select **Manage > Roles** or, on the Admin Home page, click **Roles**.
3. In the Organizations panels, select the role's organization. (Commercial users only. Community users skip to step 4.)

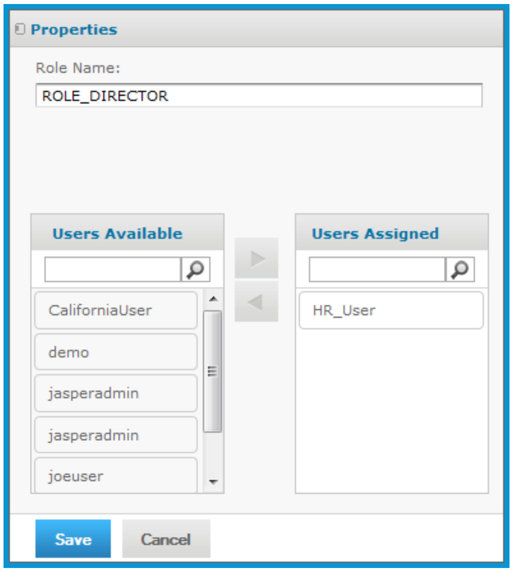
   The Roles panel is displayed.

4. Select the role in the Roles panel.

> Unless you are logged in as the system admin, you cannot edit or delete the five special system-level roles.

5. In the Properties panel, click **Edit**.

   The role’s properties become editable. You can change the role name and the users assigned to it.



Role Name: ROLE_DIRECTOR

Figure 2-12 Editing the Members of a Role

6. Enter a different name to change the role name throughout the server.

> Permissions in the repository that use the role name are automatically updated. However, role names in security files for Domains and OLAP are *not* updated with the new role name and may cause a security risk. If you use security files for Domains or OLAP, do not change role names without verifying the files as well. For more information, see the *JasperReports Server User Guide*.

7. To assign or remove users from the role, select the users, and click the arrow buttons between the Users Available and Users Assigned lists.
8. Click **Save** to keep your changes, or **Cancel** to quit without saving.

2.3.4 Deleting One or More Roles

1. Log in as a user with administrative privileges for the organization in which the role is defined.
2. Select **Manage > Roles** or, on the Admin Home page, click **Roles**.
3. In the Organizations panels, select the role’s organization. (Commercial users only. Community users skip to step 4.)

   The Roles panel is displayed.

4. Select the role in the Roles panel. Use Control-click and Shift-click to make multiple selections.

Unless you are logged in as the system admin, you cannot edit or delete the five special system-level roles.

5. In the tool bar of the Roles panel, click **Delete** and confirm the action.

Chapter 3 Repository Administration

This section describes functionality that can be restricted by the software license for JasperReports Server. If you don't see some of the options described in this section, your license may prohibit you from using them. To find out what you're licensed to use, or to upgrade your license, contact Jaspersoft.

JasperReports Server provides a powerful and flexible environment for deploying and running JasperReports. The repository stores all the resources used to run and create reports, including data source definitions, JRXML files, datatypes, and helper files such as images. Administrators create the folders and resources so that users can create, run, and save the reports they need. For administrators who want to customize the user interface, the repository also holds the CSS and image files that define a theme.

The repository is structured as a hierarchy of folders that is based on the hierarchy of organizations. The JasperReports Server web interface enables you to browse the repository's resources, manage its folder structure, and secure its contents. This chapter covers the basic tasks of administering the repository, including:

- Creating folders and organizing repository objects.
- Managing references to data sources, images, fonts, and other resources upon which reports rely.
- Controlling access to resources in the repository through roles and object-level permissions.

Further information about the repository is covered in the following sections:

- **"Overview of the Repository" on page 14**
- **"Resources in the Repository" on page 65**
- **"Themes" on page 111**

You can also access the repository programmatically by using the web services and APIs. For more information on these features, refer to the *JasperReports Server Web Services Guide* and to the *JasperReports Server Ultimate Guide*, respectively.

This chapter contains the following sections:

- **Resource Types**
- **JasperReport Structure**
- **Managing Folders and Resources**
- **Multiple Organizations in the Repository**
- **Permissions**

3.1 Resource Types

Resources in the repository have a type that determines how users can interact with it. The various resource types are based on various reports and report elements that users and administrators store in the repository.

There are two fundamental types of resources: those that the end user creates, and those that the administrator must create. End users create the following resources. Procedures for end users to create these resources are described in the *JasperReports Server User Guide*:

Table 3-1 Resources Created by End Users

Resource Type	Description
Ad Hoc view	Professional edition only. Created interactively in the Ad Hoc Editor by dragging and dropping columns of data onto a table, chart, or crosstab. Users may then explore their data by applying filters and performing pivot operations. An Ad Hoc view can also be saved as an interactive report and shared with other users.
Dashboard	Professional edition only. A collection of reports, input controls, graphics, labels, and web content displayed together. Users create dashboards interactively in the Dashboard Designer and save them in the repository.
Content resource	Report output of any format, either from running a report in the background or from scheduling a report. A content resource is a simple file that the repository allows users to view or download.
JasperReport or simply report	A complex type that combines a JRXML file, a data source, and optional components such as input controls to define a report that users can run in the server. Depending on the usage scenario, both users and administrators create JasperReports in the server. For more information, see **"JasperReport Structure" on page 45**. Optionally, reports may also store a snapshot of the report data to improve performance when many users access the same reports.
Report version	Professional edition only. Reports with input controls allow you to save combinations of input data so that you can run a custom version of the report directly. In the repository, report versions are always listed under the original report.

The other types of resources are all created and managed in the repository by administrators. The following resources generally support the creation of reports:

Table 3-2 Resources Created by Administrators

Resource Type	Description
Data source	A connection that points to a database or other data store. Data sources define where data is stored for running reports. There are several types of data sources, based on the type of connection or location of the data: JDBC, JNDI, and bean data sources. For more information, see **"Data Sources" on page 65**.
Datatype	A basic type that defines the format for input values, for example text, number, or date. A datatype may also specify a valid range for the input value.

Resource Type	Description
Domain	A metadata layer that selects, joins, and filters tables and fields from your data and lets you give them user-friendly labels. A Domain can be the basis for an Ad Hoc report. Domains also support row-level security and localization of labels. Domains are further documented in the *JasperReports Server User Guide*.
File	A resource that stores a file in the repository. **"File Resource Types" on page 107** gives the list of supported file formats and their purpose.
Input Control	A complex type that specifies what values users can input for a report and how the input field appears when running the report, for example radio buttons or check boxes. Input controls depend on datatypes or lists of values to specify the format of the input.
List of Values	A basic type that defines a list of arbitrary labels for input. Each label is associated with a value that can correspond to your data. For example, the Month Names List in the sample data associates the name of each month with the values 1 to 12.
Query	A database query string, for example in SQL. The JRXML doesn't necessarily include the query, in which case, you must define a query resource for use in the JasperReport.

Administrators may also manage OLAP resources in the repository, if their license supports Jaspersoft OLAP. For more information about OLAP and Mondrian resources, see the *Jaspersoft OLAP User Guide*.

Table 3-3 OLAP Resources Created by Administrators

Resource Type	Description
Mondrian XML/A Source	A server-side XMLA source definition of a remote client-side XML/A connection.
OLAP Client Connection	Defines how to retrieve data for an OLAP view. An OLAP client connection is either a direct Java connection (Mondrian connection) or an XML-based API connection (XML/A connection).
OLAP View	If you implement Jaspersoft OLAP, a view of multidimensional data that is based on an OLAP client connection and an MDX query. Like JasperReports, they are collections of individual resources that define how to access and present the data.

3.2 JasperReport Structure

The resource in the repository that aggregates all information needed to run a report is called a JasperReport. A JasperReport is based on a JRXML file that conforms to the JasperReports open source library that the server uses to render reports.

A JasperReport is a complex resource that is composed of other resources:

- A JRXML file that defines the report, called the main JRXML.
- A data source that supplies data for the report.
- A query if none is specified in the main JRXML.
  - The query may specify its own data source, which overrides the data source defined in the report.

- Input controls for any parameters that users may enter before running the report. Input controls are composed of either:
  - A datatype definition.
  - A list of values.
- Any additional file resources, such as images, fonts, and resource bundles referenced by the report template.
- If the report includes sub-reports, the JRXML files for the subreports.

The collection of all the resources that are referenced in a JasperReport is sometimes called a report unit. End users usually see and interact with a JasperReport as a single resource in the repository, but report creators must define all of the component resources.

3.2.1 Referencing Resources in the Repository

There are several ways to define and reference all the resources in a JasperReport.

In environments without JasperReports Server, reports are stored in the file system, and shared resources are usually stored on a network drive accessible to all developers and users. This solution is sometimes impractical, as you cannot always add such resources to the classpath, and the use of absolute paths has its own limitations. In addition, storing the resources in the file system discourages their reuse: your developers may invest time in creating new versions of resources that already exist because they don't know about them.

By storing resources in the repository, JasperReports Server makes it easy and reliable to share resources such as images, style templates, and subreports between reports. The repository mimics a folder and file structure, so that references to external files can be handled as references to external resources in the repository.

In versions of JasperReports Server prior to 5.5, the JasperReports used the `repo:`syntax. As of 5.5, this is no longer necessary, and regular file paths are recognized and managed within the repository.

When you upload your JRXML to the repository, your file references become valid repository references, and you can store all your resources in well-known locations in the repository. This simplifies the process of uploading your reports, because you don't have to upload the resources each time. Also, you can manage these resources either through iReport, through the JasperReports Server user interface, or through the server's APIs. For example, when you update a logo image resource, all reports that reference the resource also display the new logo.

3.2.2 Absolute References

Absolute references are URIs in the JRXML of the report that specify a resource's repository path. The path may refer to the file system where the JRXML was created, but when uploaded to the server, it refers to folders in the repository.

The path must start with one of the following:

> / to represent the root of the repository in the community edition, or the current user's organization in commercial editions. For example, `/images/logo` is a resource in the /images folder.
>
> `../` to represent the folder where the JasperReport is uploaded. For example, `../myLogo` is a resource in the same folder as the JasperReport.

As with a file system path, the repository path is composed of the resource ID of every parent folder, ending with the ID of the resource. iReport with the JasperReports Server plug-in supports absolute references by allowing you to drag resources from the repository tree view into the design area.

If you implement organizations, the absolute path is relative the user's organization, as described in section **"Multiple Organizations in the Repository" on page 55**.

When uploading the JRXML with absolute resource references as part of a JasperReport in the server, you only need to ensure that the resource with the given path exists in the repository before running the report. When the report runs, the server locates the resource in the repository and uses it to render the report.

Because file resources such as images, fonts, and JARs are the only resources for which you can create references directly in JRXML, they are the only resources for which you can create absolute references.

One disadvantage of absolute references is that JasperReports Server does not maintain the dependency between the JRXML and the absolute reference. When uploading the JRXML, there is no warning if the resource does not exist, and the server allows you to delete the resource from the repository even if it is still being referenced. If the resource is not available, running the report fails with an error.

3.2.3 Local Resources and External References

JasperReports Server provides more flexibility and power when you use indirect references instead of absolute references. Indirect references are placeholder names that must be manually linked to the resource when uploading the JasperReport. The syntax for an indirect reference contains only a placeholder name for the resource, for example:

```
logoImage
```

When you upload a JRXML with this reference, the server prompts you to provide the resource. You have two choices:

- Creating a new resource, in this case by uploading an image, that becomes part of the JasperReport. This is called a local resource. You cannot access this resource from elsewhere in the repository, it exists only within the JasperReport.
- Selecting a resource from the repository, called an external reference because it is external to the JasperReport. This allows any number of reports to link to the same resource, yet allow that resource to be managed independently of them.

While indirect references require slightly more work than absolute references in the JRXML, the server manages the dependency. Local resources exist as part of JasperReport, and external references cannot be deleted until they are no longer referenced.

In cases when you don't want to reference existing resources, local resources allow reports to be highly customized and self-contained. A local resource that is defined inside the JasperReport has all the same properties as a repository resource, but it is not accessible in the repository. Users must edit the JasperReport to access any resources it defines locally.

Users who are not administrators may create JasperReports but not other resources in the repository. Therefore, if an administrator does not provide them resources for external references, their only option is to create local resources for all dependencies within the JasperReport.

Indirect references are used implicitly in several other cases when you define a JasperReport:

- The main JRXML itself is either a local resource created by uploading a file or an external reference to an existing JRXML file resource in the repository.
- Every report must have a data source, and JasperReports Server gives you the option of creating a new local resource or of using an external reference to an existing data source.

- Every report must also have a query that matches its data source. You may choose to create a query local resource or use an external reference to an existing query.
- Parameters in a report are implicitly handled as an indirect reference to an input control. For every parameter named in your main JRXML, you must define an input control either as a local resource or external reference.

Every level of indirect referencing is independent of the other. For example, when creating a JasperReport, you may choose to create an input control as a local resource, but that input control may have an external reference to its datatype. The server still manages the dependency between the local input control and the datatype resource in the repository.

Local resources and external references are use throughout the repository, for example when creating input controls, query resources, Domains, and OLAP resources.

3.2.4 References in Subreports

A subreport is a subordinate JRXML file that is included in a JasperReport. As with all other resources referenced by the main JRXML, the subreport JRXML file may be specified by an absolute reference, a local resource or an external reference.

As a JRXML file, a subreport can reference other resources of its own. However, the subreport is run as part of the main JRXML, and any references in the subreport are interpreted relative to the JasperReport resource (represented by the main JRXML) and the context in which the JasperReport is being run.

3.2.5 Data Snapshots

As of JasperReports Server 4.7, report resources may also store a snapshot of the report data. A snapshot is a copy of the data that the query returns when the data is refreshed. This data snapshot is an internal structure that is not visible nor accessible from the repository. However, when data snapshots are enabled, a data snapshot is stored in the repository with each report. When users open a report, the report viewer retrieves and displays from the snapshot. Users then have the option of refreshing the data in the report viewer, and if they have permissions, saving the data snapshot back into the report resource.

For more information about interacting with data snapshots, see the *JasperReports Server User Guide*. To enable snapshots, see **8.5, “Enabling Data Snapshots,” on page 186**.

3.3 Managing Folders and Resources

Administrators and users with the proper permissions can create, modify, move, and delete folders and resources in the repository. The specific roles and permissions of the user determine the actions that are available. For the definition of the permissions on folders and resources, see **“Permissions” on page 57**.

One responsibility of a JasperReports Server administrator is to set up an environment for users to create and save dashboards, Ad Hoc views, and reports. That usually means creating a folder structure where users have write permission. Users with write permission may also create their own sub-folders to store their reports and dashboards.

Another scenario that administrators can set up involves the resources for users to create JasperReports. When given write permission, users have the ability to upload JRXML files and define resources inside the JasperReport. But for security reasons, only the administrator can create shared data sources and other resources in the repository. If many users are uploading JRXML files as JasperReports, the administrator should create shared data sources and resources ahead of time in the repository. This also has the benefit of simplifying maintenance, for example updating one shared logo file instead of having many users edit their reports.

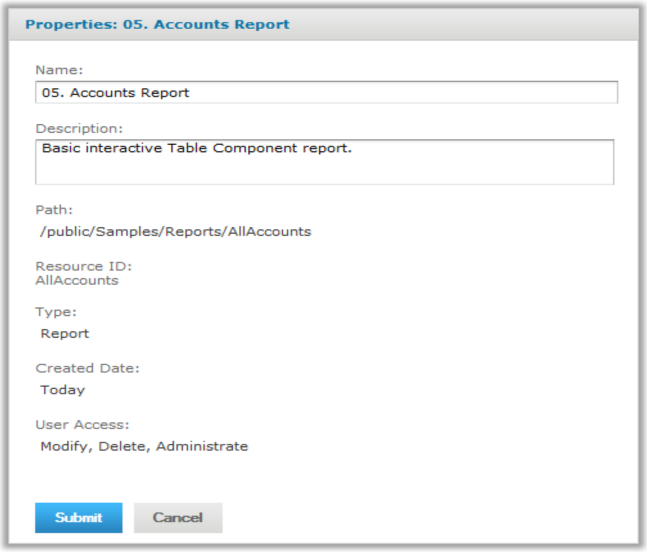
3.3.1 Resource IDs

All resources, including folders, have an ID, a name, and an optional description:

- The ID is used internally to reference resources. As with files, the ID must be unique within its folder, but may exist in several folders.
- The name is a label for the resource displayed in the repository UI.
- The optional description appears in the repository and in tooltips. You can give longer descriptions to resources to help users understand their contents or purpose.

As in a file system, the IDs of nested folders containing a resource define the path to the object. For example, the path to a report might be: /reports/samples/Freight. The path of every resource is shown under its name in the repository listing or search results.

To view the name and resource ID of a resource, right-click the folder or the resource in the repository or search results and select **Properties...** from the context menu.



Properties: 05. Accounts Report

Name:
05. Accounts Report

Description:
Basic interactive Table Component report.

Path:
/public/Samples/Reports/AllAccounts

Resource ID:
AllAccounts

Type:
Report

Created Date:
Today

User Access:
Modify, Delete, Administrate

Figure 3-1 Resource Properties Dialog for a Writable Resource

If you have write or administer permission as shown in the figure, you can also edit the name and description of the resource. For some operations such as export, you need the resource's path, also called repository URI, that you can copy from this dialog.

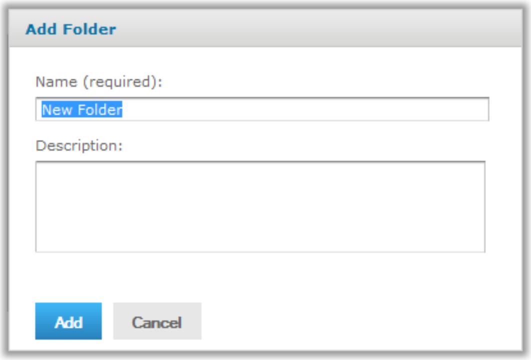
3.3.2 Creating Folders

Any user with write permission on a folder can create new sub-folders.

To create a folder:

1. Log on as a user who has write permission to the parent folder.

2. Select **View > Repository** and locate the parent folder in the left-hand Folders panel.
3. Right-click the parent folder and select **Add Folder** from the context menu.
4. The Add Folder dialog appears.



Add Folder

Name (required):

New Folder

Description:

Figure 3-2 Add Folder Dialog

5. Enter a folder name and optional description, then click **Add**.

   The folder is created in the repository. The name appears in the hierarchy of folders. The description is only visible when viewing the properties of the folder, as shown in **Figure 3-1**.

   New folders and their future contents inherit the permissions of their parent folders. Administrators can change the permissions on the new folder, as described in **"Setting Permissions" on page 60**. End users cannot change permissions in the repository unless they have been granted the Administer permission by an administrator.

3.3.3 Adding Resources

Each resource has different requirements, for example some are created from uploaded files, others are created by defining values in a wizard. Specific procedures for adding each type of resource are given as follows:

- Interactive resources such as Ad Hoc views and dashboards are described in the *JasperReports Server User Guide*.
- JasperReports are covered in the *JasperReports Server User Guide*.
- Domains are covered in the *JasperReports Server User Guide*. Domains are only available in the Pro version of JasperReports Server.
- Mondrian and OLAP resources are covered in the *Jaspersoft OLAP User Guide*.
- Data sources, queries, input controls, and file resources are explained in the chapter **"Resources in the Repository" on page 65**

Most resources are created through the Add Resource menu item on the context menu for folders in the repository. In **Figure 3-3**, you can see the full menu and submenu with all the resources administrators can create:

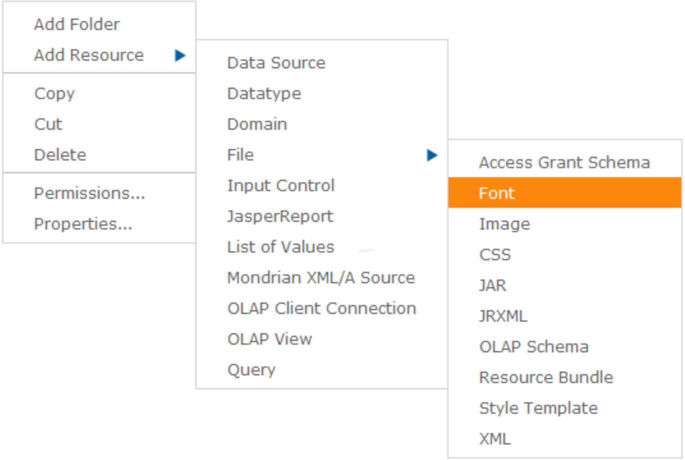


Figure 3-3 Add Resource Context Menu Expanded

For every resource you create, you must specify a name and resource ID that can used to reference the resource in the repository. In addition, each dialog has one or more pages for specifying the values and controls specific to the resource you are adding.

New resources inherit the permissions of the folder in which they are created. Administrators can change the permissions on the new resource, as described in section **"Setting Permissions" on page 60**.

3.3.4 Renaming Folders and Resources

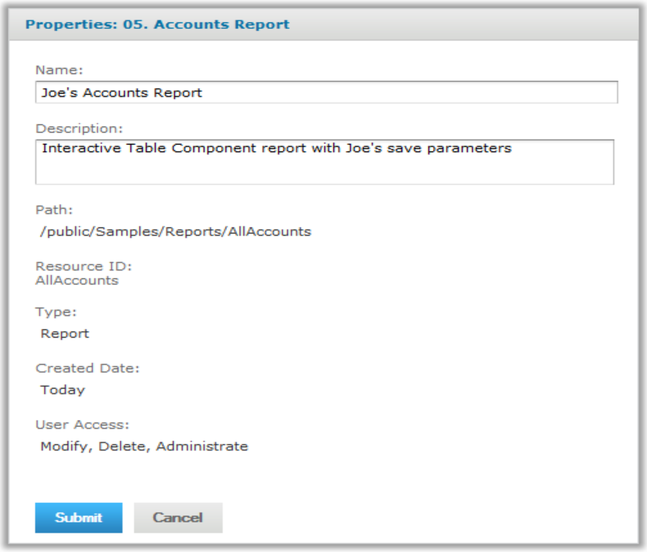
Any user with write permission on a folder or resource can change its name and description.

You cannot change the name of an organization's top-level folder in the way described here. The name of the top-level folder is copied from the name of the organization. Therefore, to change the name of the folder, you have to change the name of the organization, as described in section **"Editing an Organization" on page 28**.

To rename a folder or resource:

1. Log on as a user who has write permission for the folder or resource.
2. In the repository, browse or search for the resource. For renaming folders, select **View > Repository** and locate the folder.
3. Right-click the object and select **Properties...** from the context menu.

   The Properties dialog appears.



Properties: 05. Accounts Report

Name:
Joe's Accounts Report

Description:
Interactive Table Component report with Joe's save parameters

Path:
/public/Samples/Reports/AllAccounts

Resource ID:
AllAccounts

Type:
Report

Created Date:
Today

User Access:
Modify, Delete, Administrate

Figure 3-4 Properties Dialog for a Report Resource

You can change the folder or resource's name and description, but not the ID or the resource type; the ID is permanent once the resource is created, and the type is displayed here for information only.

4. Click **Submit** to save your changes.

3.3.5 Copying and Moving

The repository interface lets any user with the proper permission copy or move both resources and folders. Copying requires read permission on the source, moving requires delete permission on the source, and both require write permission on the destination folder.

You can drag-and-drop the objects, or you can copy-paste or cut-and-paste them from their context menus. Folders must be moved one at a time, but multiple resources from the same folder can be copied or moved together.

Copying and moving actions are not possible on the search interface, only on the repository interface showing the list of folders. Currently, it is not possible to create a copy of a resource in the same folder.

The moved objects inherit their permissions from the destination folder in which they are placed; they do *not* keep the permissions they had before the move. If you want the objects to have other permissions, you must set the permissions again after the move (see **"Setting Permissions" on page 60**).

To copy or moving folders and resources:

1. Log on as a user who has the required permissions for the folder or resource.
2. Click **View > Repository**, and expand the folders to display the object to be copied or moved.
3. Right-click the object and select **Copy** or **Cut**. If the Cut command does not appear in the menu, you do not have delete permission required to move the object.

   You can select multiple resources with Control-click or Shift-click, but you can select only a single folder at a time.

4. Right-click the destination folder and select **Paste** in the context menu. If the **Paste** command does not appear in the menu, you do not have write permission there.

   Alternatively, you can drag the selected resource or folder to move it the destination folder. To perform a copy, you must press the Control key *before* clicking to drag. When dragging resources, the destination folder is highlighted in blue if you have permission to write there, and in gray otherwise. If you try to move a resource to a location where you don't have permission, the server displays the contents of the target folder, but the resource is not moved.

3.3.6 Editing Resources

The various types of resources have different ways of being edited. For end users who work with interactive resources, editing mostly involves the **Open in Designer** action on the context menu for dashboards and Ad Hoc views. The procedures in the following table are further described in the *JasperReports Server User Guide*.

Table 3-4 Resources That End Users Can Edit

Resource Type	How to Edit
Ad Hoc views	Professional edition only. Users select **Open in Designer** and modify the view interactively. After changing the content, users can overwrite the existing view or save as a new view. Reports created from Ad Hoc views are saved in the same format as JasperReports, but the resources referenced in the report unit are generated by the Ad Hoc editor and should not be modified. There is one exception: administrators may create a JSP file and set it as a custom report view.
Dashboard	Professional edition only. Users select **Open in Designer** and modify the dashboard interactively. After changing the content, users can overwrite the existing dashboard or save it as a new dashboard.
Content Resource	Report output is a file stored in the repository. These files cannot be edited, only downloaded or deleted.
JasperReport	Users select **Edit** and change the data source, input controls, or file resources that are referenced in the JasperReport. Administrators may also edit JasperReports. For more information, see **"JasperReport Structure" on page 45**. When users **Run** a report, it is displayed in the interactive report viewer. If data snapshots are enabled, the report is displayed with data that was previously returned by the data source. When data snapshots are not enabled, the server queries the data source and runs the report's query. After interacting with the report's columns and values, users may save the report, either by overwriting the original or as a new copy, depending on user's permissions.
Report Version	Professional edition only. Users may select **Edit** to change the values stored as input parameters.

For the other resources in the following table, editing is accessible only to administrators. End users, even those with write permission on a resource, cannot edit these resources.

Table 3-5 Resources That Only Administrators Can Edit

Resource Type	How to Edit
Data Source	Administrators select **Edit** from the context menu on these resources. Editing these resources uses the same dialog that was used to define the resource when it is first added to JasperReports Server. Administrators can view the current definition of a resource or change the values that define a resource. For example, you could view the datatype of an input control, change a query, or upload a new file in a file resource. In the case of Domains, you also have access to the Domain Designer used when creating the Domain. You can add tables and fields, change filters, or change the display characteristics of items in the Domain. For more information about Domains, see the *JasperReports Server User Guide*. For all other resource types, see the procedure for creating it in **"Resources in the Repository" on page 65**.
Datatype	
Domain	
File	
Input Control	
List of Values	
Query	

When editing a resource, there are several limitations:

- You can modify the name or description of the resource, but not its ID. If you must remove an ID, you need to create a new, similar resource and delete the old one.
- You cannot change the location of the resource. Some dialogs for editing a resource include the saved location, but the field is for information only. To change the location of the resource, see **"Copying and Moving" on page 52**.
- For file resources, you cannot see the name of the file that was uploaded, nor in most cases download and view the contents of the file. Your only option is to upload a new file to replace the old one.

3.3.7 Deleting Folders and Resources

Users with delete permission on a folder or resource can delete those objects from the repository. In order to delete a folder, the user must also have delete permission on all the resources and folders that the deleted folder contains, because the entire contents of the deleted folder are deleted as well.

Folders must be deleted one at a time, but multiple resources can be deleted together.

There is no undo from a delete.

The repository keeps track of which resources are referenced by other resources. It does not allow you to delete resources if they are still referenced by other resources. For example, an input type that is used by a report or a properties file that is used by a Domain cannot be deleted as long as the report or Domain still references them.

To find the resources that reference the one you want to delete, you need to look at each report, view, Ad Hoc Topic, or Domain that you suspect of referencing it. When you edit the definition of a JasperReport or a Domain, you can see the resources it references. Then you can either remove the reference from the resource or delete the entire resource containing the reference.

To delete a folder or resource:

1. Log on as a user who has delete permission for the folder or resource.
2. In the repository, browse or search for the object to be deleted.
3. Right-click the object and click **Delete** in the context menu that appears.

In the repository view, you can select multiple resources and click Delete in the tool bar or in the context menu. In the list of folders, you can only delete single folders at a time, although all contents of the folders, including subfolders are deleted. In the search results, you can select multiple resources and right-click to select Delete in the context menu.

3.4 Multiple Organizations in the Repository

If you implement multiple organizations, there are certain considerations when designing the repository structure for your deployment.

Multiple organizations are only available in the professional edition of JasperReports Server.

3.4.1 Organization Folders

In the repository, each organization has its own branch, contained in a folder named after the organization. JasperReports Server automatically restricts users' view and access to the branch of the repository in their organization's folder. Organization admins can create any folder structure needed within the organization.

The top folder of an organization is contained in a folder called Organizations in the parent organization. Top-level organizations are contained in a folder called Organizations at the root of the folder hierarchy. Administrators can view and browse the Organizations folder, and if any suborganizations are created, they can also view all folders and resources in the suborganization. As administrators of the parent organization, they can also create folders and resources in the suborganization.

By default, users of an organization can also view and create folders and resources in any suborganization. To prevent this, administrators can change the permissions on the Organizations folder or individual organization folders.

The Organizations folder in every organization is a special folder that is managed by the server. Administrators cannot create folders or resources directly in the Organizations folder. The server creates the folder for each suborganization when the administrator creates a new organization through the **Manage > Organizations** page. Administrators can create folders and resources in the Folder Template folder in the Organizations folder; these resources are copied into new organizations. For more information, see **2.1.3, "Default Folders for Organizations," on page 28**

3.4.2 Design Considerations

Careful design of the JasperReports Server repository leads to a clear and robust environment for your BI environment and easy yet secure access for users. One of the main decisions is how you want your organizations and users to access resources: which resources are shared across organizations as opposed to which are specific to a particular organization. This usually breaks down into several scenarios, depending on the resources that organizations need:

- Organizations have private resources - Organizations have separate data sources, reports, OLAP views etc. This would be typical in an organization with departments. These private resources would be stored in each organization's own folders, and perhaps only a few resources such as company logos would be shared between them.
- Organizations share resources - Resources are kept in the public folders where they can be used by all organizations and users. You may have common data sources and reports across customers, but the

underlying data is partitioned by organization. Data level security restricts what users see when running public reports and OLAP views.

- Organization share resources, but have some customizations - For example, users in the organization create reports that are private and stored locally, but they access resources in the public folders.
- Organizations have a hierarchical organization - You can have one organization containing other organizations. By default, the parent organization can access all the resources of its child organizations. If you don't want this, you must avoid creating suborganizations or customize the server's multi-organization architecture.

3.4.3 Referencing Resources in the Repository

All resources in the repository can be referenced by Universal Resource Identifiers (URIs), which specifies the resource name and folder path of the resource. Because of the hierarchy of organizations, references are relative to the user accessing them. JasperReports Server transforms relative references into actual resource locations in the repository based on the user's organization and the organization's main folder. By default, folder locations are transformed in the following ways:

- For organization members, locations in /public are not transformed, but those in the organization's main folder are transformed to the actual location, for example, /organizations/organization_1.

  For example, if a user in org_1 runs a report that references /images/myLogo image resource, the actual path in the repository that is fetched is /organizations/org_1/images/myLogo. If the report also references /Public/sharedLogo, the server fetches the resource in /Public/sharedLogo.
- For system admins, locations throughout the repository are not transformed. They see the actual repository path names.

  If a system admin runs the same report in the example above, the reference to /images/myLogo attempts to fetch a resource named /image/myLogo, which only works if there is a folder at the root of the repository named images with a copy of the myLogo. The report fails (or is missing a resource) when run by the system admin, unless he logs in as that user through the **Manage > Users** page.

This transformation enables URIs to reference different resources depending on the organization of the user who accesses them. For example, a report may have an organization-specific logo as an image. We can set up the report as follows:

- Logo URI specified in the JRXML: /images/orgLogo. When transformed for each user, the URI accesses a location relative to his organization's main folder.
- Every organization using this report must have a folder named /images containing an image resource with the ID orgLogo. When a user in any organization runs the report, the server fetches the organization-specific image and displays it.

There are three exceptions to references being transformed. In these cases, the references must be literal:

- In report units, references to data sources, JRXMLs, or input controls.
- In OLAP views, references to OLAP connections.
- In OLAP connections, references to data sources or schemas.

Also, because these references are not transformed, you must observe the following:

- For maintenance tasks on an organization's report units, OLAP views and OLAP connections, you must log in to that organization and do the tasks there. You cannot administer the resources as superuser or another organization's admin.
- The three resources (report units, OLAP views and OLAP connections) cannot reference objects across organizations or even in their own parent organization. The reference would not be transformed; it would

be taken literally and would fail. For example, if the data source for a report unit is in the /dataSources folder of This_Org, users in That_Org cannot access it because their reference cannot cross organizations.

To test the absolute references, you should login as an admin of the organization using the references. See **"Testing User Permissions" on page 62**.

3.4.4 Best Practices

The best practices for resources in a repository shared by multiple organizations are as follows:

- The system admin must login as an organization user in order to maintain or run organization resources.
- Resources with absolute references to resources in organization folders only work for users within the organization or a parent organization.
- If a JRXML that accesses organization resources with URIs must run across organizations, then all organizations must have identical folders, object names, and expected object types for those resources.
- The public folder should be used for resources that are shared across organizations.

3.5 Permissions

Permissions on folders and resources determine what users see in the repository and what actions they are allowed to perform. In the following table, the actions granted for each permission include all of the actions granted for permissions above it, except for the No Access permission. The actions granted for each permission strictly exclude all of the actions granted for permissions below it.

Permission	Actions Granted on Repository Folders and Resources
No Access	Users can never see or access the folder or resource either directly in the repository or indirectly when running a report, dashboard, or OLAP view.
Execute Only	Users can never see the folder or resource in the repository, but the reports, dashboard, or OLAP views that they run can access them.
Read Only	• See the folder or resource in any JasperReports Server dialog • See the properties of a folder or a resource • Copy a folder and all of its readable contents • Copy resources individually or in bulk • View (run) a report, dashboard, or OLAP view • Run a report in the background • Schedule a report to run later
Read + Delete	• Cut (move) a folder and all of its contents • Delete a folder and all of its contents • Cut (move) resources individually or in bulk • Delete resources individually or in bulk

Permission	Actions Granted on Repository Folders and Resources
Read + Write	• Save report options for a JasperReport • Delete report options • Copy resources to a folder with this permission • Edit resources
Read + Write + Delete	• Add a subfolder • Paste into a folder (copy or cut) • Save a new Ad Hoc view, report, or dashboard in a folder • Save the output of a scheduled report in a folder • Rename a folder or resource and change its description string • Open an Ad Hoc view in the Ad Hoc Editor or a dashboard in the designer • Modify and overwrite an existing Ad Hoc view, report or dashboard • Add a JasperReport resource to the repository (upload a JRXML) • Edit the definition of a JasperReport resource in the repository (replace the JRXML)
Administer	• Set the permissions (by role and by user) on a folder or resource. This effectively delegates certain repository administration tasks.
Administer and ROLE _ADMINISTRATOR	• Add (create) a resource in a folder • Edit a resource, for example the components of a report unit or a Domain

Permissions apply when browsing or searching the repository, as well as when using any dialog that accesses the repository, such as when browsing folders to save a report. Note that:

- Copying does *not* preserve the permissions on an object. Users may copy a read-only object, paste it into a read-write folder, then edit the object. For more details, see **3.3.5, "Copying and Moving," on page 52**
- Copying and cutting (moving) actions can only be completed if the user has Read + Write + Delete access to the folder in which the object is pasted. For more details, see **3.3.5, "Copying and Moving," on page 52**
- Cutting, deleting, and setting permissions on folders is allowed only if the user has the same permission on all folder contents. Cutting and deleting resources in bulk is allowed only if the user has at least Read + Delete permission on all selected resources.
- Deleting a resource or the contents of a folder is only allowed if no other resources rely on them. For more details, see **3.3.7, "Deleting Folders and Resources," on page 54**

3.5.1 Inheriting Permissions

According to the permission architecture, there is a permission setting for every user and role on every folder and resource in the repository. To simplify the definition of permissions, JasperReports Server supports the inheritance of permissions from the parent folder of a folder or resource. If no permission is explicitly defined for a user or role on a given folder or resource, the user or role has the same access permission that is defined on the parent folder. When a permission is defined explicitly, that permission is enforced, regardless of those on the parent folder.

Using this mechanism, administrators can manage large hierarchies of content and keep them secure. When the administrator sets a permission explicitly, that permission for a given user or role is inherited recursively by all of the folder's contents and subfolders, unless they have an explicit definition of their own. Permissions that are assigned on an organization's top folder are inherited across the entire organization. Permissions that are set on the root folder or (if using the professional edition of JasperReports Server) Organizations folder by the system admin are inherited across multiple organizations.

For example, the system admin can make all organizations read-only by default to ordinary users, and each organization admin can make specific folders writable so that users can store their reports and output.

3.5.2 Cumulative Permissions

Because permissions can be assigned to both users and roles, a user belonging to one or more roles may have multiple permissions defined or inherited on any given folder or resource. In fact, every permission must be defined on the root, even if it has the default value of No Access, and therefore every role- and user-based permission on every folder and resource has a setting through inheritance. Therefore, for every folder or resource, every user has a their own user-based permission and the permission assigned to the ROLE_USER.

How does JasperReports Server determine the effective permission from the many that apply? Permissions in the server are strictly cumulative, meaning that the least restrictive among the set of all permission applies. Even if a more restrictive permission, such as No Access, is set explicitly, the less restrictive permission such as Read-Only applies, regardless of whether it is inherited or set explicitly.

3.5.3 Administrator Permissions

The JasperReports Server authorization architecture distinguishes between administrators and all other users. Administrators are defined as users with either ROLE_SUPERUSER (available in the professional edition of JasperReports Server only), ROLE_ADMINISTRATOR, or both. By design, system administrators with the ROLE_SUPERUSER always have irrevocable Administer access to the entire repository, including to the contents of every organization. The system administrator cannot modify the permissions for ROLE_SUPERUSER, to prevent being locked out or unable to administer some resource. Therefore, the system admin can set permissions for all other users, on any folder or resource, and in any organization if necessary. In particular, the system administrator can modify permissions for ROLE_ADMINISTRATOR, for example to share some resources across all organizations by making them read-only to everyone, including the organization admins.

Organization admins are organization users with the ROLE_ADMINISTRATOR, like the default jasperadmin created in every organization. By default, organization admins have the Administer permissions to everything in their organization, except what the system admin has changed to a lesser permission. However, organization admins cannot change the permissions granted to ROLE_ADMINISTRATOR, to prevent them from overriding the settings of the system admin and from locking themselves out of a folder or resource.

3.5.4 Execute-Only Permission

As in file systems, execute-only permission in JasperReports Server allows running reports, dashboards, and OLAP views to access a resource, but keeps the resource from appearing in the repository.

Execute-only permission applies to folders as well, keeping them from appearing in folder tree when users browse the repository, yet still allowing the resources they contain to inherit the execute-only permission. This is useful for hiding folders and resources such as data sources that only administrators and data analyst roles need to access in the repository. However, if your execute-only folder contains read-only resources, those resource are hidden when browsing folders, but can be found, either accidentally or intentionally, by using the repository search.

As with all other permissions, execute-only permission is either role-based or user-based, so that certain users may access a resource from a running report, but not others.

If you have data or sensitive content in a resource, always set No Access permission for users or roles that must not be able to access it.

Hiding a resource with execute-only permission does not protect against access, because malicious users who find the resource ID may be able to create a report, dashboard, or OLAP view that extracts the sensitive content.

3.5.5 Default User Permissions

For all non-administrator users, the default permission at the root is No Access and any permissions must be explicitly defined. In practice, the default installation of the repository contains sample data with a mix of no access, execute only, read only, and read-write permissions that allow the sample users to access folders and resources. The sample permissions demonstrate a common approach to permissions, allowing users to see the resources they can access and hiding the ones they can't, while administrators have full access.

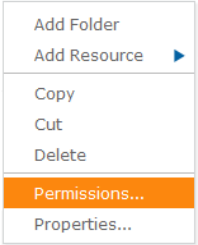
We recommend you familiarize yourself with the permissions mechanism by viewing and setting permissions in the sample data, as described in the following section.

3.5.6 Setting Permissions

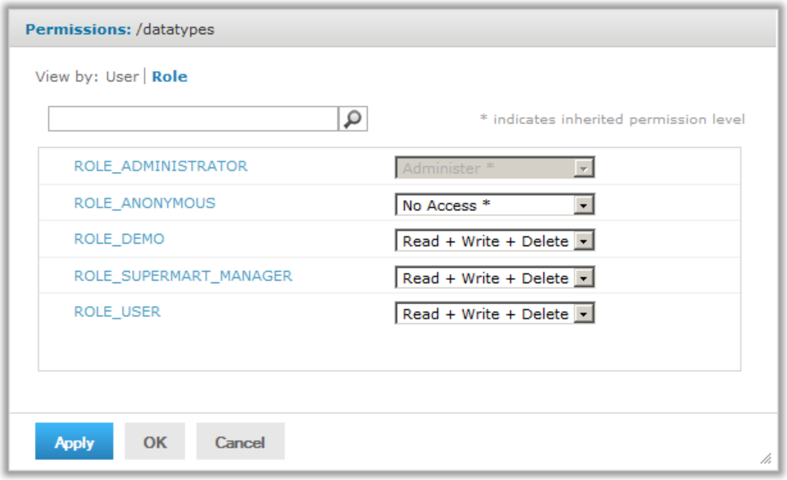
Administrators can assign permissions to access any folder or resource throughout the repository. Users with the Administer permission on a folder can assign permissions to that folder and any contents that inherit the permission. Users granted Administer permission to a resource can only set the permissions on that specific resource.

To set permissions on a folder or resource in the repository:

1. Log in as a user with administrative privileges.
2. In the repository, browse or search for the folder or resource.
3. Right-click the object and select **Permissions...** from the context menu:



   The Permissions dialog opens. It shows the permissions in effect for the selected object. By default, it first shows the permissions given to roles. Permissions that are inherited from the object's parent are indicated by an asterisk (*).



Permissions: /datatypes

View by: User | **Role**

* indicates inherited permission level

ROLE_ADMINISTRATOR	Administer *
ROLE_ANONYMOUS	No Access *
ROLE_DEMO	Read + Write + Delete
ROLE_SUPERMART_MANAGER	Read + Write + Delete
ROLE_USER	Read + Write + Delete

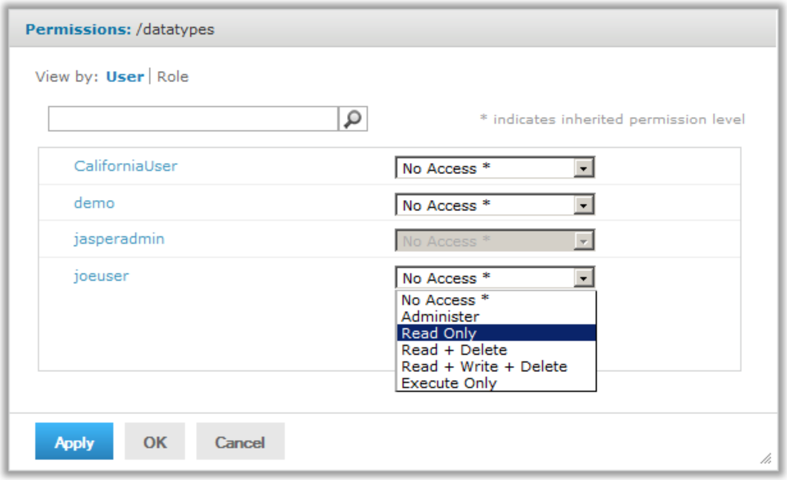
Figure 3-5 Permissions Dialog Showing Permissions by Role

In systems with multiple organizations, the users and roles displayed include only those within the scope of the user. For example, in the default single organization, the organization admin cannot see the permission for the system admin (`superuser`) or for ROLE_SUPERUSER.

In **Figure 3-5**, you can see the default role-based permissions on the sample Input Data Types folder as seen by the organization admin (`jasperadmin`). Members of certain roles can see and modify the input data types stored in this folder; these roles likely correspond to users such as data analysts. Regular users have execute only permission so they do not see this folder, but the reports they run can access its contents. Administrators cannot change the permission for their administrator role or user name, to prevent them from removing their ability to set permissions.

4. In the dialog, click **User** to view the permissions assigned to specific users. Click **Role** when viewing user permissions to toggle back.
5. For each user or role, you can select a new permission from the drop-down.

In **Figure 3-6**, you can see the default user permissions on this folder. In the default installation, all permissions are defined by role; therefore, all user permissions are No Access inherited from the root. The figure shows a read-only permission being granted to the sample end user. This gives the user `joeuser` the ability to see but not modify the Input Data Types folder and its contents. For all other end users, however, the folder is still execute-only due to the settings in **Figure 3-5**.



Permissions: /datatypes

View by: User | Role

* indicates inherited permission level

CaliforniaUser No Access *
demo No Access *
jasperadmin No Access *
joeuser No Access *

Figure 3-6 Permissions Dialog Showing Permissions by User

6. Click **Apply** to save your changes. If you toggle between user and role permissions, you must click **Apply** first to save any changes you made.
7. Click OK to save your changes and close the permissions dialog when you are finished.

   You can open several permissions dialogs for different resources or folders at the same time, as well as navigate the repository. This helps when trying to set permissions uniformly across several folders or organizations.

There are two special cases when setting permissions:

- If a resource inherits a permission, for example Read-Only, you cannot set the permission to the same value, at least not directly. You need to temporarily change the permission level on the parent folder, then set the explicit permission, then set the parent folder's permission back to the original value.

  When a resource and its parent folder have been set to the same permission in this way, the permission dialog still shows the asterisk as if the permission were inherited. But when the parent is later given a different permission, for example Read-Write, the resource retains its explicit Read-Only permission instead of inheriting Read-Write.
- To reset the permission level so that it once more inherits from its parent folder, select a different permissions level and click **Apply**, then select the permission with the asterisk and click **Apply** again.

3.5.7 Testing User Permissions

Once you have configured users, roles, and permissions, Jaspersoft recommends that you test the permissions granted to a few representative users. Testing is also recommended when you add new users, roles, and resources, and when you make any major modifications to your access control configuration.

To test user permissions:

1. Log in as an administrator.
2. Select **Manage > Users**.
3. Select the user's organization, then browse or search for the user whose permissions you are testing.
4. In the Users panel, select the user.

5. In the Properties panel, click **Login as User**.

   The selected user’s Home page appears. The login information in the upper-right corner shows that you are logged in as that user.
6. In the repository, browse or search for the folders and resources to test.
7. Verify that JasperReports Server displays the expected folders and resources. Make a note of any objects that should be displayed but are not, and any objects that should be hidden but are displayed.
8. When you have verified the user’s permissions, click **Log Out**.

   Your own Home page appears.
9. To change the user’s permissions, edit the permissions in the repository and modify the user or role definitions.
10. Continue testing until the user’s permissions are satisfactory.
11. Repeat these steps with several representative users to ensure that your access control is properly configured. An access control configuration that hasn’t been tested doesn’t secure your data adequately.

Chapter 4 Resources in the Repository

This section describes functionality that can be restricted by the software license for JasperReports Server. If you don't see some of the options described in this section, your license may prohibit you from using them. To find out what you're licensed to use, or to upgrade your license, contact Jaspersoft.

The repository in JasperReports Server stores the resources that can be combined to create a report from an uploaded JRXML file. The previous chapter introduced the repository and how to create folders and generic resources. This chapter goes into detail about how to create some key resources: data sources, queries, input controls, and file resources. These are the resource that users reference when uploading a JasperReport.

There are two scenarios for administering JasperReports Server, depending on how your end users create and consume reports.

- If you have users who are proficient at creating their own reports in iReport, they can upload them as JasperReports to the server. In this case, administrators must work with users to prepare the resources required by their reports.
- In the second scenario, administrators create and upload JasperReports to the server for their less technical users. Administrators still need to define all the resources for the reports that their users request.

This chapter contains the following sections:

- **Data Sources**
- **Queries**
- **Input Controls**
- **File Resources**

4.1 Data Sources

A data source is a resource in the repository that defines how and where to obtain the data displayed by reports, Ad Hoc views, and OLAP views. Typically, it specifies the URI of the database server and the details you need to access it, such as a user name and password. JasperReports Server provides data source types for relational databases, most flavors of big data, and for specialized data such as Amazon Web Services and JavaBean data. Virtual data sources allow you to combine several data sources into one.

JasperReports Server can access any relational database that supports the SQL query language through the JDBC (Java DataBase Connectivity) API. Most database vendors provide a JDBC driver to access their product, for example DB2, MySQL, Oracle, PostgreSQL, and Vertica (to name but a few). In this case, you can configure two types of data sources in the repository:

- JDBC data source – Establishes a direct connection to the database server using its JDBC driver. JasperReports Server configures and manages the connections to the database. By default, the maximum number of simultaneous connections for each data source is 20. If the driver is not installed, the system admin can upload and manage JDBC drivers through the UI.
- JNDI data source – Relies on the JNDI (Java Naming and Directory Interface) service of the application server to locate a database connection. You must first define and configure database connections in your application server. The configuration of the application server determines the number of connections that are shared. Note that the application server connects to the database using JDBC, meaning that JNDI data sources are available for all databases that support JDBC.

Big data stores that are not compatible with JDBC have a custom data source:

- Cassandra data source – This new data source introduced in JasperReports Server 5.6 is different from the community-contributed data source for Cassandra. This data source supports the Cassandra Query Language CQL 3.
- Hadoop-Hive data source – This data source can access Apache Hadoop clusters through Apache Hive, Hive 2, or Impala. It uses the Hive Query Language (HiveQL) that is similar to SQL but distinct.
- MongoDB data source – This custom data source for MongoDB supports Jaspersoft's own MongoDB Query Language.

Finally, JasperReports Server also supports some specialized data sources:

- Amazon Web Services (AWS) data sources – Accesses data stored in your AWS data store using JasperReports Server, either on-premises or in the cloud.
- Virtual data source – Allows you to combine multiple data sources into a single data source and join them within a Domain. Also can wrap a data source for big data to be used in a Domain.
- Bean data source – Allows you to access data encapsulated in JavaBeans.
- Internal diagnostic data source – A custom data source for the server's own diagnostic data. The diagnostic information is only available to system admins (`superuser` by default). For more information, see **9.8, "Using the Diagnostic Data In Reports," on page 232**.

In the case of analysis data, JasperReports Server supports OLAP data sources (such as Mondrian and XML/A connections). For information about analysis data sources, refer to the *Jaspersoft OLAP Ultimate Guide*.

You can extend JasperReports Server to support any custom data source. Custom data sources consist of Java implementation classes, a message catalog, and a Spring bean definition. For more information about custom data sources, see the *JasperReports Server Ultimate Guide*.

4.1.1 JDBC Data Sources

Before you create a JDBC data source, the JDBC driver for your data base must be configured in JasperReports Server by a system administrator. For more information on JDBC drivers, see **4.1.1, "JDBC Data Sources," on page 66**.

To create a JDBC data source:

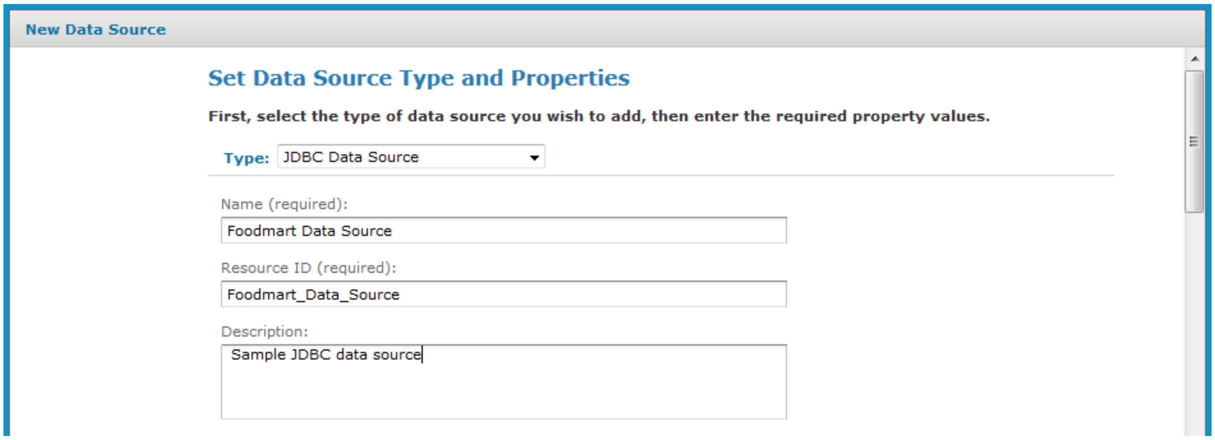
1. Log on as an administrator.
2. Click **View > Repository**, expand the folder tree, and right-click a folder to select **Add Resource > Data Source** from the context menu. Alternatively, you can select **Create > Data Source** from the main menu on any page and specify a folder location later. If you installed the sample data, the suggested folder is Data Sources.

   The New Data Source page appears.

3. In the Type field, select **JDBC Data Source**.

   The page refreshes to show the fields necessary for a JDBC data source.

4. Enter a name and optional description for the data source. The resource ID is filled in automatically based on the name.



New Data Source

Set Data Source Type and Properties

First, select the type of data source you wish to add, then enter the required property values.

Type: JDBC Data Source

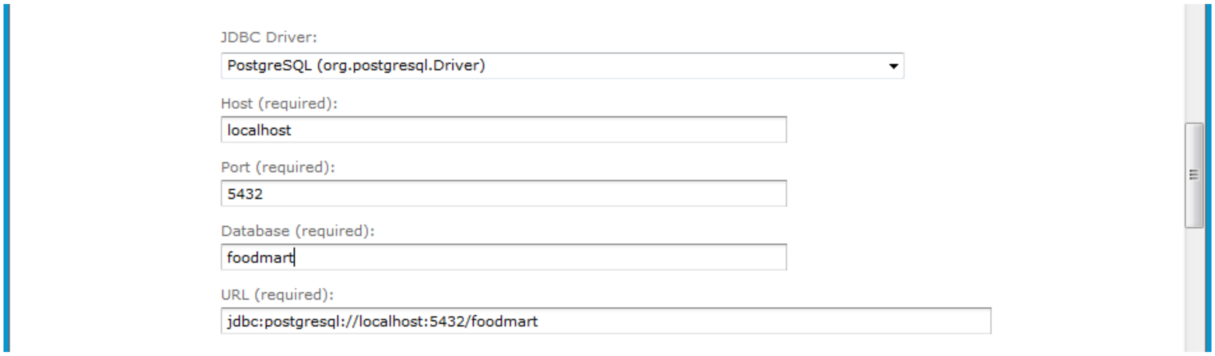
Name (required): Foodmart Data Source

Resource ID (required): Foodmart_Data_Source

Description: Sample JDBC data source

Figure 4-1 Setting the JDBC Data Source Type

5. Select the JDBC driver for your database. If your driver is listed as NOT INSTALLED, a system administrator must first upload the driver as described in **4.1.1, “JDBC Data Sources,” on page 66**.



JDBC Driver: PostgreSQL (org.postgresql.Driver)

Host (required): localhost

Port (required): 5432

Database (required): foodmart

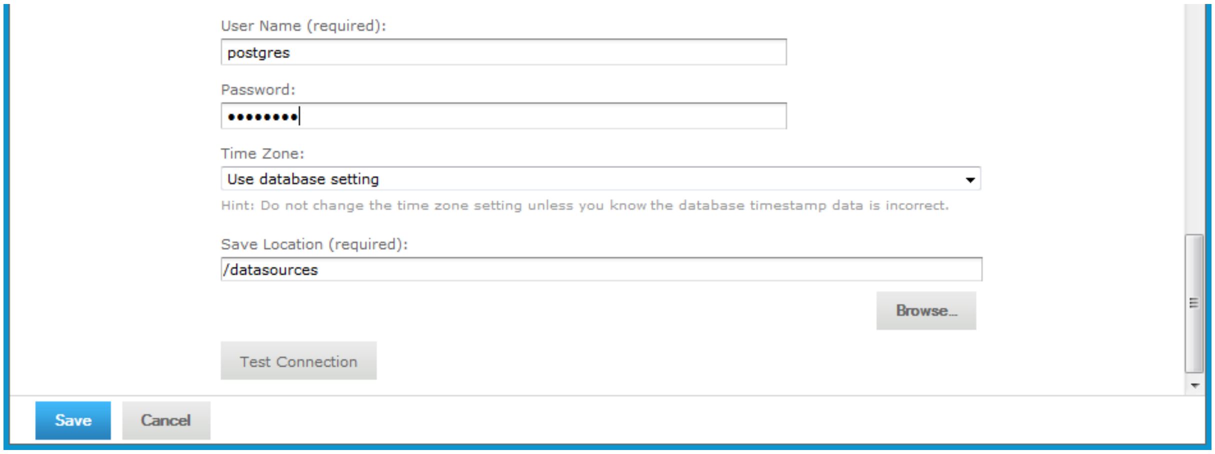
URL (required): jdbc:postgresql://localhost:5432/foodmart

Figure 4-2 Setting the JDBC Driver

6. Enter the hostname, port, and database name for your database. The default hostname is the localhost, and the default port is the typical port for the specified database vendor. The three fields are combined automatically to create the JDBC URL that the server will use to access the database.

   For more information about JDBC URLs, including optional parameters, see the troubleshooting **A.12.4, “JDBC Database URLs,” on page 245**.

7. Fill in the database user name and password. These are the credentials that the server will use to access the database.



User Name (required): postgres

Password: ••••••••

Time Zone: Use database setting

Hint: Do not change the time zone setting unless you know the database timestamp data is incorrect.

Save Location (required): /datasources

Figure 4-3 Testing the JDBC Connection

Set the Time Zone field when the date-time values stored in the target RDBMS do not indicate a time zone. When date-time values are stored in a format other than local time zone offset relative to Greenwich Mean time (GMT), you must specify a time zone so that the server can properly convert date-time values read from the target database. Set the Time Zone field to the correct time zone for the data in the data base.

When in doubt, leave the Time Zone field blank.

The list of time zones is configurable, as described in appendix section **"Specifying Additional Time Zones" on page 259**.

8. Click **Test Connection** to validate the data source. If the validation fails, ensure that the values you entered are correct and that the database is running. To diagnose JDBC connection issues, you can turn on logging as described in the troubleshooting **A.12.4, "JDBC Database URLs," on page 245**.
9. When the test is successful, click **Save**. The data source appears in the repository.

4.1.2 Managing JDBC Drivers

To access a database from JasperReports Server using JDBC you must have a driver, which must be accessible in the server's classpath. In JasperReports Server 5.6, the following drivers are installed by default:

- PostgreSQL
- MySQL (mariadb)

Drivers for other databases can be downloaded from links on the Jaspersoft community website:

http://community.jaspersoft.com/wiki/downloading-and-installing-database-drivers

The system administrator (superuser) can add JDBC drivers for other databases in the following ways:

- During installation. For more information, see the *JasperReports Server Installation Guide*.
- At any time through the UI. As described in the procedure below, the system admin can add, update, or remove JDBC drivers through the user interface, without needing to restart the server.

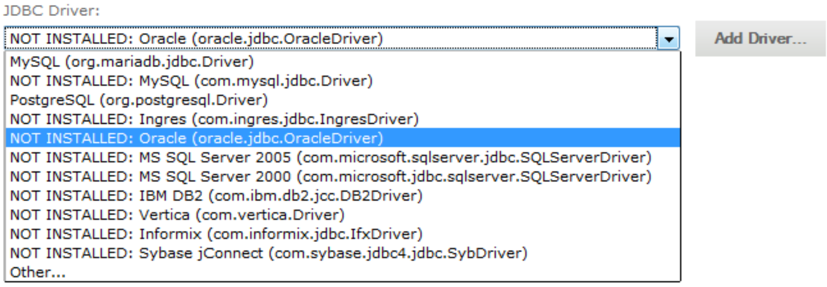
Only the system administrator can manage the JDBC drivers, but once they are uploaded, they are available to all administrators who create data sources.

JBoss does not allow the flexibility of uploading drivers on the fly. On JBoss, drivers that have not been installed do not appear in the list below, and you must configure and restart JBoss to add a driver. For more information, see **A.12.2, "JDBC Drivers on JBoss," on page 244**.

To add or update a JDBC driver:

1. Log on as the system administrator (`superuser` on commercial editions, `jasperadmin` on community editions).
2. Select **Create > Data Source** from the main menu.
3. In the Type field, select **JDBC Data Source**.

   The page refreshes to show the fields necessary for a JDBC data source.
4. The dropdown selector for the JDBC Driver field shows the JDBC drivers that are available and those that are not installed.



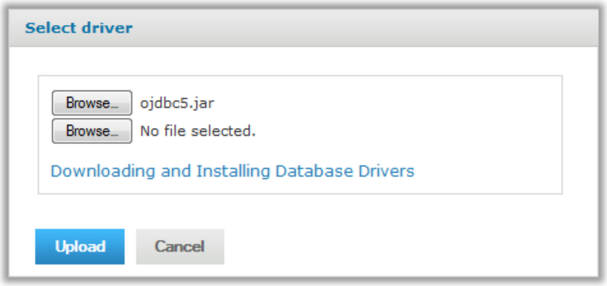
JDBC Driver:

NOT INSTALLED: Oracle (oracle.jdbc.OracleDriver)

MySQL (org.mariadb.jdbc.Driver)
NOT INSTALLED: MySQL (com.mysql.jdbc.Driver)
PostgreSQL (org.postgresql.Driver)
NOT INSTALLED: Ingres (com.ingres.jdbc.IngresDriver)
NOT INSTALLED: Oracle (oracle.jdbc.OracleDriver)
NOT INSTALLED: MS SQL Server 2005 (com.microsoft.sqlserver.jdbc.SQLServerDriver)
NOT INSTALLED: MS SQL Server 2000 (com.microsoft.jdbc.sqlserver.SQLServerDriver)
NOT INSTALLED: IBM DB2 (com.ibm.db2.jcc.DB2Driver)
NOT INSTALLED: Vertica (com.vertica.Driver)
NOT INSTALLED: Informix (com.informix.jdbc.IfxDriver)
NOT INSTALLED: Sybase jConnect (com.sybase.jdbc4.jdbc.SybDriver)
Other...

Figure 4-4 Viewing the List of Available JDBC Drivers

5. If you want to add a driver that has not been installed, select it from the list, then click **Add Driver**. The Select Driver dialog appears.
6. If you have not yet obtained the driver, click the link for Downloading and Installing Database Drivers. That page on Jaspersoft's community website has links to the most commonly used JDBC drivers. After you download a driver to your file system, you can return to the Select Driver dialog.



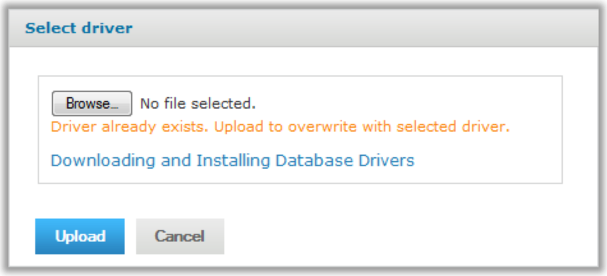
Select driver

ojdbc5.jar
No file selected.

Figure 4-5 Adding a JDBC Driver

7. In the Select Driver dialog, click **Browse** to locate the appropriate driver JAR file. If your driver has more than one JAR file, click the **Browse** button that appears after selecting the first file.
8. Click **Upload** to install the driver and make it available immediately.

9. If you want to update a driver that has already been installed, select it from the list, then click **Edit Driver**. The Select Driver dialog appears and notifies you that selecting a driver will overwrite the existing one.



No file selected.

Driver already exists. Upload to overwrite with selected driver.

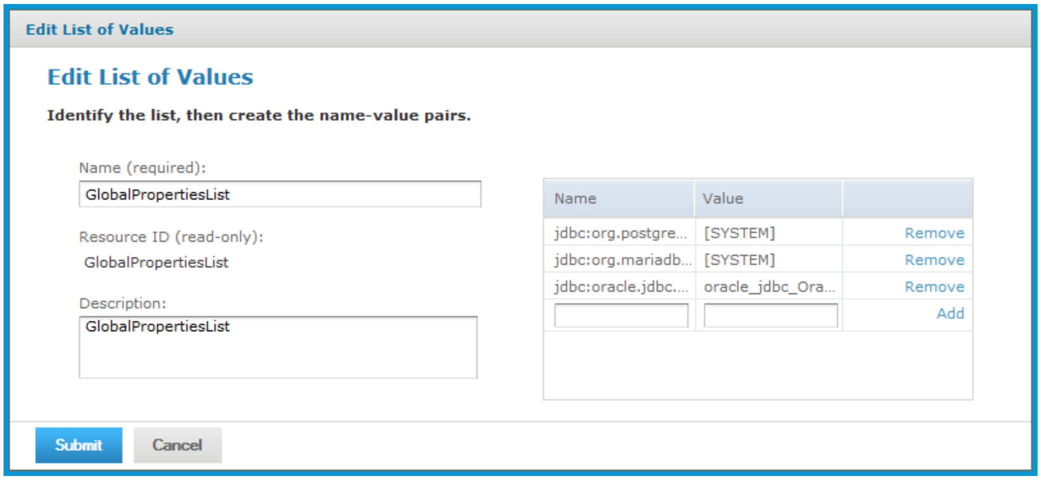
Downloading and Installing Database Drivers

Figure 4-6 Updating a JDBC Driver

10. In the Select Driver dialog, click **Browse** to locate the new driver JAR file.
11. Click **Upload** to replace the existing driver and make it available immediately.
12. You can now use this driver to create a data source, and the driver will be installed when other administrators create data sources.

To remove an uploaded JDBC driver:

1. Log on as the system administrator (`superuser` on commercial editions, `jasperadmin` on community editions).
2. Select **View > Repository** and open the System Properties folder at the root.
3. Right click the GlobalPropertiesList resource and select **Edit** from the context menu.
4. Locate the driver you uploaded in the list of properties. The drivers with the value [SYSTEM] are the default drivers configured at installation time.
5. Click **Remove** beside the driver you want to remove.



Edit List of Values

Identify the list, then create the name-value pairs.

Name (required): GlobalPropertiesList

Resource ID (read-only): GlobalPropertiesList

Description: GlobalPropertiesList

Name	Value	
jdbc:org.postgre...	[SYSTEM]	Remove
jdbc:org.mariadb...	[SYSTEM]	Remove
jdbc:oracle.jdbc....	oracle_jdbc_Ora...	Remove
		Add

Figure 4-7 Removing an Uploaded JDBC Driver

6. Click **Submit** to save your changes.

If the JDBC driver you remove was one that updated a default driver, the default driver will reappear as a [SYSTEM] driver in the GlobalPropertiesList the next time you use the New Data Source wizard.

4.1.3 JNDI Data Sources

Adding a JNDI data source is very similar to adding a JDBC data source. The JNDI data source accesses a database connection that is previously defined and configured in the application server and published as a JNDI resource or service. Instead of specifying a driver and database as you do with JDBC data sources, you only need to specify the JNDI service name in your application server.

Application servers use JDBC connections themselves to expose a database through JNDI. You must specify the JNDI service name of a JDBC connection.

For information about setting up a JNDI connection in your application server, see the following sections:

- **“JNDI Services on Apache Tomcat” on page 246**
- **“JNDI Services on JBoss” on page 246**
- **“JNDI Services on WebLogic” on page 246**

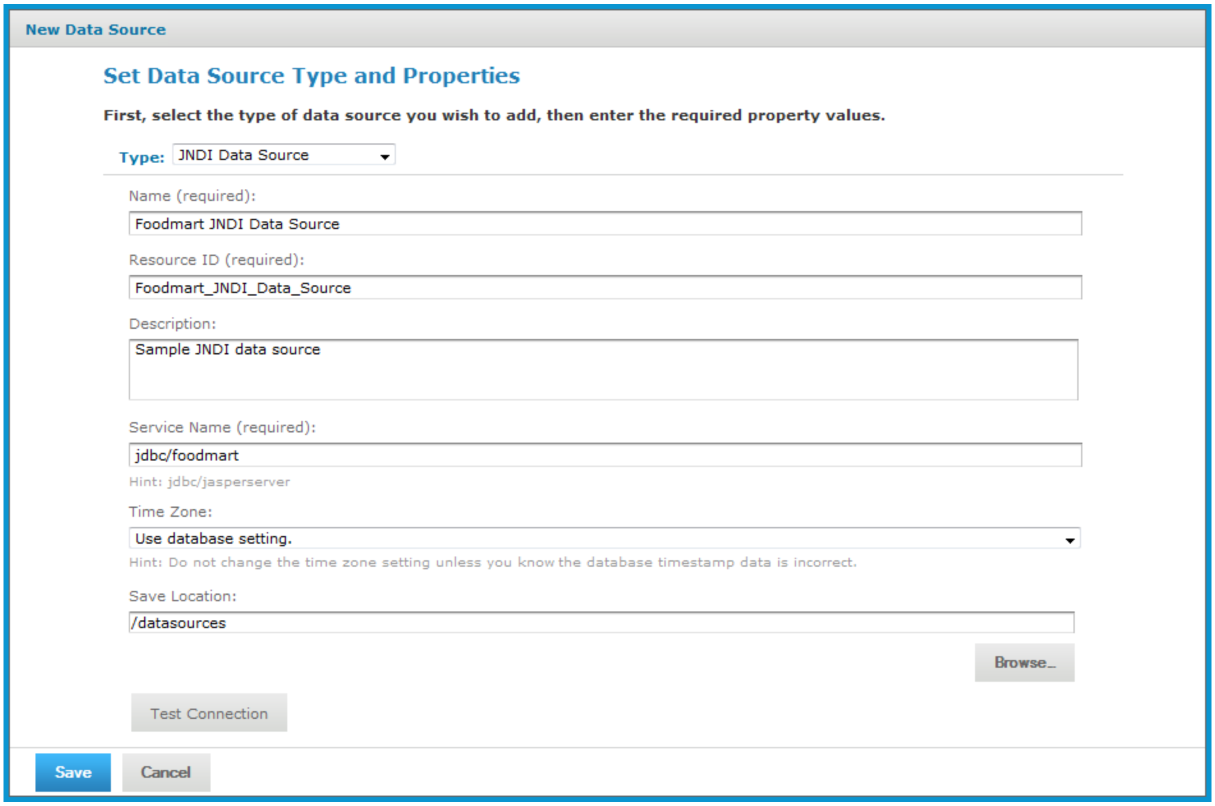
To create a JNDI data source:

1. Log on as an administrator.
2. Click **View > Repository**, expand the folder tree, and right-click a folder to select **Add Resource > Data Source** from the context menu. Alternatively, you can select **Create > Data Source** from the main menu on any page and specify a folder location later. If you installed the sample data, the suggested folder is Data Sources.

   The New Data Source page appears.
3. In the Type field, select **JNDI Data Source**.

   The information on the page changes to reflect what’s needed to define a JNDI data source.
4. Fill in the required fields, along with any optional information.

   The service name is the name that the application server exposes through JNDI. The following figure shows values for connecting to the JNDI service for the Foodmart database included in the sample data.



New Data Source

Set Data Source Type and Properties

First, select the type of data source you wish to add, then enter the required property values.

Type: JNDI Data Source

Name (required): Foodmart JNDI Data Source

Resource ID (required): Foodmart_JNDI_Data_Source

Description: Sample JNDI data source

Service Name (required): jdbc/foodmart

Hint: jdbc/jasperserver

Time Zone: Use database setting.

Hint: Do not change the time zone setting unless you know the database timestamp data is incorrect.

Save Location: /datasources

Figure 4-8 JNDI Data Source Page

Set the Time Zone field when the date-time values stored in the target RDBMS do not indicate a time zone. When date-time values are stored in a format other than local time zone offset relative to Greenwich Mean time (GMT), you must specify a time zone so that the server can convert date-time values read from the target database properly. Set the Time Zone field to the correct time zone for the data in the data base.

When in doubt, leave the field blank.

The list of available time zones is configurable, as described in **"Specifying Additional Locales" on page 258**.

5. Click **Test Connection** to validate the data source. If the validation fails, ensure that the values you entered are correct, that the database is exposed through JNDI, and that the database is running. Also, see the troubleshooting **A.12.5, "JNDI Services on Apache Tomcat," on page 246**.
6. When the test is successful, click **Save**. The data source appears in the repository.

For details about configuring and exposing a JNDI database connection at the application server level, refer to the documentation provided with your application server.

4.1.4 AWS Data Sources

Amazon Web Services (AWS) provide computation and data storage on demand in the cloud. Jaspersoft partners with Amazon to deliver business intelligence solutions based on AWS.

JasperReports Server supports two of the AWS database services as data sources for reporting:

- Amazon Relational Database Service (RDS)
- Amazon Redshift data warehouse

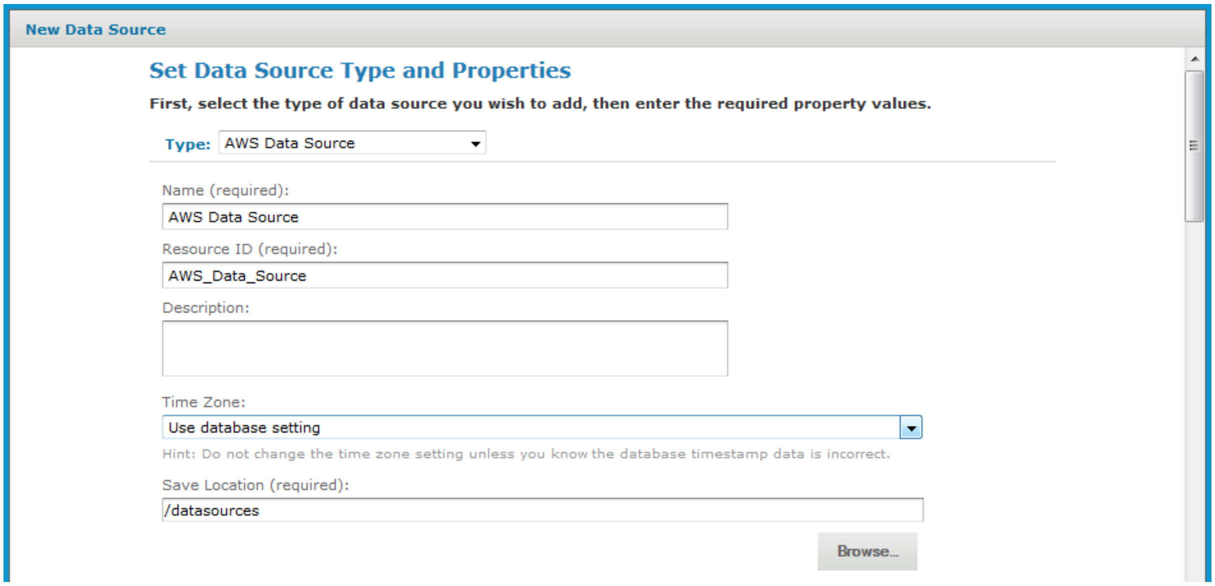
JasperReports Server can access either of these services when you define a data source with the correct configuration information and credentials. The AWS data source wizard uses the AWS credentials you provide to discover RDS and Redshift data sources. Then it uses those credentials to properly configure security groups to maintain the connection between JasperReports Server and the AWS data source, even when the IP address changes. You can access AWS data sources from both stand-alone server instances that you maintain on your own computers and virtual server instances that you run on Amazon's Elastic Compute Cloud (EC2). For more information, see https://www.jaspersoft.com/cloud.

To create an AWS Data Source:

1. Log into JasperReports Server as an administrator.
2. Click **View > Repository**, expand the folder tree, and right-click a folder to select **Add Resource > Data Source** from the context menu. Alternatively, you can select **Create > Data Source** from the main menu on any page and specify a folder location later. If you installed the sample data, the suggested folder is Data Sources.

   The New Data Source page appears.
3. In the Type field, select **AWS Data Source**.

   The information on the page changes to reflect what's needed to define an AWS data source.
4. Enter a name, optional description and location in the repository to store the data source.



New Data Source

Set Data Source Type and Properties

First, select the type of data source you wish to add, then enter the required property values.

Type: AWS Data Source

Name (required): AWS Data Source

Resource ID (required): AWS_Data_Source

Description:

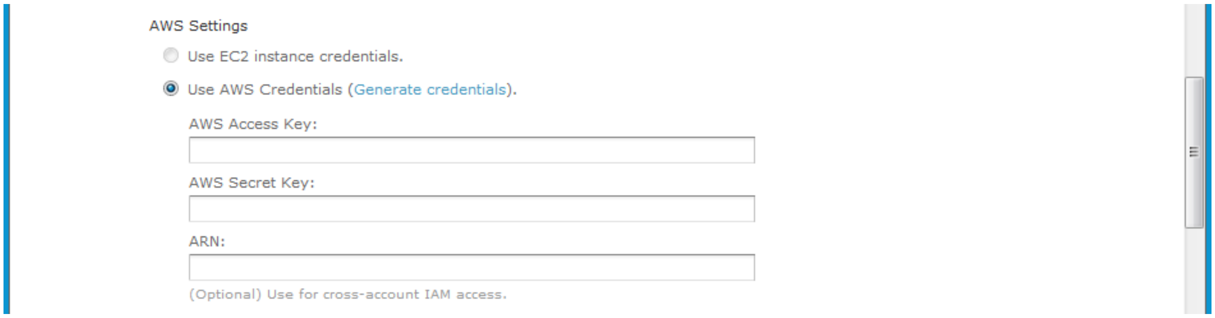
Time Zone: Use database setting

Hint: Do not change the time zone setting unless you know the database timestamp data is incorrect.

Save Location (required): /datasources

Figure 4-9 Set Data Source Type and Properties Page

5. Under the AWS Settings heading, specify your Amazon credentials in one of the following ways:



AWS Settings

○ Use EC2 instance credentials.

● Use AWS Credentials (Generate credentials).

AWS Access Key:

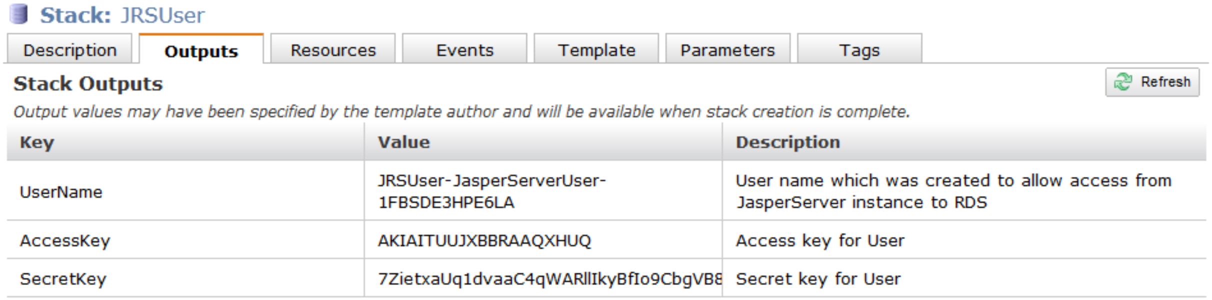
AWS Secret Key:

ARN:

(Optional) Use for cross-account IAM access.

Figure 4-10 Selecting AWS Credentials

- If your JasperReports Server is running in Amazon's EC2 service, and it has the proper instance role assigned, the server will detect this and automatically use your EC2 credentials. Using the EC2 instance credentials requires that the role was properly set up and assigned when the instance was created. If you are using the EC2 service, Jaspersoft strongly recommends that you use the EC2 credentials.
- If your JasperReports Server is not running on Amazon's EC2, enter the AWS credentials associated with the RDS or Redshift service. If you don't have AWS keys, click **Generate credentials**, then look for them on the **Outputs** tab for your Stack on the Amazon console:



Stack Outputs

Output values may have been specified by the template author and will be available when stack creation is complete.

Key	Value	Description
UserName	JRSUser-JasperServerUser-1FBSDE3HPE6LA	User name which was created to allow access from JasperServer instance to RDS
AccessKey	AKIAITUUJXBBRAAQXHUQ	Access key for User
SecretKey	7ZietxaUq1dvaaC4qWARllIkyBfIo9CbgVB8	Secret key for User

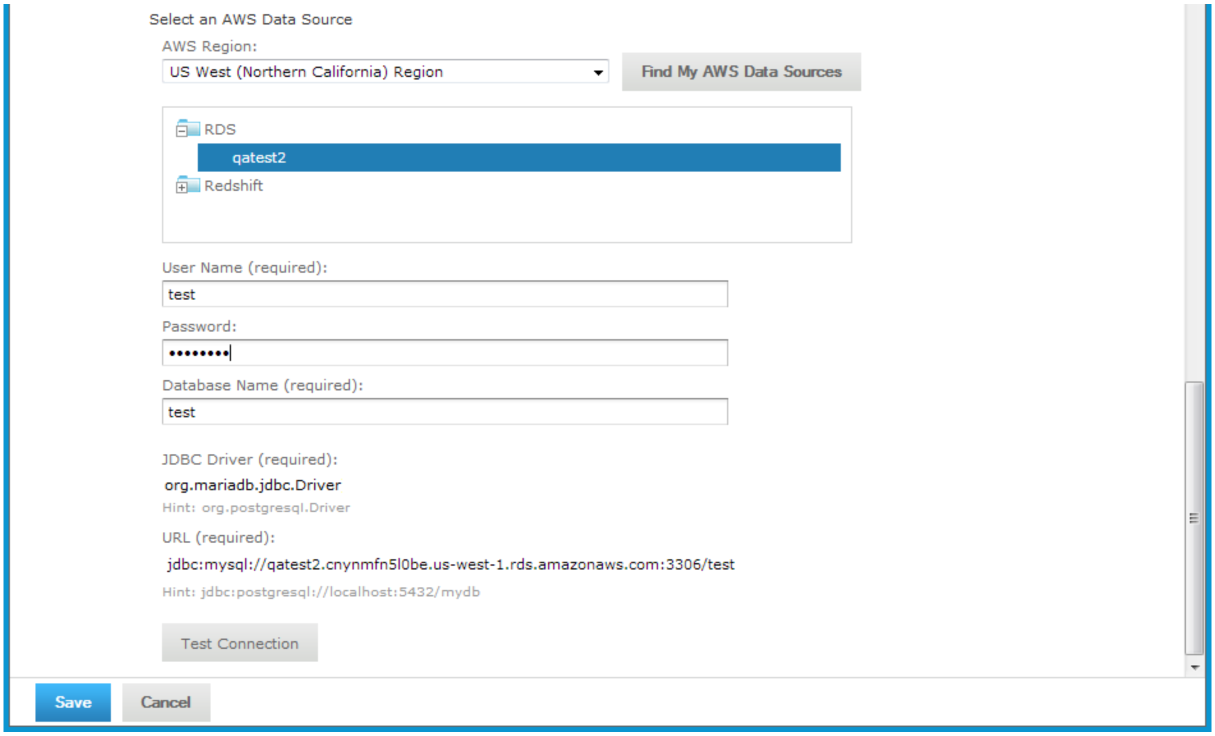
Figure 4-11 AWS Access and Secret Keys

6. Under the Select an AWS Data Source heading, specify the connection details of the AWS data source that you want to connect to:
   a. Select your AWS Region from the drop-down.
   b. Click the **Find My AWS Data Sources** button.

      The AWS data source queries your environment and displays your available data sources. See **Figure 4-12 on page 75**.

   c. Select your data source.
   d. Enter your user name, password, and database name.

      The AWS data source queries your environment and adds the appropriate driver and URL.



Select an AWS Data Source

AWS Region: US West (Northern California) Region

User Name (required): test

Password: ••••••••

Database Name (required): test

JDBC Driver (required): org.mariadb.jdbc.Driver

Hint: org.postgresql.Driver

URL (required): jdbc:mysql://qatest2.cnynmfn5l0be.us-west-1.rds.amazonaws.com:3306/test

Hint: jdbc:postgresql://localhost:5432/mydb

Figure 4-12 Select an AWS Data Source Section

7. When you've entered all the information, click **Test Connection**.

   If your connection is successful, a message appears at the top of the screen. Sometimes the process takes a few minutes. In that case you will see an alert. Try the test again after one or two minutes. The test performs the following actions:

   - Validates the user name and password.
   - Creates a database security group.
   - Adds the IP address of your JasperReports Server instance to the security group to authorize ingress to the data service (RDS or Redshift).

   If you want to control details of the security group name or specify the IP address manually because you have a complex VPC Topology, see **8.7, "Configuring Amazon Web Services," on page 194**. You can also change the default JDBC driver through the configuration.

8. Click **Save**.

   The new data source appears in the repository.

4.1.5 Cassandra Data Sources

The Apache Cassandra database provides scalability and high availability for certain applications of big data. In JasperReports Server 5.6, Jaspersoft replaces the previously unsupported community connector with a supported data source for Cassandra. For more information about Cassandra, see http://cassandra.apache.org/.

The Cassandra data source relies on a new driver that has certain limitations in how your data can be structured and accessed:

- The current version of Cassandra does not support NULL values in the data. All required fields must have non-NULL default values. This also means that input controls cannot be null and must be given a value.
- The current version of the driver does not support aggregate functions (sum, min, max).
- For query parameters, the current version of the driver supports $X(IN...), but no other $X functions.

As the Cassandra driver is updated to include more functionality, Jaspersoft plans to update the Cassadra data source in future releases.

The Cassandra data source supports queries in the Cassandra Query Language 3 (CQL3). To improve performance, design your Cassandra data with the following guidelines:

- Specify the `ALLOW FILTERING` suffix to speed up queries.
- All fields referenced in `WHERE` clauses of a query should be indexed.

As with all big data stores, Cassandra data sources have the following limitations and usage guidelines within JasperReports Server:

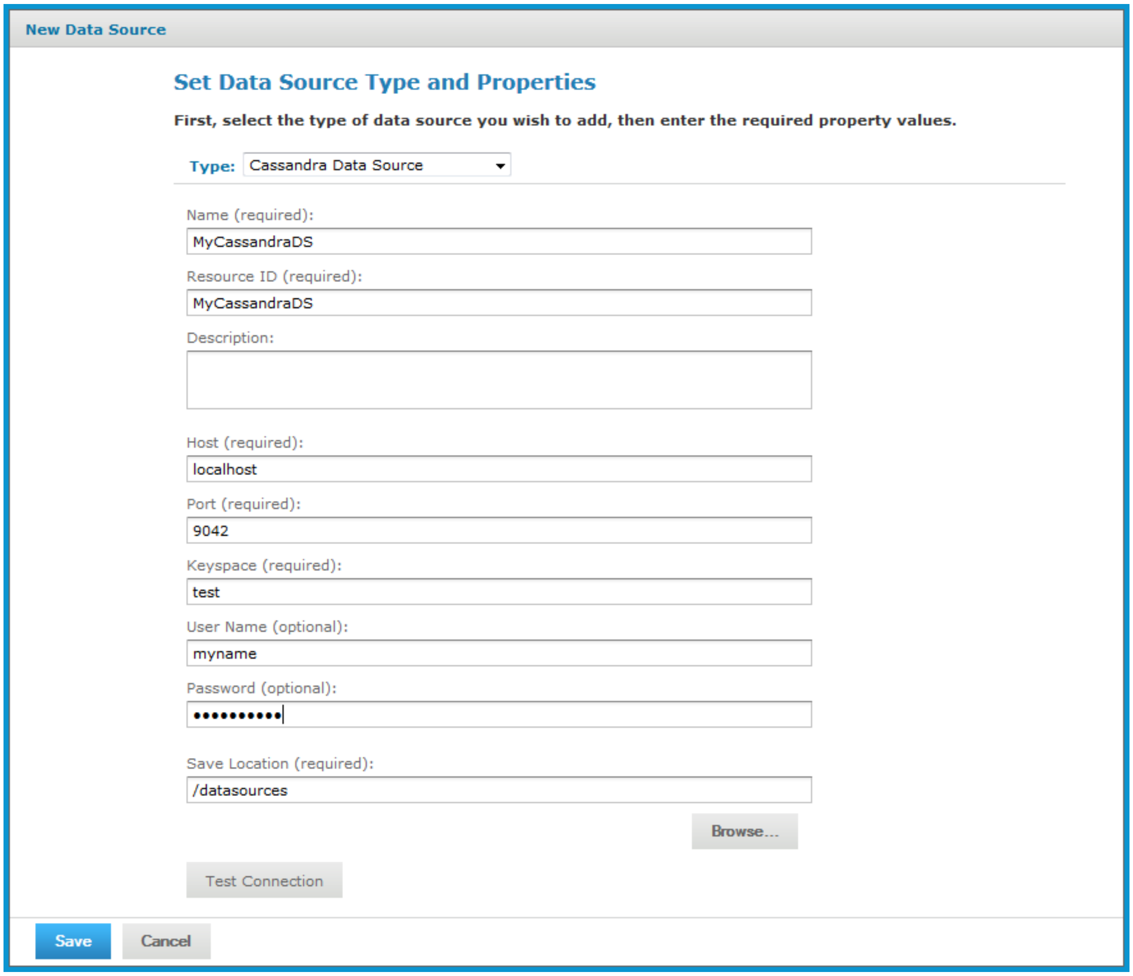
- Cassandra data sources are not supported for OLAP connections
- Cassandra data sources cannot be used directly in Domains. To use Cassandra in a Domain, see **“Big Data Connectors for Virtual Data Sources” on page 86**.
- Cassandra data sources can be used in Ad Hoc Topics, but they do not support query optimization.
- You must configure your query limits to handle big data (see **“Configuring Ad Hoc” on page 174**).
- You must configure your JVM memory to handle the expected amount of data (see the *JasperReports Server Installation Guide*).

4.1.5.1 Creating a Cassandra Data Source

1. Log on as an administrator.
2. Click **View > Repository**, expand the folder tree, and right-click a folder to select **Add Resource > Data Source** from the context menu. Alternatively, you can select **Create > Data Source** from the main menu on any page and specify a folder location later. If you installed the sample data, the suggested folder is Data Sources.

   The New Data Source page appears.
3. In the Type field, select **Cassandra Data Source**.

   The information on the page changes to reflect what’s needed to define a Cassandra data source.



New Data Source

Set Data Source Type and Properties

First, select the type of data source you wish to add, then enter the required property values.

Type: Cassandra Data Source

Name (required): MyCassandraDS

Resource ID (required): MyCassandraDS

Description:

Host (required): localhost

Port (required): 9042

Keyspace (required): test

User Name (optional): myname

Password (optional): ••••••••••

Save Location (required): /datasources

Figure 4-13 Cassandra Data Source Page

4. Fill in the required fields, along with any optional information.

   Use port 9042 with the Cassandra data source. Cassandra's default port of 9160 is for the Thrift client that is commonly used with Cassandra. To use the Cassandra Query Language (CQL) with Jaspersoft's Cassandra data source, you need may need to configure your Cassandra instance as follows:

   ```
   start_native_transport: true

   native_transport_port: 9042
   ```

5. Click Test Connection to check the values you entered. Make sure that the port is set to 9042, because the connection test will also work with the wrong port (9160).
6. When done, click **Save**. The data source appears in the repository.

4.1.5.2 Increasing File Descriptor Limits for Cassandra

Many users have reported errors when viewing many reports from a Cassandra data source. Cassandra generally needs more than the default limit of open file descriptors (1024).

To increase the number of file descriptors, administrators need to change the security limits on the Cassandra nodes and on the operating systems running JasperReports Server.

To test this configuration, you can increase the limits for the current session with the following Linux commands:

```
sudo ulimit -Hn 32768
```

or

```
sudo ulimit -Sn 32768
```

The effects of the commands above will be reset when the computer restarts. To make the changes permanent, edit the file /etc/security/limits.conf to add the following settings:

```
* soft nofile 32768
* hard nofile 32768
root soft nofile 32768
root hard nofile 32768
* soft memlock unlimited
* hard memlock unlimited
root soft memlock unlimited
root hard memlock unlimited
* soft  unlimited
* hard unlimited
root soft unlimited
root hard unlimited
```

4.1.6 Hadoop-Hive Data Sources

Unlike traditional databases, Hadoop supports huge amounts of data, often called big data. As of version 5.6, JasperReports Server supports three servers that process requests to a Hadoop cluster:

- Hive, also called Hive 1
- Hive 2
- Impala

Depending on whether you use Hive 1, Hive 2, or Impala, there are certain restrictions on accessing data in Hadoop. The original Hive 1 server has high latency with access times on the order of 30 seconds and up to 2 minutes. Hive 2 is much faster, but still not as fast as relational databases. As a result, Hadoop-Hive data sources have certain limitations and guidelines for use in JasperReports Server:

- Hadoop-Hive data sources are not supported for OLAP connections.
- Hadoop-Hive data sources cannot be used directly in Domains. To use Hadoop-Hive in a Domain, see **"Big Data Connectors for Virtual Data Sources" on page 86**.
- Hadoop-Hive data sources are not suitable for creating reports interactively in the Ad Hoc Editor.
- Reports based on Hadoop-Hive are not suitable for dashboards.
- Filters and query-based input controls that rely on Hadoop-Hive data sources will be slow to populate the list of choices.
- You must configure your query limits and timeout to handle latency (see **"Configuring Ad Hoc" on page 174**).
- You must configure your JVM memory to handle the expected amount of data (see the *JasperReports Server Installation Guide*).

In general, reports based on Hadoop-Hive data sources are best suited to be run in the background from the repository. For very large reports, consider scheduling them to run at night so the output is available immediately when you need it during the day.

Hadoop-Impala data sources have much less latency, and allow interactivity with Ad Hoc views, filters, and dashboards. However, Hadoop-Impala data sources still have the following limitations:

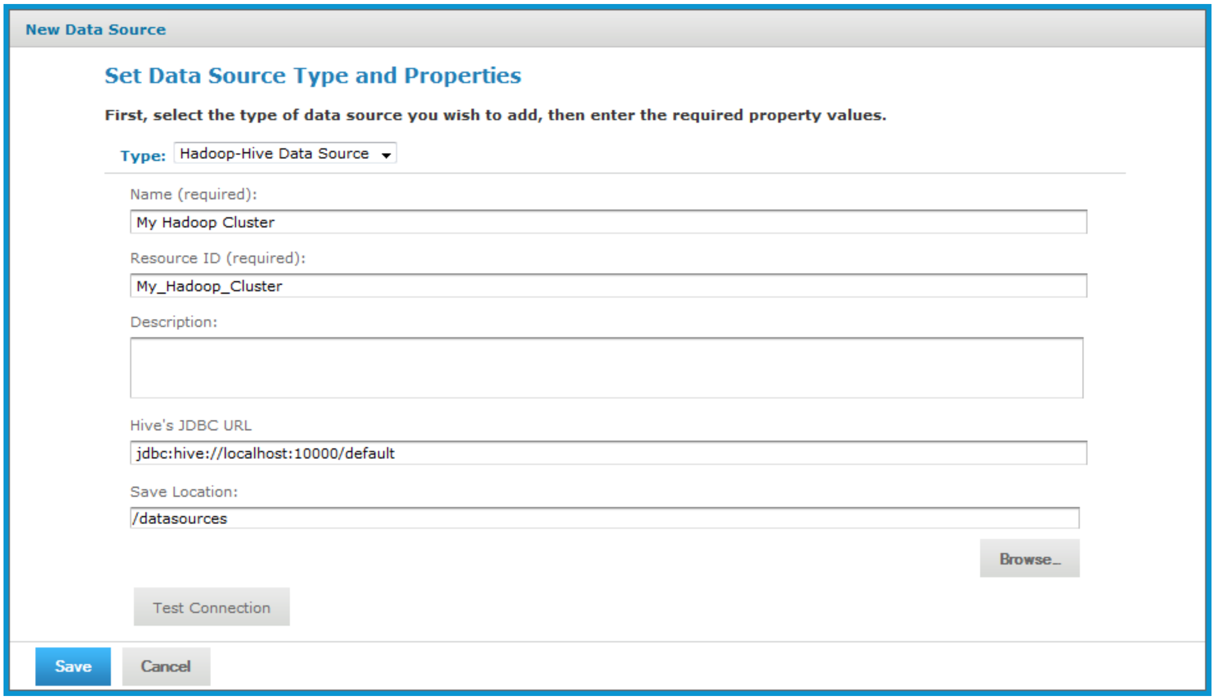
- Hadoop-Impala data sources are not supported for OLAP connections.
- Hadoop-Impala data sources cannot be used directly in Domains. To use Hadoop-Impala in a Domain, see **"Big Data Connectors for Virtual Data Sources" on page 86**.
- Hadoop-Impala data sources can be used in Ad Hoc Topics, but they do not support query optimization.
- You must configure your query limits to handle big data (see **"Configuring Ad Hoc" on page 174**).
- You must configure your JVM memory to handle the expected amount of data (see the *JasperReports Server Installation Guide*).

To create a Hadoop-Hive 1 or 2 or Hadoop-Impala data source:

1. Log on as an administrator.
2. Click **View > Repository**, expand the folder tree, and right-click a folder to select **Add Resource > Data Source** from the context menu. Alternatively, you can select **Create > Data Source** from the main menu on any page and specify a folder location later. If you have installed the sample data, the suggested folder is Data Sources.

   The New Data Source page appears.
3. In the Type field, select **Hadoop-Hive Data Source**.

   The information on the page changes to reflect what's needed to define a Hadoop-Hive data source.



New Data Source

Set Data Source Type and Properties

First, select the type of data source you wish to add, then enter the required property values.

Type: Hadoop-Hive Data Source

Name (required): My Hadoop Cluster

Resource ID (required): My_Hadoop_Cluster

Description:

Hive's JDBC URL: jdbc:hive://localhost:10000/default

Save Location: /datasources

Figure 4-14 Hadoop-Hive Data Source Page

4. Fill in the required fields, along with any optional information.

The JDBC URL depends on which type of server you are using:

Hive 1:	jdbc:hive://<hostname>:10000/default
Hive 2:	jdbc:hive2://<hostname>:10001/default
Impala:	jdbc:hive2://<hostname>:21050/;auth=noSasl

5. When done, click **Save**. The data source appears in the repository.

4.1.7 MongoDB Data Sources

MongoDB is a big data architecture based on the NoSQL model that is neither relational nor SQL-based. Jaspersoft provides a connector that allows reports to use MongoDB as a data source. Reports based on a MongoDB data source can be used as Topics that allow users to create Ad Hoc views based on the fields returned by the MongoDB query.

As with all big data stores, MongoDB data sources have the following limitations and usage guidelines within JasperReports Server:

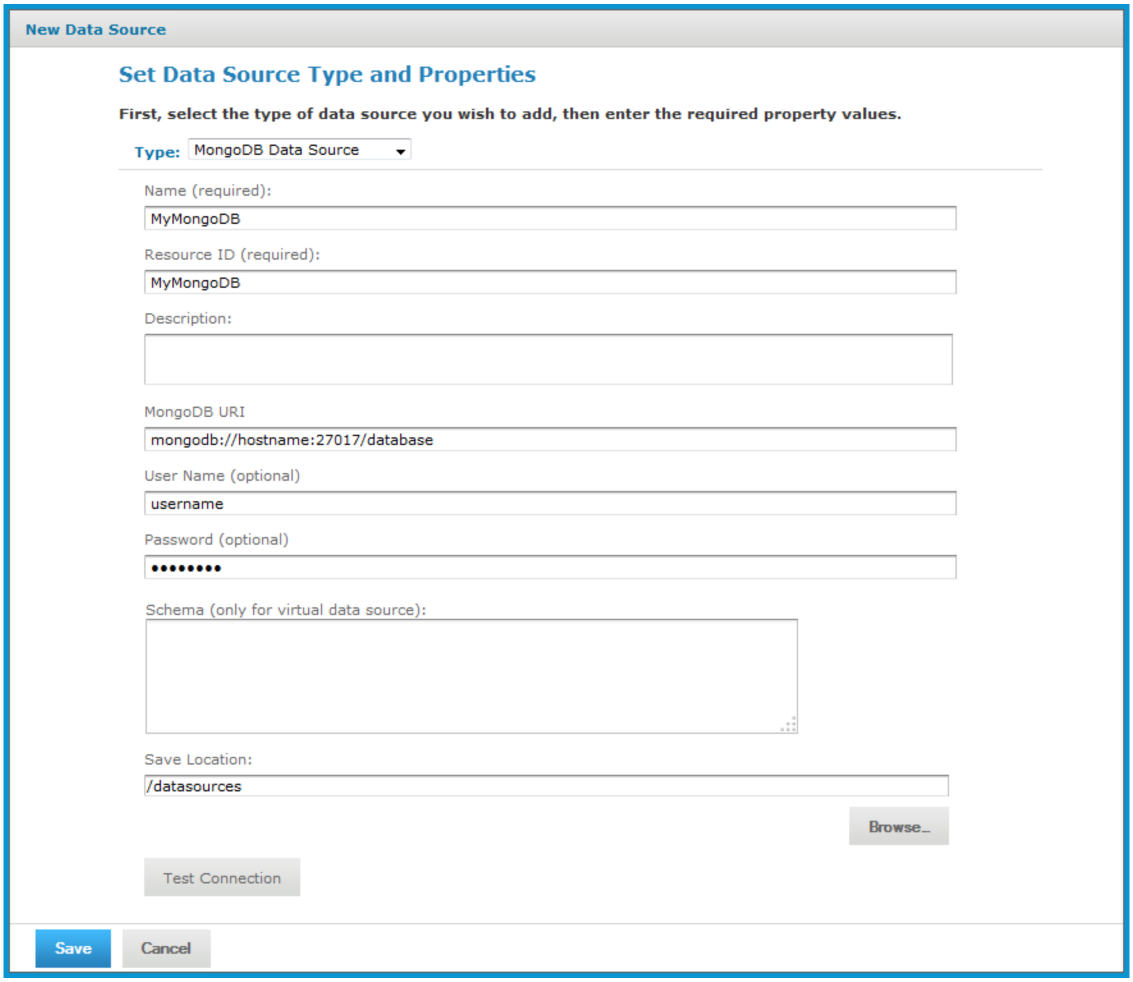
- MongoDB data sources are not supported for OLAP connections
- MongoDB data sources cannot be used directly in Domains. To use MongoDB in a Domain, see **"Big Data Connectors for Virtual Data Sources" on page 86**.
- MongoDB data sources can be used in Ad Hoc Topics, but they do not support query optimization.
- You must configure your query limits to handle big data (see **"Configuring Ad Hoc" on page 174**).
- You must configure your JVM memory to handle the expected amount of data (see the *JasperReports Server Installation Guide*).

To create a MongoDB data source:

1. Log on as an administrator.
2. Click **View > Repository**, expand the folder tree, and right-click a folder to select **Add Resource > Data Source** from the context menu. Alternatively, you can select **Create > Data Source** from the main menu on any page and specify a folder location later. If you have installed the sample data, the suggested folder is Data Sources.

   The New Data Source page appears.
3. In the Type field, select **MongoDB Data Source**.

   The information on the page changes to reflect what's needed to define a MongoDB data source.



New Data Source

Set Data Source Type and Properties

First, select the type of data source you wish to add, then enter the required property values.

Type: MongoDB Data Source

Name (required): MyMongoDB

Resource ID (required): MyMongoDB

Description:

MongoDB URI: mongodb://hostname:27017/database

User Name (optional): username

Password (optional): ••••••••

Schema (only for virtual data source):

Save Location: /datasources

Figure 4-15 MongoDB Data Source Page

4. Fill in the required fields, along with any optional information.

   The MongoDB URL has the form: mongodb://<hostname>:27017/<database>

5. The schema is used only if you plan to wrap the MongoDB data source in a virtual data source for use in a Domain. For instructions, see **"Big Data Connectors for Virtual Data Sources" on page 86**.
6. When done, click **Save**. The data source appears in the repository.

MongoDB is designed to be accessed through API calls in an application or a command shell. As a consequence, it does not have a defined query language. In order to write queries for MongoDB data sources, Jaspersoft has developed a query language based on the JSON-like objects upon which MongoDB operates. JSON is the JavaScript Object Notation, a textual representation of data structures that is both human- and machine-readable.

The Jaspersoft MongoDB Query Language is a declarative language for specifying what data to retrieve from MongoDB. The connector converts this query into the appropriate API calls and uses the MongoDB Java connector to query the MongoDB instance. The following examples give an overview of the Jaspersoft MongoDB Query Language, with SQL-equivalent terms in parentheses:

- Retrieve all documents (rows) in the given collection (table):

```
{ 'collectionName' : 'accounts' }
```

- From all documents in the given collection, select the named fields (columns) and sort the results:

```
{
  'collectionName' : 'accounts',
  'findFields' : {'name':1,'phone_office':1,'billing_address_city':1,
                  'billing_address_street':1,'billing_address_country':1},
  'sort' : {'billing_address_country':-1,'billing_address_city':1}
}
```

- Retrieve only the documents (rows) in the given collection (table) that match the query (where clause). In this case, the date is greater-than-or-equal to the input parameter, and the name matches a string (starts with N):

```
{
  'collectionName' : 'accounts',
  'findQuery' : {
    'status_date' : { '$gte' : $P{StartDate} },
    'name' : { '$regex' : '^N', '$options' : '' }
  }
}
```

The Jaspersoft MongoDB Query Language also supports advanced features of MongoDB such as map-reduce functions and aggregation that are beyond the scope of this document. For more information, see the language reference on Jaspersoft's community website.

4.1.8 Virtual Data Sources

Virtual data sources have two usage scenarios:

- They allow you to combine multiple JDBC and JNDI data sources and make them available to be joined through a Domain. You can combine any number of data sources, including schemas from different databases, databases from different vendors, and different schemas within the same database into a single object.
- Virtual data sources also make Cassandra, Hadoop-Hive, and MongoDB data sources available in Domains. In this usage, the virtual data source acts as a wrapper for the data source for big data, with certain limitations described in **"Big Data Connectors for Virtual Data Sources" on page 86**.

A virtual data source may wrap a single data source for big data, or combine any number of JDBC, JNDI and big data data sources.

Once you have created a virtual data source, you create a Domain that joins tables across the data sources to define the relationships between the data. Ad Hoc views and reports based on the Domain can access the combined data transparently. For more information about Domains, see the chapter "Creating Domains" in the *JasperReports Server User Guide*.

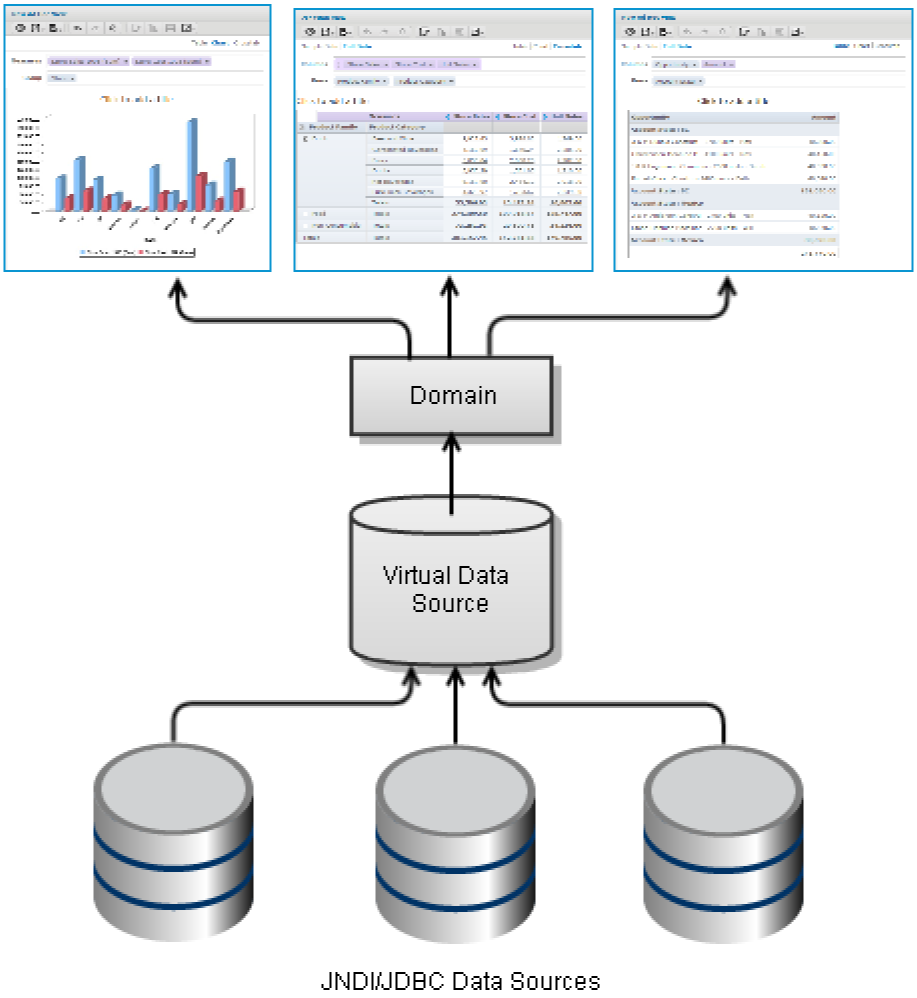


Figure 4-16 Virtual Data Source Scenario

When you combine data sources into a virtual data source, you select an alias for each data source you include; this alias is added as a prefix to the tables in the original data source to ensure that table names are unique across the virtual data source.

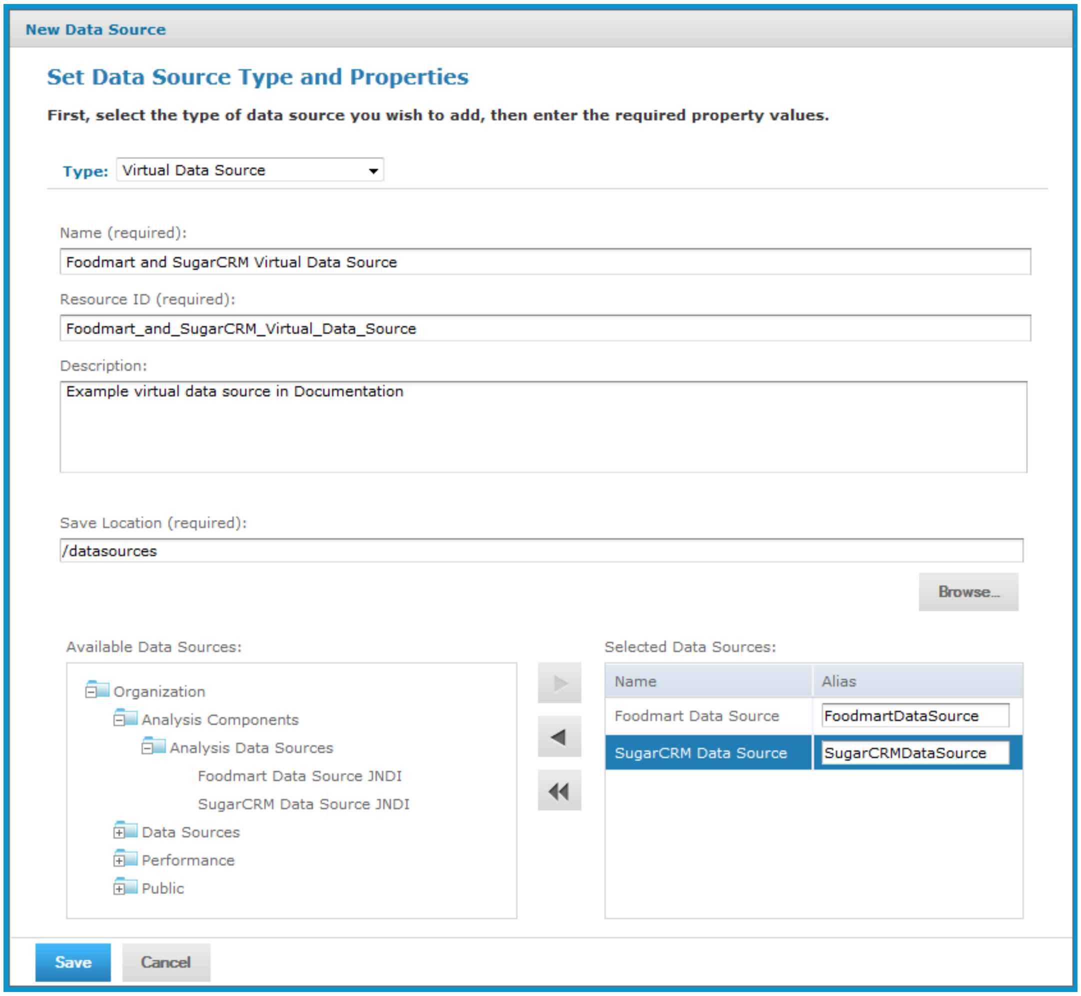
To create a virtual data source:

1. Log on as an administrator.
2. Click **View > Repository**, expand the folder tree, and right-click a folder to select **Add Resource > Data Source** from the context menu. Alternatively, you can select **Create > Data Source** from the main menu on any page and specify a folder location later. If you have installed the sample data, the suggested folder is Data Sources.

   The New Data Source page appears.
3. In the Type field, select **Virtual Data Source**.
4. Fill in the other required fields, along with any optional information.

5. Locate the data sources you want to use in the Available Data Sources pane. Double-click each desired data source to select it. The data source is shown in the Selected Data Sources pane.
6. Change the aliases by editing them directly in the Alias column, if desired. The alias is used to identify the selected data source within the virtual data source; it is also added as a prefix to the name of each table in that data source. Spaces are *not* allowed in aliases.
7. Click **Save**. The data source appears in the repository.

The following figure shows values for creating a virtual data source by combining two of the databases included in the sample data: the Foodmart database and the SugarCRM database.



New Data Source

Set Data Source Type and Properties

First, select the type of data source you wish to add, then enter the required property values.

Type: Virtual Data Source

Name (required): Foodmart and SugarCRM Virtual Data Source

Resource ID (required): Foodmart_and_SugarCRM_Virtual_Data_Source

Description: Example virtual data source in Documentation

Save Location (required): /datasources

Available Data Sources:

- Organization
  - Analysis Components
    - Analysis Data Sources
      - Foodmart Data Source JNDI
      - SugarCRM Data Source JNDI
  - Data Sources
  - Performance
  - Public

Selected Data Sources:

Name	Alias
Foodmart Data Source	FoodmartDataSource
SugarCRM Data Source	SugarCRMDataSource

Figure 4-17 Creating a Virtual Data Source

Virtual data sources cannot use the Time Zone field that may be set on individual data sources. If used in a virtual data source, a target data source with a time zone will not return the expected date/time values. Therefore, Jaspersoft recommends that you do not use data sources with time zone settings in a virtual data source.

You can edit a virtual data source to add or remove the data sources it uses. If the virtual data source is used by a Domain, you can add data sources, but you cannot remove them. Removing a data source from a virtual data source modifies only the virtual data source; the data source you removed remains in the repository.

To edit a virtual data source:

1. Log on as an administrator.
2. Click **View > Repository** and expand the folder tree to locate the folder containing the data source.
3. Right-click the data source and select **Edit** from the context menu.
4. To add a data source, locate the data source in the Available Data Sources pane and double-click. To remove a data source, select it in the Selected Data Sources pane and click the left arrow.
5. Click **Save**. If you are attempting to delete a data source from a virtual data source that is used by a Domain, you receive a warning and the data source is unchanged. Otherwise, the data source is updated in the repository.

4.1.8.1 Performance Considerations

Virtual data sources are based on the Teiid engine to handle multiple data sources and combine the results from them. How you design the tables in each of your data sources and how you combine them in a Domain join can significantly affect performance.

There are several issues to keep in mind when designing a solution that combines several databases in a virtual data source:

- The virtual data source runs in JasperReports Server and must allocate memory and use processing to handle result sets.
- The Teiid engine uses its own cache for data accessed through a virtual data source. You can clear the Teiid cache at the same time as the Ad Hoc cache, as described in **"Ad Hoc Cache Management" on page 180**.
- The virtual data source can push down certain operations (joins, filters, and aggregations) to the databases, others it must perform in memory. The more it can push down, the smaller the datasets that it must handle in memory
- You should design your schema so that the most processing in your query can be pushed down to the database, and so that the virtual data source handles the least amount of data in a join between data sources.

For example, if you create a duplicate copy of a date dimension table in both of your data sources, they can be joined much more efficiently. If this table existed in only one database, the Teiid engine would need to retrieve all the rows from the other database and perform the join itself. With this table in both data bases, the Teiid engine can push down all of the time-dimension joins to the individual databases and perform a final join on much smaller datasets.

For more information about optimizing your data for use in Teiid, see http://www.jboss.org/teiid/.

4.1.8.2 Logging for Virtual Data Sources

If you have issues with your big data connections through virtual data sources, you can enable logging in the following classes:

com.jaspersoft.jasperserver.api.common.virtualdatasourcequery.VirtualDataSourceQueryService

com.jaspersoft.jasperserver.api.engine.common.virtualdatasourcequery.teiid.TeiidEmbeddedServer

For information about enabling logging, see **"Configuring System Logs" on page 188**.

4.1.9 Big Data Connectors for Virtual Data Sources

As of JasperReports Server 5.6, virtual data sources can also connect to several flavors of big data:

- Cassandra
- Hadoop-Hive 1, 2, and Impala
- MongoDB

Virtual data sources use the Teiid query engine internally to join the data from various sources, and to access big data stores. In the case of big data, the virtual data source extracts the connection information from the existing data source and uses an internal Teiid connector to access data. The Teiid connectors map the various structures used in each big data model to a relational model with tables and fields. This connector is distinct from what are called the native data sources for big data. For this reason, when a data source for big data is wrapped in a virtual data source, the resulting data source has the following limitations:

- The Cassandra, Hadoop, and MongoDB connectors in virtual data sources do not support query parameters (`$P` and `$X`). Therefore, if you use a big data connector wrapped in a virtual data source as the data source for a stand-alone query, report or Topic, you can't include parameters to create input controls. When used in Domains and then Ad Hoc views, you can define filters to replace this functionality.
- The Cassandra connector for virtual data sources does not support any aggregation functions.
- The MongoDB connector for virtual data sources does not support the find operations, aggregation or map reduce functions that the native MongoDB data source allows.
- The MongoDB connector for virtual data sources can't be used in stand-alone reports or Topics. It must be used in a Domain and accessed through an Ad Hoc view or report.

However, there are significant advantages to accessing big data through virtual data sources:

- When wrapped in a virtual data source, you can access Cassandra, Hadoop, and MongoDB through a Domain, Domain Topic, Ad Hoc view, and Ad Hoc report.
- A virtual data source can contain any mix of JDBC, JNDI, and big data connectors. When you define a Domain using this data source, you can access the tables from each store and define joins between compatible fields.
- Virtual data sources that use a big data connector support query optimization, unlike the native data sources for big data. In fact, the big data connectors for virtual data sources support query optimization in Ad Hoc views and reports based on stand-alone Topics, and in Ad hoc views and reports based on Domains. The only exceptions are calculated fields, which cannot be optimized when used in Ad Hoc views or reports that are based on Topics or Domains. For more information about query optimization, see **"Configuring Ad Hoc" on page 174**.

For more information about Teiid, see http://www.jboss.org/teiid/.

4.1.9.1 Creating Big Data Connectors

To create a virtual data source that accesses a data source for big data:

1. Create a native data source for big data, or verify that it was created as described in one of the following sections:
   - **"Cassandra Data Sources" on page 75**
   - **"Hadoop-Hive Data Sources" on page 78**
   - **"MongoDB Data Sources" on page 80**

   In the case of a MongoDB data source, you must specify the schema for the tables into which the data will be mapped. If you did not define the table schema, you can edit the data source to add one, but you must restart JasperReports Server after any modifications to the schema value. For more information, see **4.1.9.2, "Relational Schema for MongoDB Connector"**.

2. Create a virtual data source as described in **"Virtual Data Sources" on page 82**.
3. In the virtual data source creation dialog, select the big data data source that you created in the first step, and save the virtual data source. You can select one or more big data sources, or any mix of big data, JDBC, and JNDI data sources.
4. Create a Domain, specify the virtual data source you just created, and then select the big data tables when you create the Domain schema. The data from the data source is mapped to tables and fields in the Domain that you can use to create joins, filters, and all other features of a Domain.

4.1.9.2 Relational Schema for MongoDB Connector

This schema defines a relational structure of tables and columns for the data in your MongoDB instance. The following URL gives the syntax for the schema text:

https://docs.jboss.org/author/display/TEIID/MongoDB+Translator

The following example shows a document from the collection named `customer` in MongoDB with an embedded document named `address`. The right side shows the corresponding schema for use in the virtual data source connector.

```
{                                                CREATE FOREIGN TABLE customer (
    "_id": 10,                                       _id integer PRIMARY KEY,
    "name": "John Doe",                              name varchar(255),
    "age": 27,                                       age integer,
    "gender": "male",                                gender varchar(50))
                                                 OPTIONS(UPDATABLE 'TRUE');
    "address": {                                 CREATE FOREIGN TABLE address (
        "_id": 10,                                   _id integer PRIMARY KEY,
        "street": "123 Sesame St.",                  street varchar(255),
        "city": "Anytown",                           city varchar(100),
        "state": "Rhode Island",                     state varchar(25),
        "zip": 12345                                 zip integer,
    }                                                FOREIGN KEY (_id) REFERENCES customer (_id), )
}                                                OPTIONS(UPDATABLE 'TRUE',
                                                         teiid_mongo:MERGE 'customer');
```

When writing your schema, keep in mind the following issues:

- For embedded relations in MongoDB (both 1-to-1 and 1-to-many), the embedded document must have the same ID as the parent document.
- The MongoDB translator supports automatic mapping of Teiid data types into MongoDB data types.
- Not all MongoDB data types are supported. Currently, the following types are not supported:
  - MongoDB Arrays
  - MongoDB::OID
  - Regular Expressions
  - MongoDB::Code
  - MongoDB::MinKey and MongoDB::MaxKey
- As a result, your documents should use integer IDs and not MongoDB::OID.
- When you change the mapping or add a new collection in the schema, you must restart JasperReports Server.

4.1.10 Bean Data Sources

The bean data source type is a key extension because it allows you to make use of any custom or exotic data that you might need to report on. Bean data sources serve as a bridge between a Spring-defined bean and a JasperReport. The Spring bean is responsible for providing the data or parameters that fill the report.

To use a bean data source, you must first configure the underlying Spring bean and make it available in the server's web application context. For example, you would add a bean definition to one of the WEB-INF/applicationContext*.xml files.

The bean must resolve to a `ReportDataSourceService` instance, either directly or by way of a factory no-argument method. You can use any Spring instantiation method (for example, a constructor or factory) and bean scope (for example, singleton or prototype) for the data source service bean.

The `ReportDataSourceService` instance is responsible for supplying data source parameters to the JasperReport. Custom `ReportDataSourceService` implementations can follow two approaches:

- If the implementation can provide the data to be used to fill a report, it needs to wrap the data into a suitable `JRDataSource` implementation and pass the data using the `REPORT_DATA_SOURCE` report parameter.
- If the data comes from the report query by way of a JasperReports query executor, the data source service must set values for the connection parameters defined by the query executor. The connection parameters are usually obtained from the properties of the data source service instance.

For example, you could implement a Hibernate data source service that would be injected in a session factory. The factory would create a Hibernate session that would be passed as a value for the `HIBERNATE_SESSION` parameter. The JasperReports Hibernate query executor then uses the parameter to run the HQL report query.

The `ReportDataSourceService` interface contains two methods: `setReportParameterValues` and `closeConnection`. The former provides data and connection parameter values; the latter is required to close and release any resources or connections created during the call to `setReportParameterValues`.

Once the data source service bean is available through Spring, you can add the bean data source to the repository.

To create a bean data source:

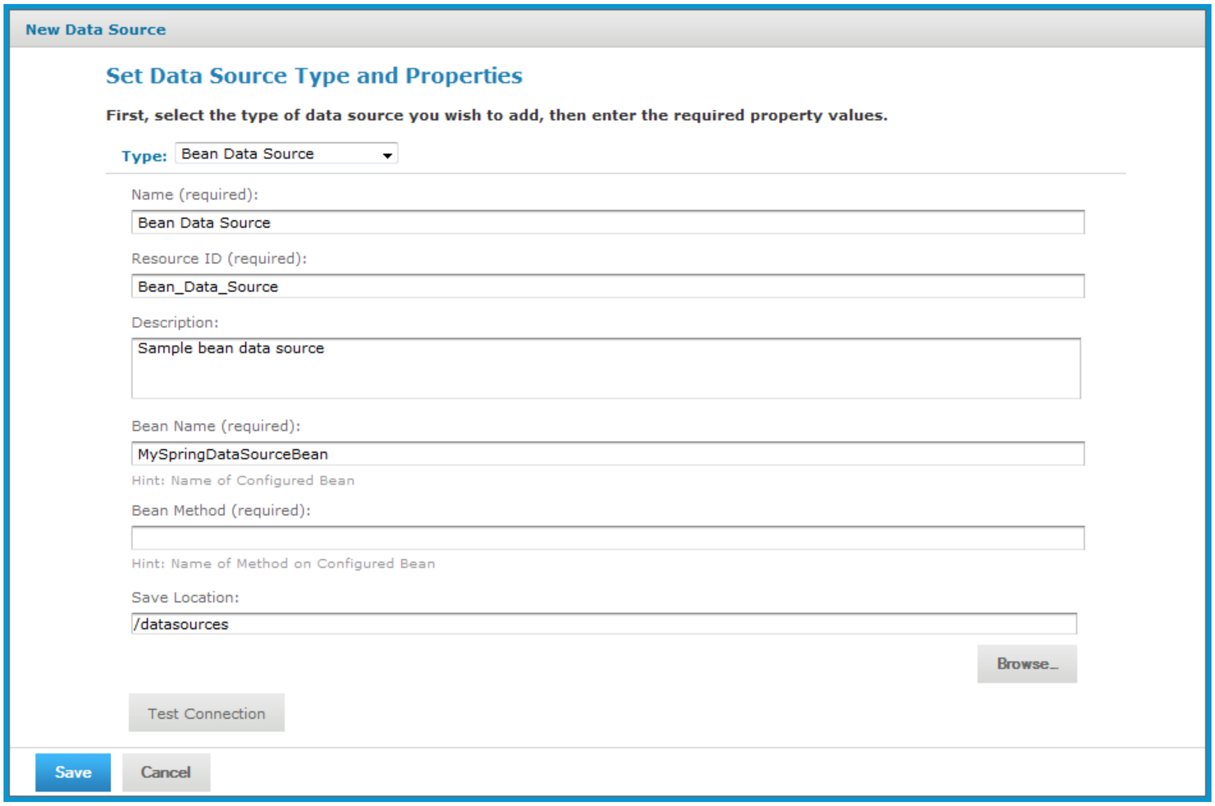
1. Log on as an administrator.
2. Click **View > Repository**, expand the folder tree, and right-click a folder to select **Add Resource > Data Source** from the context menu. Alternatively, you can select **Create > Data Source** from the main menu on any page and specify a folder location later. If you installed the sample data, the suggested folder is Data Sources.

   The New Data Source page appears, as shown in **Figure 4-18 on page 89**.
3. In the Type field, select **Bean Data Source**.

   The information on the page changes to reflect what's needed to define a bean data source.
4. Fill in the required fields, along with any optional information.

   If the data source service is to be instantiated through a factory method of the Spring bean, you should also enter the name of the method.
5. Click **Test Connection** to validate the data source.

   If the validation fails, ensure that the values you entered are correct and that the bean is in the classpath.
6. When the test is successful, click **Save**.



New Data Source

Set Data Source Type and Properties

First, select the type of data source you wish to add, then enter the required property values.

Type: Bean Data Source

Name (required): Bean Data Source

Resource ID (required): Bean_Data_Source

Description: Sample bean data source

Bean Name (required): MySpringDataSourceBean

Hint: Name of Configured Bean

Bean Method (required):

Hint: Name of Method on Configured Bean

Save Location: /datasources

Figure 4-18 Bean Data Source Page

4.2 Queries

JRXML reports use a query to select the data to be returned from the data source. The query can be defined in the JRXML itself, or it can be saved in the repository. A query in the repository can be re-used by multiple JasperReports. See the sample queries in the /SuperMart Demo/Common folder in the repository.

Reusing a query enables you to adapt reports to different audiences. The query returns the same data from the same data source every time, but each report presents the data in a different way. Reusing a query simplifies maintenance of reports, as well, since all the reports return the same data. Also, separating the query from the JRXML makes it easier to maintain large numbers of reports when the data source changes and the query needs to be updated.

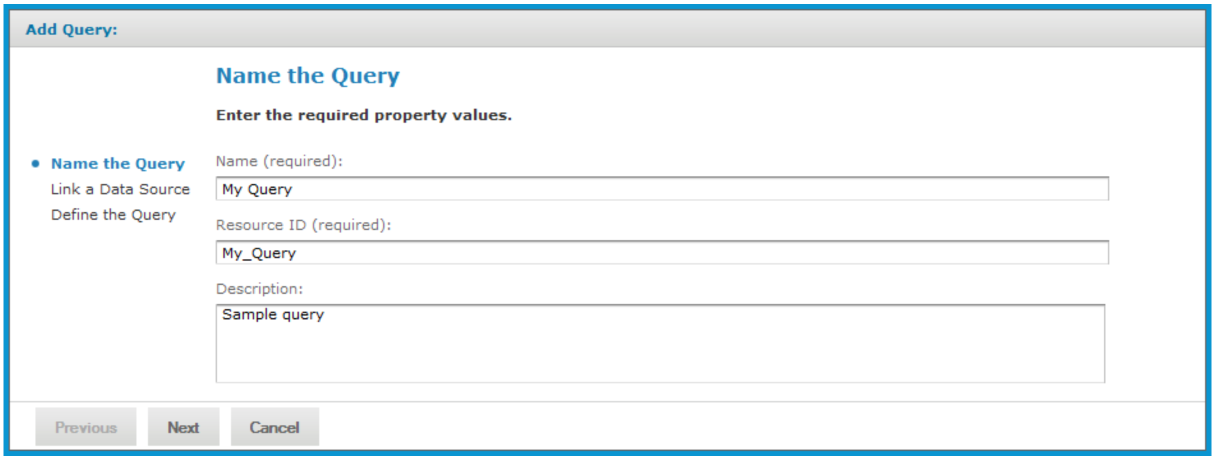
See the *JasperReports Server User Guide* for complete instructions on using JRXML reports. For another means of adapting reports to different audiences, refer to the chapter on Domains in that manual.

Query resources can also be used to populate list input controls. For more information, see the chapter on cascading input controls in the *JasperReports Server Ultimate Guide*.

To create a reusable query resource:

1. Login as an administrator.
2. Click **View > Repository** and expand the folder tree to locate the folder in which you want to create the query. If you installed the sample data, the suggested folder is Input Data Types.
3. Right-click the folder and select **Add Resource > Query** from the context menu.

The Add Query page appears.



Add Query:

Name the Query

Enter the required property values.

Name (required): My Query

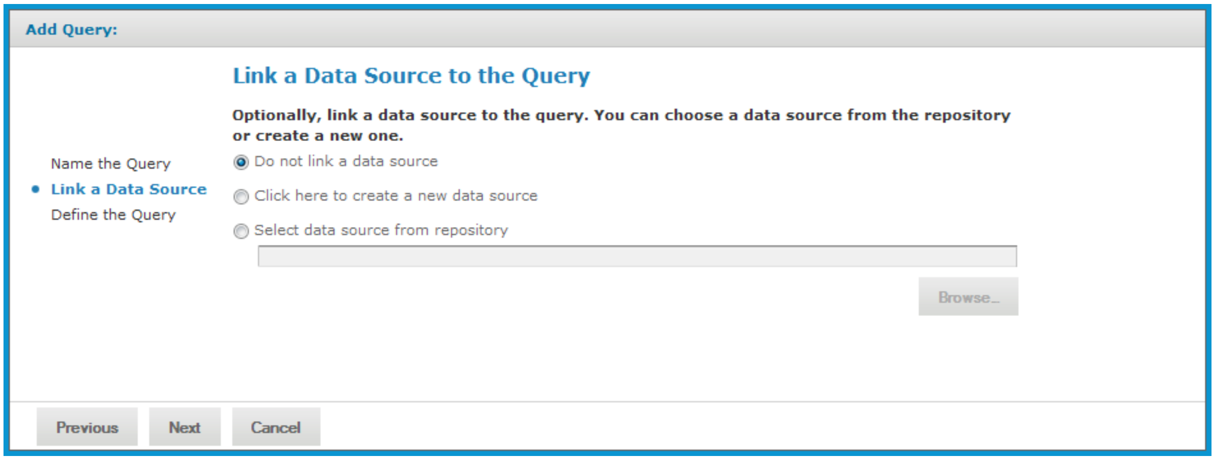
Resource ID (required): My_Query

Description: Sample query

Figure 4-19 Add Query - Name the Query Page

4. Enter a name and optional description for the query and click **Next**. The resource ID is filled in automatically.

   The Link a Data Source page appears.



Add Query:

Link a Data Source to the Query

Optionally, link a data source to the query. You can choose a data source from the repository or create a new one.

● Do not link a data source

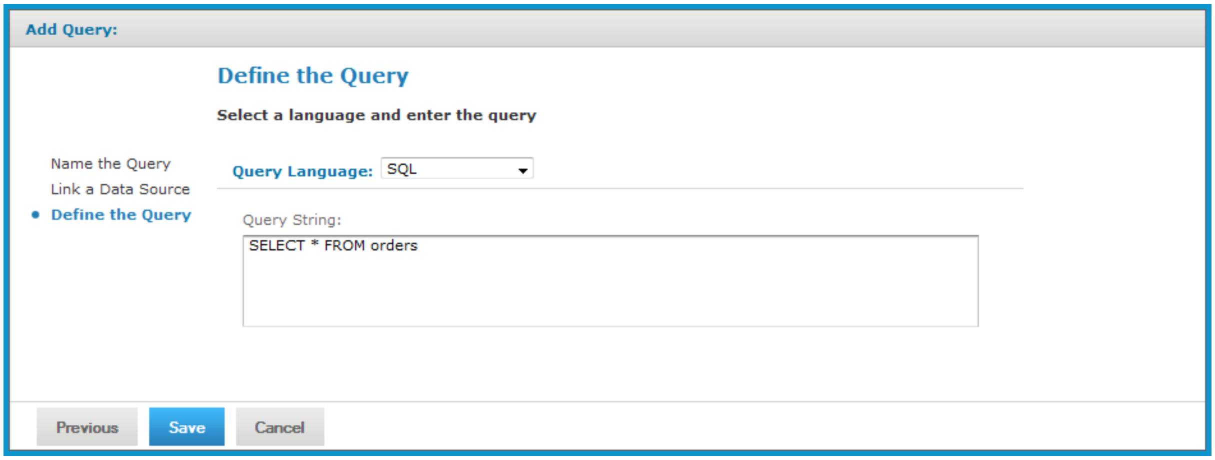
○ Click here to create a new data source

○ Select data source from repository

Figure 4-20 Add Query - Link a Data Source Page

5. Select the data source and click **Next**. For this example, leave the default, but other options are presented:
   - **Do not link a data source**. If no data source is associated with the query, the server uses the data source that is associated with the report that references this query.
   - **Create a new data source**. You can define a local data source within this query resource that is not accessible to any other resource. This new data source overrides any data source specified in reports that use this query.
   - **Select data source from repository**. This creates a reference to a data source in the repository. The data source you select overrides any data source specified in reports that use this query.

   After clicking **Next**, the Define the Query page appears.



Add Query:

Define the Query

Select a language and enter the query

Query Language: SQL

Query String:

```
SELECT * FROM orders
```

Figure 4-21 Add Query - Define the Query Page

6. Select **SQL** as the Query Language.

   The query language Domain (sl) is selected when opening Domain-based queries created in versions of the server prior to 3.7. It is used only for backward compatibility and should not be selected for new Domain-based queries.

7. Enter the following test in the **Query String** field:

   ```
   SELECT * FROM orders
   ```

8. Click **Save**.

By default, JasperReports Server supports SQL, HQL (Hibernate), HiveQL (Hadoop-Hive), MongoDB, and Domain queries, while JasperReports supports several more (such as EJBQL, xPath and MDX). However, JasperReports Server can support queries in additional query languages if there is a properly-configured query executor implementation for each additional language when the server is deployed.

A specialized bean data source can be used to support multiple query languages. For information about bean data sources, refer to section **"Data Sources" on page 65**. Another option is to add new types of data sources to the server, thus extending the reach of the JasperReports Server platform by leveraging one of its main extension points. Custom data sources are described in the *JasperReports Server Ultimate Guide*.

4.3 Input Controls

Any JasperReport can be parameterized so that its generated output is a function of values given at runtime (query filters), or so that its layout is changed to accommodate different users (such as changing the title).

When writing JRXML, you can declare parameters and accommodate any runtime value that needs to be passed into the query executor, the rendering engine, or the calculation engine. However, the parameter information in a JRXML file does not provide everything JasperReports Server needs to build a complete user interface and prompt users for values. You must also define an input control resource that defines the following:

- The range of possible values or the list of discrete values that are allowed.
- The type of input, for example single-select or multi-select, and the widget to display the possible values, for example drop-down list or check boxes.
- Display options such as labels and whether the value is required.

- The name of the corresponding parameter in the JRXML.

When a user runs the report, the server uses the above information to prompt the user to enter a value and validate the input. For example, consider a report that returns sales data for all of a company's products; the user might input the name of a product to view by selecting a product name in a list.

JasperReports Server supports several types of input controls, each of which can map to certain types of parameters in the report's JRXML. The input control also determines the kind of widget the user interacts with:

- Boolean – Represented as a check box. These input controls return a `java.lang.Boolean` object to the report engine in response to the user's selection. Boolean input controls return Boolean.TRUE or Boolean.FALSE as values, depending on whether the box is checked.
- Single value – Represented as a free-form text box. You must specify a datatype, for example text or numerical value, and the user's entry is validated against this datatype.
- Single-select – Represented either as a drop-down list or a set of radio buttons. A single-select input control returns a single value.
- Multi-select – Represented as a list of values (scrollable) or a set of check boxes. A multi-select input control returns a collection of values.

One advanced feature of single-select or multi-select input controls is that the values they present can be the result of a dynamic query. The query retrieves actual values from the data source before presenting them as choices to the user. These queries can contain parameters themselves, for example based on the logged-in user or the selection of a previous input control. Query parameters are described in the JasperReports Server Ultimate Guide.

Input controls rely on other resources in the repository, such as datatypes, static lists of values, or queries. You can manage these resources the same way you manage other resources; you can define them locally (available only to the input control) or reference them externally (reusing a resource in the repository). For more information, see **"Local Resources and External References" on page 47**.

Ad Hoc views based on Domains and Domain Topics always use locally defined input controls that are created automatically based on the chosen filters. They cannot refer to input controls stored in the repository, and you should not modify them. For more information, refer to the *JasperReports Server User Guide*.

Some input controls rely on queries to populate their options. These more complex controls are described in **"Query-based Input Controls" on page 96**.

4.3.1 Datatypes

Datatypes are resources that define the format of a single-value input control, for example text or numerical value. The datatype determines what users can enter in the text field so that it corresponds to the type of the parameter in the report. Furthermore, the datatype can restrict the value, for example setting a range for a number or date, or enforcing a pattern such as an email address in strings. This is all controlled through the datatype associated with the input control.

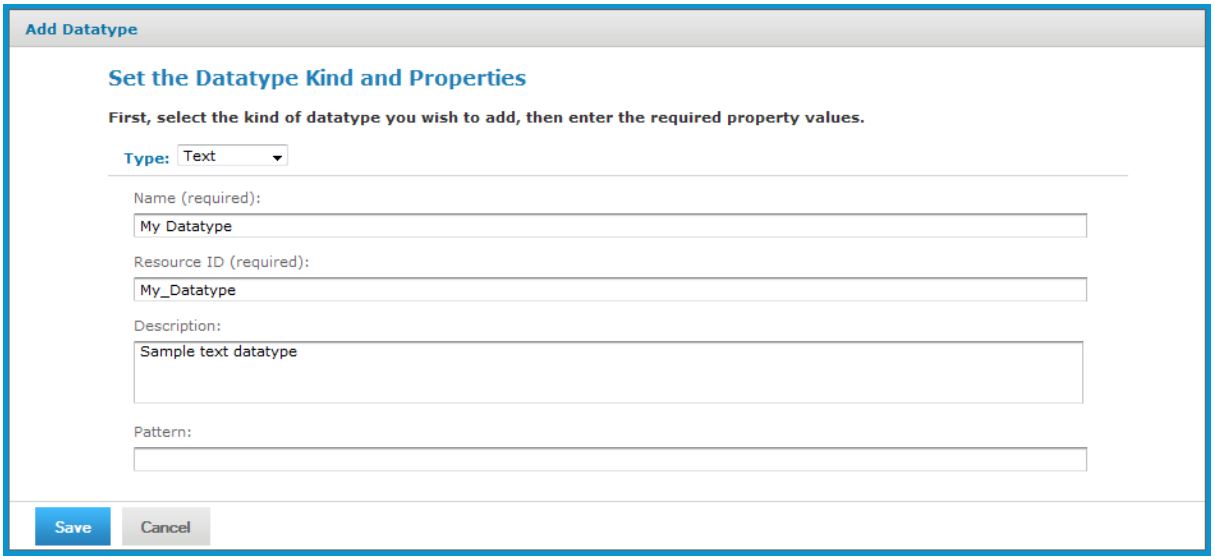
Datatypes can represent one of four types:

- Text
- Number
- Date
- Date/time

To create a datatype resource:

1. Log on as an administrator.
2. Click **View > Repository** and expand the folder tree to locate the folder in which you want to create the datatype. If you installed the sample data, the suggested folder is Input Data Types.
3. Right-click the folder and select **Add Resource > Datatype** from the context menu.

   The Add Datatype page appears.



Add Datatype

Set the Datatype Kind and Properties

First, select the kind of datatype you wish to add, then enter the required property values.

Type: Text

Name (required): My Datatype

Resource ID (required): My_Datatype

Description: Sample text datatype

Pattern:

Figure 4-22 Add Datatype Page

4. Enter a name and optional description for the datatype. The resource ID is filled in automatically.
5. Select the type of the datatype, as well as information related to the type.

   In this example, select **Text** as the type of our datatype; you have other options as well:

   - Text – For text datatypes, you can specify a regular expression in the **Pattern** field. The expression is used to validate the text that the user submits. For instance, you could enter an expression that tests for email addresses.
   - Number – With numerical datatypes, you can control the range of acceptable values by specifying minimum and maximum values and whether the specified values are themselves acceptable (**Minimum is Strict/Maximum is Strict** check boxes). If a **Strict** check box is selected, the specified value is *not* acceptable.

     For instance, for a percent field, you might specify a minimum of `0` and a maximum of `100`. If you do not want to accept 0 percent, you would check **Minimum is Strict**. If you want to accept 100 percent, you would clear **Maximum is Strict**.
   - Date and Date/Time – For these datatypes, there is a calendar widget in which you can select the desired minimum and maximum values and to make sure the configured date and date/time formats are used. To use the calendar, click the calendar icon ▦.
6. When you have defined the properties of your datatype, click **Save**. The datatype resource appears in the repository.

We have created a very basic datatype for any type of text input.

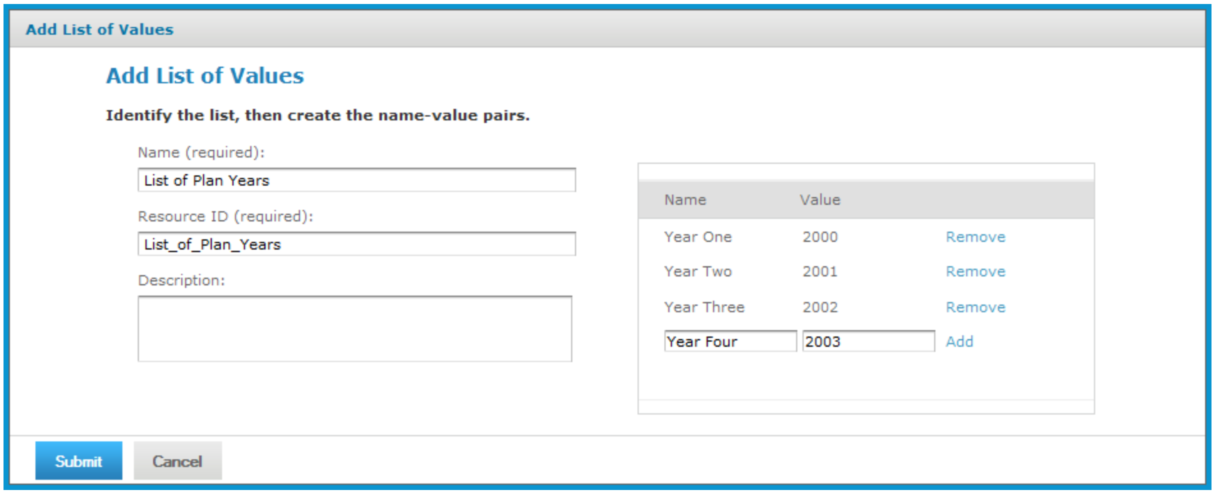
4.3.2 Lists of Values

List of values are resources that define a static list of values for single-select or multi-select input controls. For each selection in the list, the list defines a label presented to the user and the value passed to the report when it runs. Depending on the type of input control, the end user selects one or more of these labels as radio buttons, check boxes, or drop-down lists.

To create a list of values resource:

1. Log on as an administrator.
2. Click **View > Repository** and expand the folder tree to locate the folder in which you want to create the list of values. If you installed the sample data, the suggested folder is Input Data Types.
3. Right-click the folder and select **Add Resource > List of Values** from the context menu.

   The Add List of Values page appears.



Add List of Values

Add List of Values

Identify the list, then create the name-value pairs.

Name (required): List of Plan Years

Resource ID (required): List_of_Plan_Years

Description:

Name	Value	
Year One	2000	Remove
Year Two	2001	Remove
Year Three	2002	Remove
Year Four	2003	Add

Figure 4-23 Add List of Values Page

4. Enter a name and optional description for the datatype. The resource ID is filled in automatically.
5. Enter the name and value for each item in the list and click **Add**.

   The name and value are both treated as strings. Users only see the label in an input control that uses the list, and the report only receives the value. To remove an item, click Remove beside its value.
6. When you have defined all values in the list, click **Submit**. The list of values resource appears in the repository.

4.3.3 Creating an Input Control

The input control resource determines how the input control functions and appears. As with other resources, input controls can be created locally as part of a JasperReport, in which case they cannot be seen outside of the JasperReport, or they can be created separately in the repository and referenced in multiple reports.

To use an input control in a report, the control must meet two conditions:

- The parameter name in the input control must correspond to the name of the parameter in the report. No error occurs if there is a mismatch in the names, but at runtime, `NULL` is passed in as the value of the parameter instead of actual values.

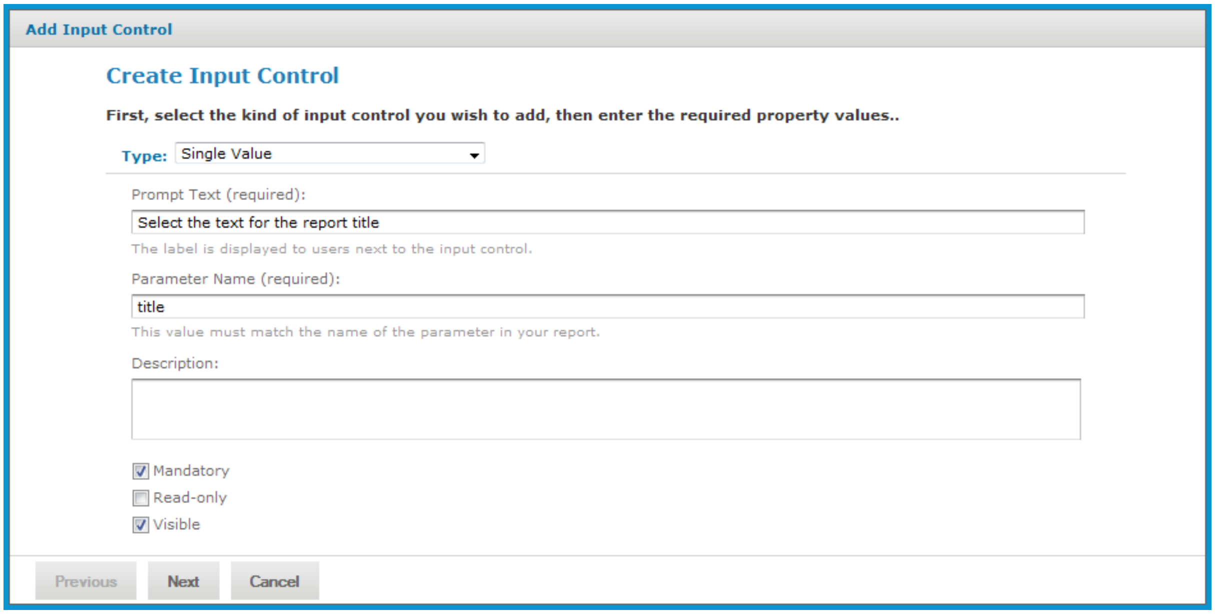
- The input control and its corresponding parameter must be of compatible datatypes (for example, both must be text types or date types). If there is a mismatch, the report fails and an exception is returned.

This section explains how to create an input control resource in the repository. To reference input controls in a JasperReport, see the *JasperReports Server User Guide*.

To create an input control resource:

1. Log on as an administrator.
2. Click **View > Repository** and expand the folder tree to locate the folder in which you want to create the input control. If you installed the sample data, the suggested folder is Input Data Types.
3. Right-click the folder and select **Add Resource > Input Control** from the context menu.

   The Add Input Control page appears.



Add Input Control

Create Input Control

First, select the kind of input control you wish to add, then enter the required property values..

Type: Single Value

Prompt Text (required): Select the text for the report title

The label is displayed to users next to the input control.

Parameter Name (required): title

This value must match the name of the parameter in your report.

Description:

☑ Mandatory
☐ Read-only
☑ Visible

Figure 4-24 Add Input Control Page

4. Select the type of input control from the **Type** list.

   In this example, select **Single Value**.
5. Enter the prompt to display to users explaining how to use the control.

   For this example, use the prompt `Select the text for the report title`.
6. In practice, the prompt text is often the same as the parameter, so the parameter name is automatically filled in from the prompt text. If you have used a different prompt, select the automatic name and replace it withe the exact name of the parameter associated with the control. Remember, the parameter name must be the same as in the reports that use this input control.

   For this example, the parameter name is `title`. The description is optional.
7. Select options for the control.

   In this example, select **Mandatory** and **Visible**; you have other options as well:
   - **Mandatory** – Forces the end user to supply a value.
   - **Read-only** – Displays the value of the parameter without allowing the end user to modify it.

- **Visible** – Makes the input control visible in the report options dialog.

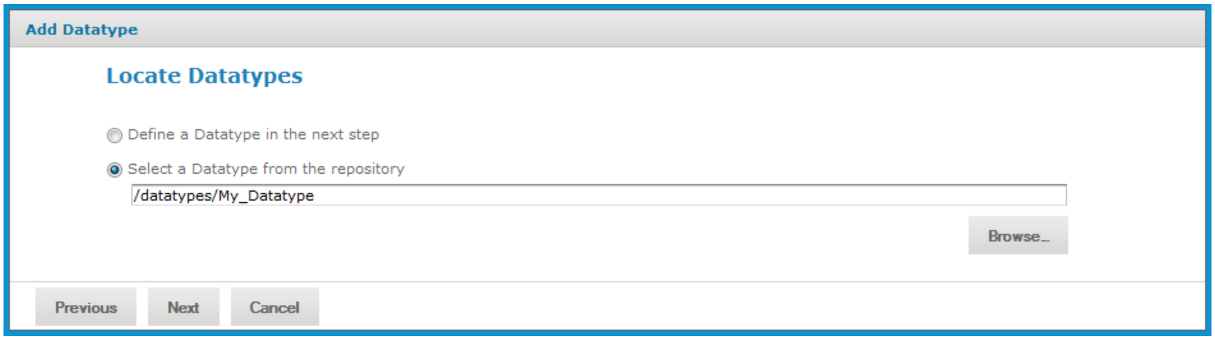
8. Click **Next**.

   Subsequent pages depend on what type of input control you chose above:

   - Boolean types do not require any further information.
   - Single-value types require a datatype resource to characterize what the user may enter.
   - Single-select and multi-select types based on static lists require a list of values resource.
   - Single-select and multi-select types based on queries require a query resource.

9. In this single-value example, the Locate Datatype page appears. Choose the option to select a datatype from the repository and click Browse. From the repository dialog that appears, select `/datatypes/TextGeneralDatatype`, which is similar to the datatype we created in section **“Datatypes” on page 92**.

   If you choose to define a datatype, the wizard takes you through the same procedure as in section **“Datatypes” on page 92**. You can then define any datatype you need, but it is local to the input control and not reusable in other input controls.


Add Datatype

Locate Datatypes

○ Define a Datatype in the next step

● Select a Datatype from the repository

/datatypes/My_Datatype

Figure 4-25 Locate a Datatype for an Input Control

10. Click **Next**. The input control resource is created in the repository.
11. Locate the input control in the repository manager. Notice that the text of the prompt that you entered in **step 5** is also used as the name for the resource.

4.4 Query-based Input Controls

Query-based input controls display a dynamic set of values for the user to choose from. They are input control resources in the repository, but instead of being based on a datatype or a static list of values, they perform a query to retrieve a list of values. For example, a report could have a city parameter, and the query-based input control could display the list of cities that exist in your data. Because the queries use standard syntax, you can include filters in a WHERE clause. In the previous example, you could restrict the list of cities to a certain country.

By including parameters, you can also create cascading input controls. A cascading input control is one whose choices depend on the selection of a previous input control. For example, after the user selects a country, the available city values are restricted to the chosen country. Cascading input controls are query-based controls that contain parameters returned by other controls.

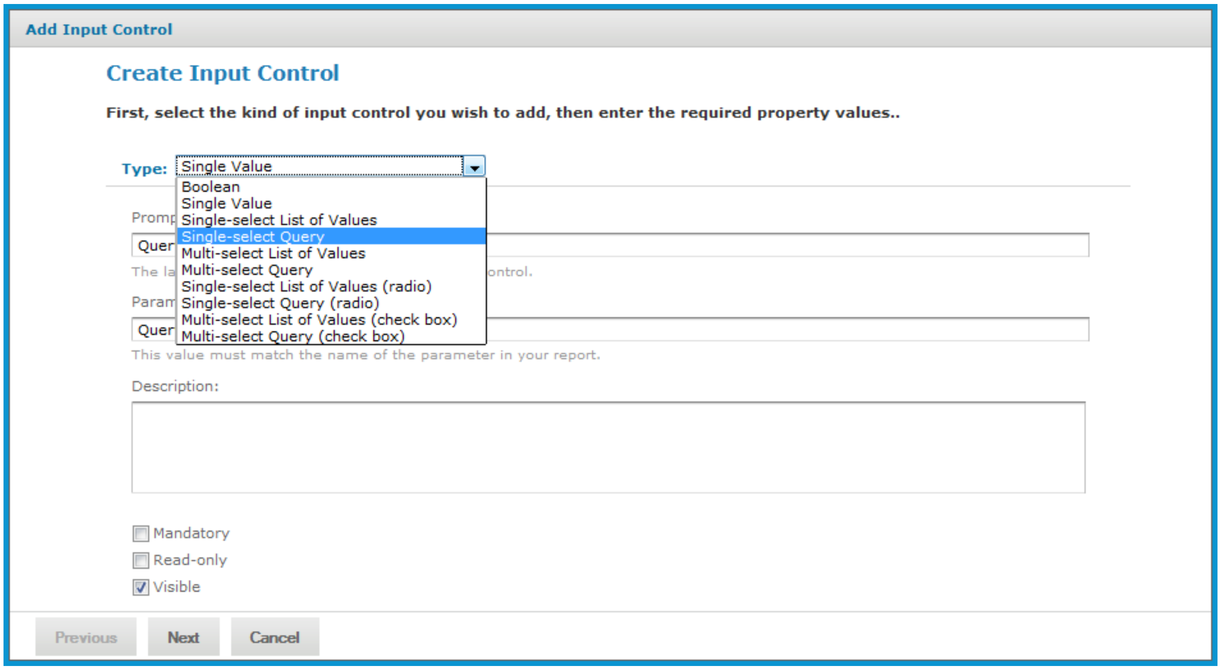
Cascading input controls help make input controls easier to use and faster to display. Certain parameters in reports have a natural hierarchy, such as countries and cities or years and quarters, and the cascading input controls let the user find values based on this hierarchy. Instead of selecting cities from one large list that may need to scroll, users can make a selection from a smaller list where all choices are visible. Also, displaying long lists make the web page slow to load, so cascading input controls that reduce the size of the list make it faster to load. If there were an especially large number of cities, more cascading input controls could be used to reduce the list, such as region or state. The values for each control are loaded only when the previous input has been selected, making for a convenient and speedy user experience.

The parameter values determined by each cascading input control may or may not be used in the report. For example, if the report only shows data about a city, the country input control exists only to speed up the choice of city. However, if the report also shows information such as city average compared to country average for a given measure, the country parameter is also used in the report.

4.4.1 Creating a Query-based Input Control

In this first example, we create a query-based input control that returns a long list of all cities for the user to choose from.

1. Log in as an administrator.
2. Browse the repository and select the folder where you want to create the query-based input control.
3. Right-click the folder and select **Add Resource > Input Control**. The Add Input Control dialog appears:



Add Input Control

Create Input Control

First, select the kind of input control you wish to add, then enter the required property values..

Type: Single Value

This value must match the name of the parameter in your report.

Description:

□ Mandatory

□ Read-only

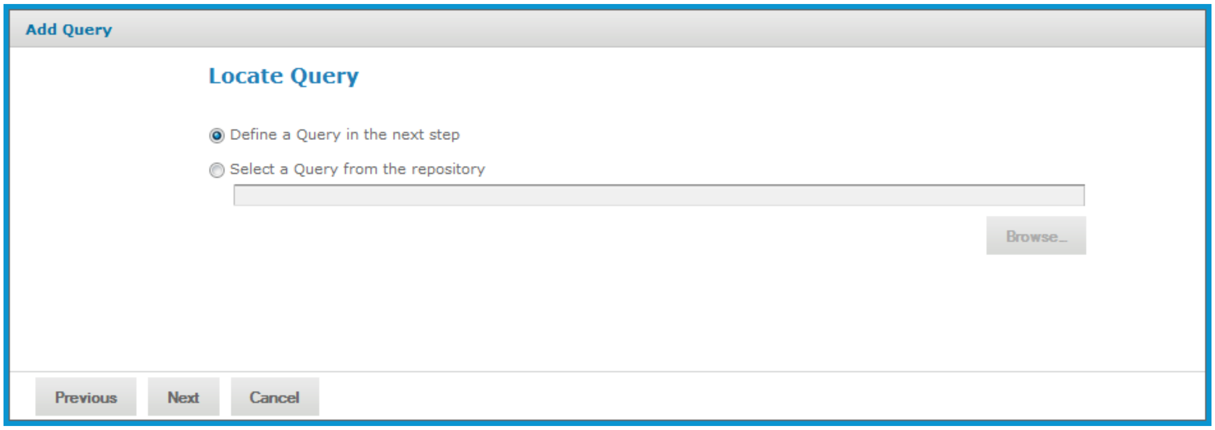
☑ Visible

Boolean
Single Value
Single-select List of Values
Single-select Query
Multi-select List of Values
Multi-select Query
Single-select List of Values (radio)
Single-select Query (radio)
Multi-select List of Values (check box)
Multi-select Query (check box)
Promp
Quer
The la
ontrol.
Param
Quer
Previous
Next
Cancel

Figure 4-26 Adding an Input Control - Naming

4. Select the type of query-based input control from the type drop-down list. This choice determines how the input control appears to users, either as a drop-down list, a set of radio buttons, a multi-select list, or a set of check boxes. In this example, we choose a single-select query-based input control.

5. Specify the prompt text, parameter name, optional description, and appearance options in the same manner as when defining a regular input control.
6. Click **Next**. Because we selected one of the query-based types, the Locate Query page appears:



Add Query

Locate Query

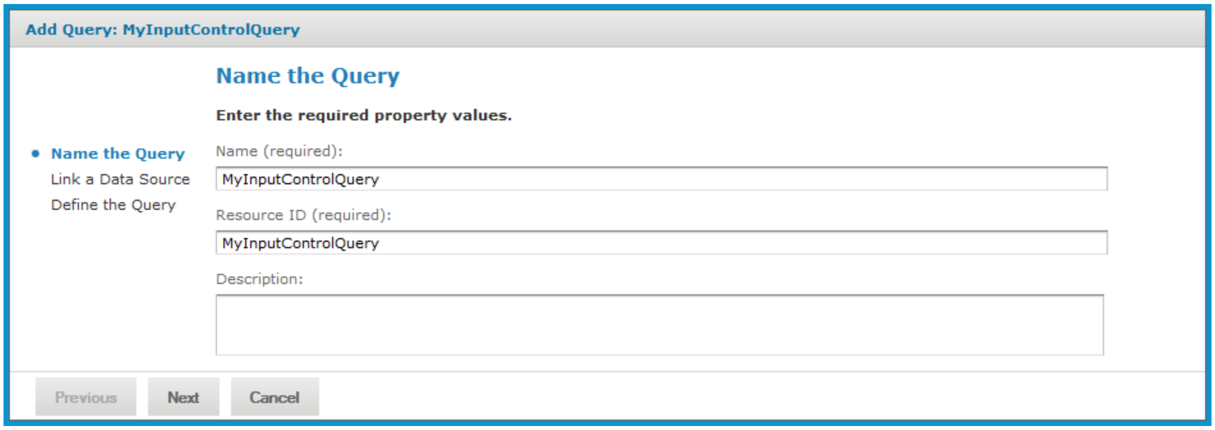
● Define a Query in the next step

○ Select a Query from the repository

Figure 4-27 Adding an Input Control - Locating the Query

If you have a suitable query resource defined in the repository, you could select it here as an external reference. In this example, we'll define a query resource locally inside the input control resource.

7. Click **Next** to define the local query resource. The query naming dialog appears:



Add Query: MyInputControlQuery

Name the Query

Enter the required property values.

Name (required): MyInputControlQuery

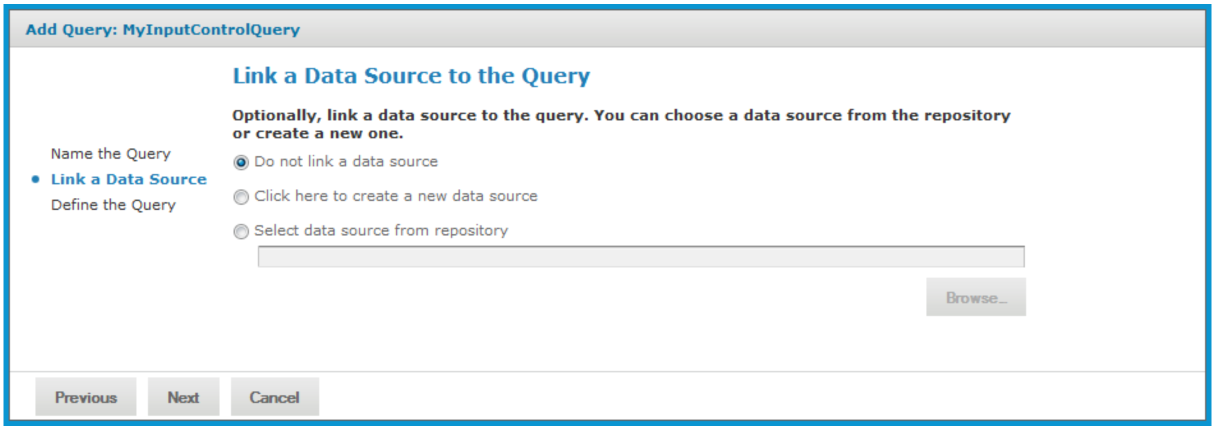
Resource ID (required): MyInputControlQuery

Description:

Figure 4-28 Adding an Input Control - Naming the Query

Although the query resource is not visible in the repository, it may still have a name, ID and optional description within the query resource. However, the values for these fields are not important.

8. Enter any name, and the ID is filled in automatically. Then click **Next**. The data source link page appears:



Add Query: MyInputControlQuery

Link a Data Source to the Query

Optionally, link a data source to the query. You can choose a data source from the repository or create a new one.

● Do not link a data source

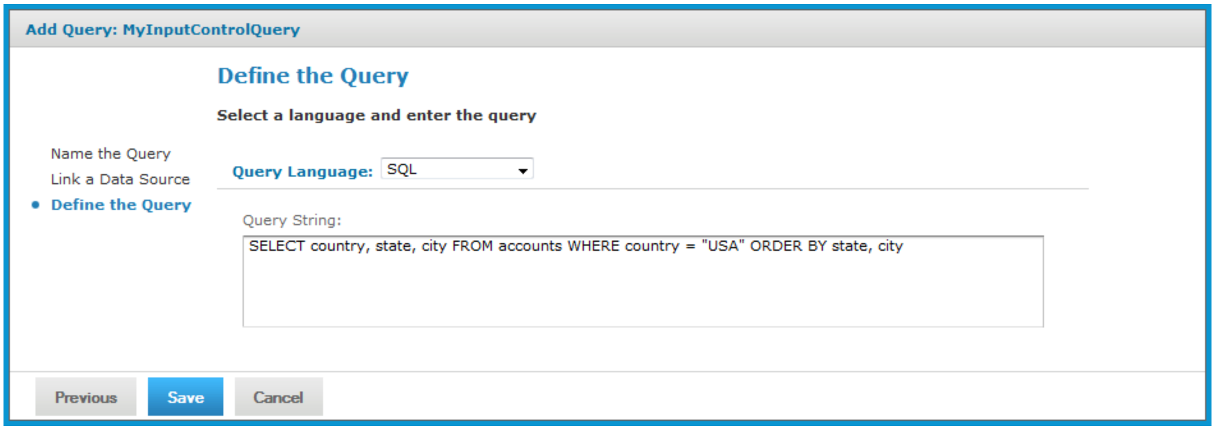
○ Click here to create a new data source

○ Select data source from repository

Figure 4-29 Adding an Input Control - Linking to a Data Source

As with all query resources, the query resource inside the input control may optionally link to a data source, either in the repository, or its own internally defined one. If no data source is linked, the query in the input control uses the same data source as report. In this example, we take the default selection of not linking to a data source.

9. Click **Next**. The query definition page appears:



Add Query: MyInputControlQuery

Define the Query

Select a language and enter the query

Query Language: SQL

Query String:

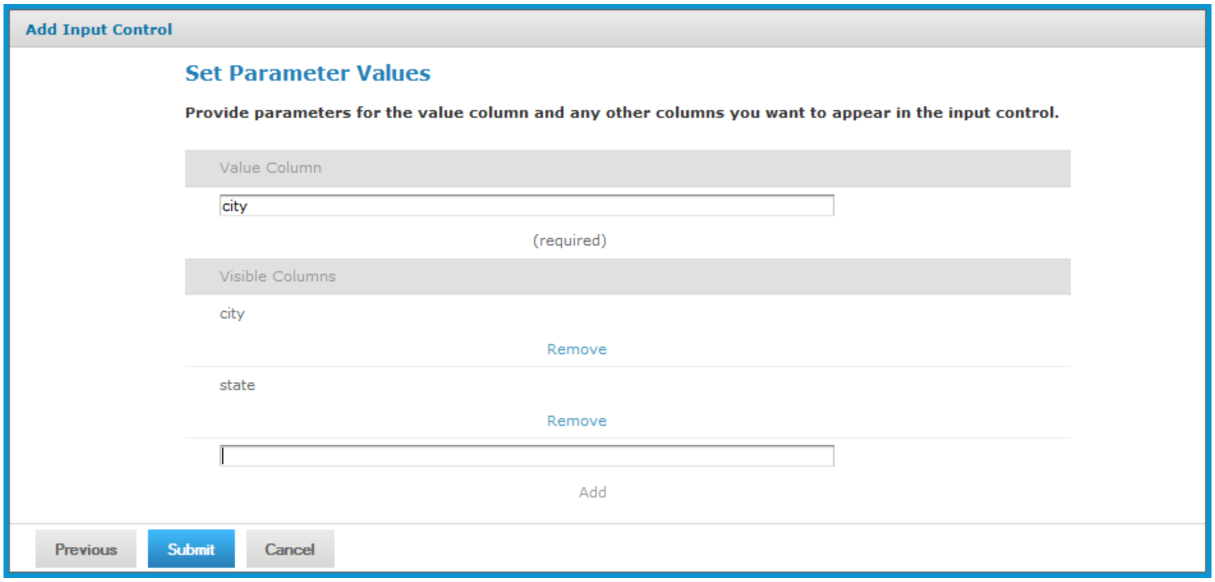
```
SELECT country, state, city FROM accounts WHERE country = "USA" ORDER BY state, city
```

Figure 4-30 Adding an Input Control - Defining the Query

10. Select the query language, in this example SQL, and enter a query string. The SELECT statement should contain the names of all fields used in the display, value, or filter for the input control. In this example, the query returns three fields, country, state, and city, and the country field is used to limit the values to a single country. The ORDER BY clause ensures that the values from the query are sorted alphabetically when they appear in the input control.

    For an example in a different query language, see **"Domain-based Queries" on page 101**.

11. Click **Save** to complete the query definition. The parameter values page appears:



Add Input Control

Set Parameter Values

Provide parameters for the value column and any other columns you want to appear in the input control.

Value Column

city

(required)

Visible Columns

city

state

Figure 4-31 Adding an Input Control - Setting Parameter Values

On the parameter values page, you define which field in the results of the query are displayed, and which field contains values that become the parameter value when chosen.

a. First, specify the value column, which is the field whose value is passed to the report. The data type of the field must match the type of the corresponding parameter in the report.

b. Next, specify the visible columns, which are the fields whose values appear in the input control that the user chooses from. In the simplest case, enter same field as the value column. If you add multiple fields to the visible columns, the input control displays the fields together, in the order listed, separated by a vertical bar (|). In the example in **Figure 4-31**, the user may see and choose from:

   Los Angeles | CA
   San Francisco | CA
   Denver | CO

   Only the city value (without the state) is passed to the report. Showing additional field in this way can help users find the value they want in long lists of results.

   The value and display columns may also be entirely different, for example, displaying the full name of a sales representative, but using the employee ID as the value returned by the input control. The only restriction is that all fields used in the value or display list must be selected by the query.

4.4.2 Built-in Parameters for Query-based Input Controls

The `LoggedInUser` and `LoggedInUsername` parameters are always available for query input controls; they are always available to reports, as well, even if an input control isn't defined for them. The standard parameters are also provided for reports if they are defined as parameters in the JRXML.

Table 4-1 Built-in Parameters for Query-based Input Controls

Parameter Name	Type	Notes
LoggedInUser	User	The user that is currently logged in. This parameter isn't available in query input controls, but is used as a parameter to the report.
LoggedInUsername	String	The user name of the current user.
LoggedInUserFullName	String	The full name of the current user.
LoggedInUserEmailAddress	String	The email address of the current user.
LoggedInUserEnabled	Boolean	Indicates whether the current user is enabled.
LoggedInUserExternallyDefined	Boolean	Indicates whether the current user is authenticated externally.
LoggedInUserTenantId	String	In the commercial editions, the name of the organization of the current user.
LoggedInUserRoles	Collection <String>	The roles assigned to the current user. This is helpful for parameters that use $X.
LoggedInUserAttributes	Map<String, String>	The profile attributes of the logged-in user. This parameter isn't usable in query input controls, but it is used as a parameter to the report. If the user has no attributes, the parameter is an empty map.
LoggedInUserAttributeNames	Collection <String>	The names of the profile attributes of the logged-in user. This is helpful for parameters that use $X. If the user has no attributes, the parameter is an empty map.
LoggedInUserAttributeValues	Collection <String>	The values of the profile attributes of the logged-in user. This is helpful for parameters that use $X. If the user has no attributes, the parameter is an empty map.
LoggedInUserAttribute_ <attribute-name>	String	For the logged-in user, the value of the attribute matching the name passed as <attribute-name> (like att1). If there is no match, the parameter is empty. This parameter is only available if it is defined in a query or as a report parameter.

4.4.3 Domain-based Queries

In the case of reports that use a Domain as the data source (an option available in the professional edition of JasperReports Server), any query-based input controls must contain a query against the Domain. When defining the query as shown in **Figure 4-30 on page 99**, set the query language to **Domain**.

The query language **Domain ("sl")** is selected when opening Domain-based queries created in JasperServer 3.5 or earlier. It is used only for backward compatibility and should not be selected for new Domain-based queries.

Domain queries have their own special syntax, the same that is used in the Domain design. A Domain-based query references fields, called items, by their item IDs, along with any set IDs that determine the path of the item within the Domain. For example, if you want your query input control to return a list store cities, where the field with ID `ej_store_store_city` is nested in the set with ID `expense_join_store`, you would use the following Domain query:

```
<query>
  <queryFields>
    <queryField id="expense_join_store.ej_store_store_city" />
  </queryFields>
</query>
```

The list contained inside the `<queryFields>` tag in a Domain query is equivalent to the fields given in the SELECT statement of an SQL query. Given the query above, you can create an input control for a Domain-based report that lets the user select a city as a parameter to the report.

Sometimes, you may want the input control to display more information than the actual value returned. As with standard query-based input controls, you can select more fields, and then display those fields in your input control. For example, to make the list of cities unambiguous, you could include the state and country in your display. In that case, the Domain-based query must also retrieve those items:

```
<query>
  <queryFields>
    <queryField id="expense_join_store.ej_store_store_city" />
    <queryField id="expense_join_store.ej_store_store_state" />
    <queryField id="expense_join_store.ej_store_store_country" />
  </queryFields>
</query>
```

Then, when specifying your visible query columns, as shown in **"The COUNTRY Input Control" on page 106**, you would add the 3 fields to the list in the order you want them to appear. When specifying fields in the list of visible query columns, use the full ID of the field, including any set IDs. For example, the following list of fields:

```
expense_join_store.ej_store_store_country
expense_join_store.ej_store_store_state
expense_join_store.ej_store_store_city
```

creates a list of values such as the following for users to choose from (the separator | is added automatically):

USA | CA | Los Angeles
USA | CA | San Francisco
USA | OR | Portland
USA | WA | Redmond

Finally, the Domain-based query also has the option to filter the query results, as shown in the following example:

```
<query>
```

```
  <queryFields>
    <queryField id="expense_join_store.ej_store_store_city" />
    <queryField id="expense_join_store.ej_store_store_country" />
    <queryField id="expense_join_store.ej_store_store_state" />
  </queryFields>
  <queryFilterString>expense_join_store.ej_store_store_country == 'USA' and
        expense_join_store.ej_store_store_state == 'CA'
  </queryFilterString>
</query>
```

The `<queryFilterString>` tag contains a DomEL (Domain Expression Language) expression that references the full ID of the fields, including any set IDs. For more information about DomEL, see the *JasperReports Server User Guide*. The `<queryFilterString>` tag in a Domain query is equivalent to the WHERE clause of an SQL query. The list of fields in the `<queryFields>` tag must include all fields being referenced in the filter string.

4.4.4 Cascading Input Controls

A cascading input control is one whose values depend on the selection made in a previous input control. Cascading input controls are created by using parameters in the query string of a related input control. In other words, the parameter defined by an input control may be used in another query-based input control.

In the query-based example of cities and states such as:

Los Angeles | CA
San Francisco | CA
Denver | CO

the query may still generate a list of hundreds of cities to scroll through. Even though each city is easy to identify with the state, scrolling through a long list is time consuming. With cascading input controls, this example can have two input controls, one for the state and one for the city:

- When input controls are displayed, the query for the state input control returns an alphabetical list of unique state names.
- When the user selects a state, the query for the city input control is triggered and returns the list of cities for that state. The cities are displayed in the input control, and when the user selects one and submits it, the city name is passed as a parameter to the report.

The user makes two selections from much shorter lists, which is easier and quicker than using one long list of city and state names. The second input control is empty, showing no selections, until clicking on the first of the cascading input controls. If the user changes the state in the first control, the list of cities in the second control updates accordingly.

4.4.4.1 Parameters in Input Control Queries

Parameter substitution in query input controls follows the same approach as for JasperReports queries. Queries of all types of data sources can use parameter substitution, and $P, $P! and $X (for SQL queries) parameters are supported. The $X notation has two principal forms explained in the following list:

- `$P{parameter_name}`

  The value of the parameter is substituted into the query. In cases where the parameter contains a string, the substitution mechanisms inserts the proper escape characters to create valid SQL. Use this for with single-select input controls and simple comparison operators such as greater-than or less-than. For example:

  ```
  select name from EMPLOYEES where deals_closed > $P{DEALS}
  ```

Do not use $P{parameter_name} with equality because the parameter value can be null, and `field = NULL` is not valid SQL. Instead use $X{EQUALS, ...} as explained below.

- `$P!{parameter_name}`

  The value of the parameter is treated as raw text. The server replaces the parameter with the value of the input control without performing extra checking or value escaping. This is used in complex cases where the input control provides a piece of the query or sometimes the entire query.

- `$X{EQUALS, column, parameter_name}` or `$X{NOTEQUAL, column, parameter_name}`

  This syntax performs equality verification and handles the case when the parameter value is null. Use this everywhere instead of the old `column = $P{parameter_name}` syntax. The $X{EQUALS...} syntax performs the following substitution before submitting the query:

  ```
  column = parameter_value -- when parameter_value is non-null
  ```

  ```
  column IS NULL -- when parameter_value is NULL
  ```

- `$X{IN, column, parameter_name}` or `$X{NOT IN, column, parameter_name}`

  Use this parameter for cascading with multiple-select input controls. The $X{IN...} operator is true when the field value matches any one of the multiple values of the input control. In the country/cities example, we can allow the user to pick any number of countries, and show all the cities in the selected countries. The query-based input control would have the following query:

  ```
  select city from ACCOUNTS where $X{IN, country, COUNTRIES}
  ```

  If the user selects the values Canada, Mexico, and USA in the COUNTRIES multi-select input control, the `$X{}` syntax translates into the following query for the CITIES input control:

  ```
  select city from ACCOUNTS where country IN ('USA','Canada','Mexico')
  ```

When defining these parameters in a report, don't use a `defaultValueExpression` element. Due to a limitation in JasperReports Server, these parameters are null when a `defaultValueExpression` is provided.

The $X syntax also supports the following operators. They are all designed to handle null input by generating 0 = 0 when the parameter value is null:

Parameter Syntax	Meaning
`$X{GREATER, column, parameter}`	column > parameter
`$X{[GREATER, column, parameter}`	column >= parameter
`$X{LESS, column, parameter}`	column < parameter
`$X{LESS], column, parameter}`	column <= parameter
`$X{BETWEEN, column, start_param, end_param}`	start_param < column < end param
`$X{BETWEEN], column, start_param, end_param}`	start_param < column <= end param
`$X{[BETWEEN, column, start_param, end_param}`	start_param <= column < end param
`$X{[BETWEEN], column, start_param, end_param}`	start_param <= column <= end param

For more information on using $P, $P! and $X to build dynamic queries, refer to the *JasperReports Ultimate Guide* and the *iReport Ultimate Guide*.

The number of parameters that can be used in a query is arbitrary, just as the number of input controls that can be defined in a JasperReport is arbitrary. In addition to the standard input control parameters, a cascading input control query can use the built-in parameters described in **"Built-in Parameters for Query-based Input Controls" on page 101**.

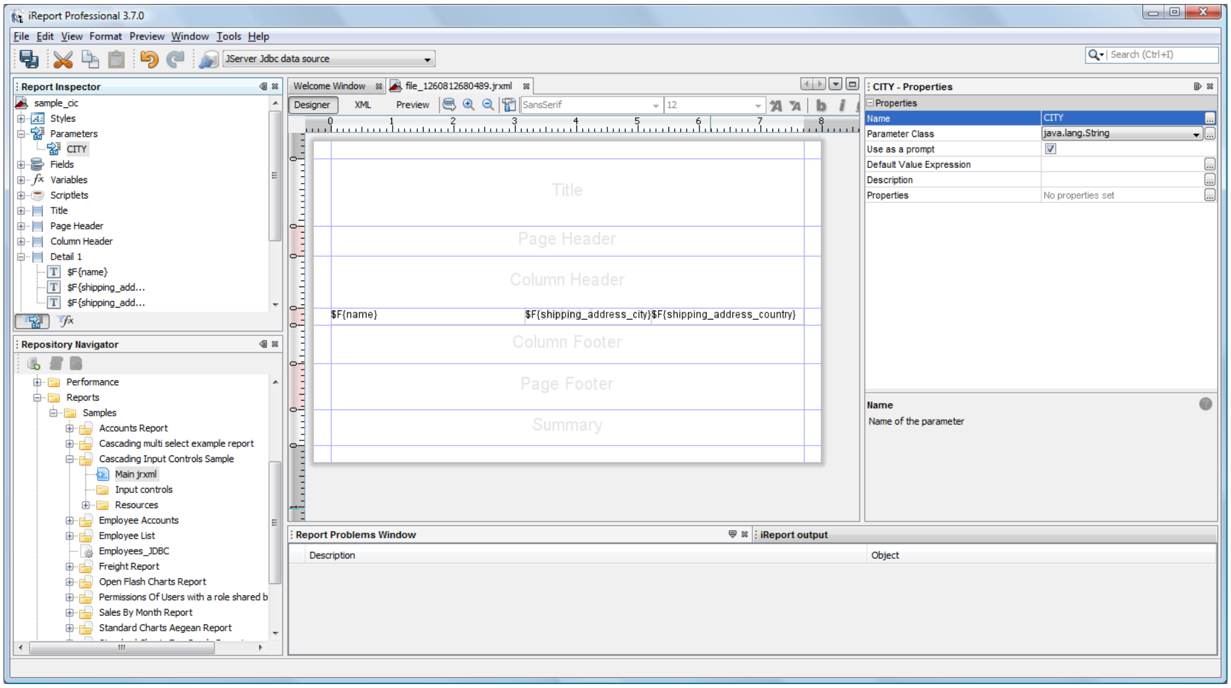
4.4.4.2 Step-by-Step Example

In this example, we'll create a simple report where users select a country and then a city to display all the accounts of a city, using the SugarCRM sample database shipped with JasperReports Server. This example uses iReport to create a report and its input controls. iReport uses the JasperReports Server plug-in to upload these resources to the repository.

We start by creating a report with a parameter called CITY and the following report query:

```
select * from accounts where $X{EQUALS, billing_address_city, CITY}
```

In the detail band, we add three fields: name, shipping_address_city, and shipping_address_country. Then we publish the report on the server, using the Publish tool of the JasperReports Server plug-in in iReport.



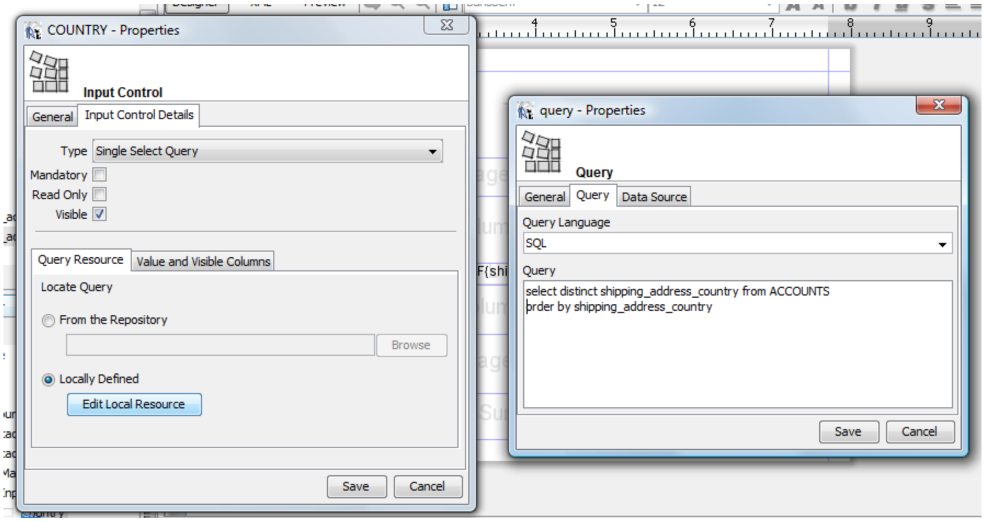
Properties	
Name	CITY
Parameter Class	java.lang.String
Use as a prompt	☑
Default Value Expression	
Description	
Properties	No properties set

Name
Name of the parameter

Figure 4-32 Simple Report Filtered by City

Now define the input controls. Right-click the JasperReport node in the Repository Navigator and add the first input control by selecting **Add > Input Control**. This input control shows the list of countries in which accounts are present. It is not a cascading input control, but its value is used in the next control: the one that selects the city.

Set the name of this first input control to COUNTRY (the display name can be “Country”). Set the Input Control type to **Single Select Query**. Edit a local resource for the query, set a name for it (“query”) and set the query language to **SQL**.



COUNTRY - Properties

Input Control

Type: Single Select Query

Mandatory ☐

Read Only ☐

Visible ☑

Locate Query

○ From the Repository

● Locally Defined

query - Properties

Query

Query Language: SQL

Query:

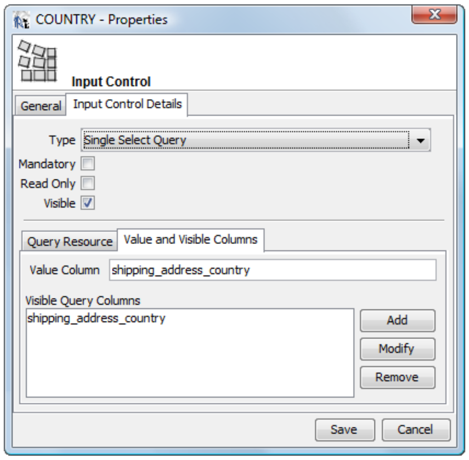
select distinct shipping_address_country from ACCOUNTS
order by shipping_address_country

Figure 4-33 Creating the COUNTRY Input Control

The query is just a simple query to select the countries. For instance:

```
select distinct shipping_address_country from ACCOUNTS
  order by shipping_address_country
```

To complete the local query resource, set the repository resource /datasources/JServerJdbcDS as the query’s data source. Finally, in the **Value and Visible Columns** tab, set the Value Column to shipping_address_country and make it (the only) visible column. The first input control, which selects the country, is now ready.



COUNTRY - Properties

Input Control

Type: Single Select Query

Mandatory ☐

Read Only ☐

Visible ☑

Value Column: shipping_address_country

Visible Query Columns:

shipping_address_country

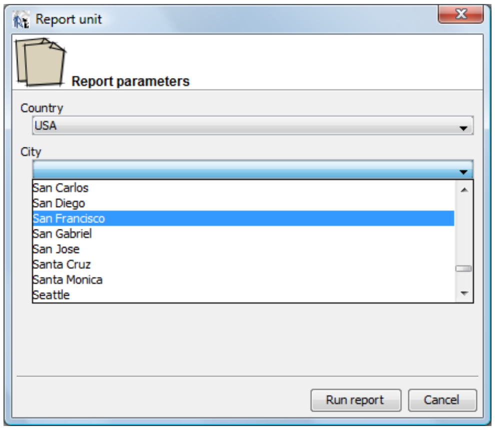
Figure 4-34 The COUNTRY Input Control

Now that we have an input control named COUNTRY, we can reference the COUNTRY parameter in another query-based input control. This is what we are going to do with the second input control named CITY. Its definition is also a **Single Select Query**of type **SQL**. The query for CITY uses a $X{EQUALS, ..., COUNTRY} parameter in its `where` condition:

```
select distinct shipping_address_city from ACCOUNTS
  where $X{EQUALS, shipping_address_country, COUNTRY}
  order by shipping_address_city
```

This time the column to be used in the Value and Visible Columns field is `shipping_address_city`.

When you run the JasperReport, if everything has been correctly configured, the dialog box in **Figure 4-35** appears. It consists of the two simple input controls, and the CITY control is not populated until the user selects a country.



Country: USA

City: San Francisco

Figure 4-35 Cascading Input Control Showing Country and Cities

4.5 File Resources

File resources are those that the administrator creates by uploading a file. Like other resources in this chapter, file resources are created by administrators so that they can be referenced by Jasper Reports. JasperReports server supports the following files:

Table 4-2 File Resource Types

File Type	Description
CSS	Cascading Style Sheet file that helps define the user interface as part of a theme.
Font	True Type font (.ttf) file to extend the set of fonts available in a report and allow embedding of fonts in the PDF output, if needed (see **"Fonts" on page 108**).
Image	Any image format supported by the JVM (Java Virtual Machine), such as JPEG, GIF, and PNG. Images can be referenced in JasperReports, and also in CSS files.

File Type	Description
JAR	Libraries that provide functionality for your reports (see **“JAR Files” on page 108**)
JRXML	The definition of a report in JasperReports’ XML-based report definition language. A JRXML file can be uploaded separately for use in multiple JasperReports.
OLAP Schema	Defines the data in an OLAP cube, including how to aggregate the dimensions.
Resource Bundle	A Java .properties file containing key-value pairs for localization of reports (see **“Resource Bundles” on page 108**)
Style Template	A JRTX file containing a style template that can be shared between JasperReports.
XML	XML file used in Domains and analysis to define data-level security.

The way in which fonts, JAR files and resource bundles are associated with reports is further explained in the following sections.

4.5.1 Fonts

The server relies on the JasperReports Library as its content rendering engine, which enables it to produce high-quality, pixel-perfect documents. The server can use any fonts that are available to its JVM as logical or physical fonts. This solution is perfect for HTML reports that are stored in the server.

However, when exporting the report to PDF, you may need to take additional steps if the report includes fonts that the PDF viewer doesn’t recognize, or if the report requires fonts that your users do not have on their computers. In this case, you must embed the font in the PDF file itself. To embed a font, you must edit the report’s main JRXML file; the TTF (True Type Font) file that the report references must be available to the server at runtime. One way to ensure that the server has the correct font is to upload it to the repository by creating a file resource. Then, the report can refer to the font’s URI in the repository.

For details about working with fonts and PDF export, refer to the JasperReports documentation.

4.5.2 JAR Files

JasperReports can leverage third-party APIs. When run, reports can make direct API calls to third-party code using JRXML expressions. This provides enormous flexibility for incorporating business logic or other utility code into report generation.

In some cases, you can make the third-party code available to the report generating process by adding the necessary libraries to the server’s application classpath when it is deployed. In other cases, upload the third-party or additional JAR files to the repository by creating a file resource. Then the report can refer to the code by referencing them as additional file resources.

4.5.3 Resource Bundles

When a single JRXML template is used to generate documents in multiple languages, it needs a resource bundle to accommodate the locale-specific content. If you upload such resource bundles by creating a file resource, your JRXML files can refer to them.

The name of the resource bundle created as a file resource in the repository must have .properties as its file extension. For example, the default resource bundle might be named MyReport.properties, and its French translation MyReport_fr.properties. For more information about resource bundles for reports, refer to the *JasperReports Server User Guide*.

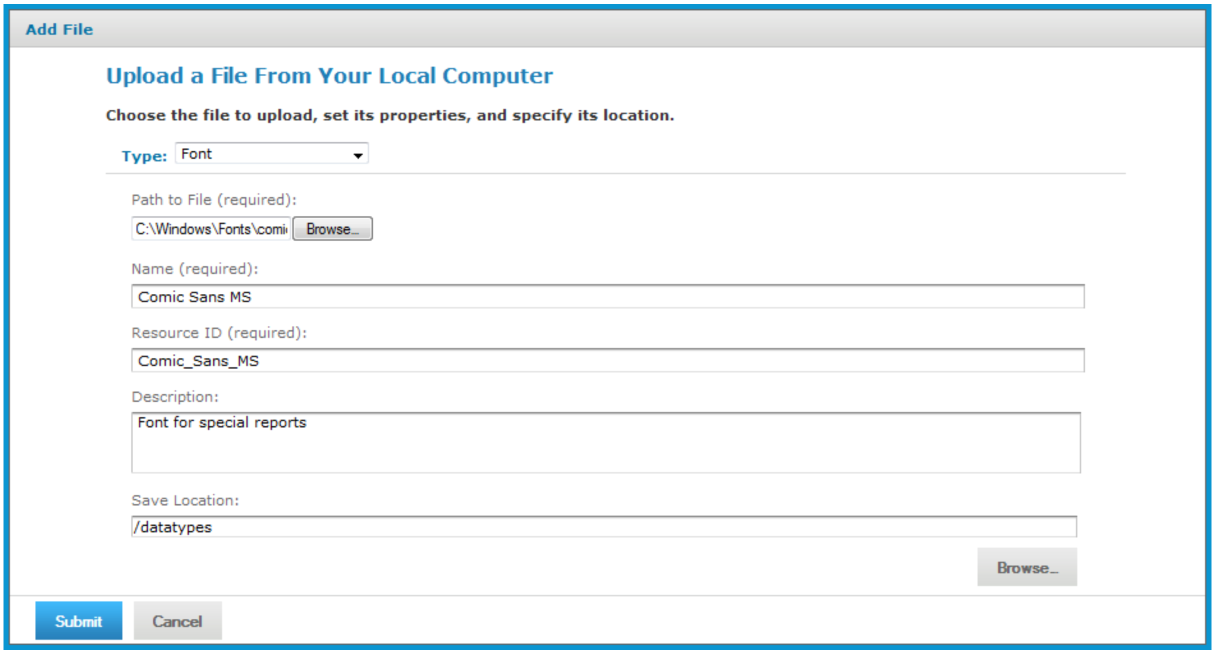
4.5.4 Creating a File Resource

Administrators should organize file resources into folders in the repository to make them easier to find when creating references.

To add a file resource:

1. Log in as an administrator.
2. Select **View > Repository** and locate the parent folder of the new resource in the left-hand Folders panel.
3. In the Folders panel, right-click the parent folder and select **Add Resource > File** from the context menu, then select the type of resource to add. In this example, select **Add Resource > File > Font**. The Add File dialog appears.
4. Enter the required information for the file resource. In additions to the name and ID, file resources only require you to enter the path to a file or click **Browse** to locate a file on your file system.

   Below, **Figure 4-36** shows the dialog for adding a Font file. All file resources are created by uploading a file in a similar fashion.



Add File

Upload a File From Your Local Computer

Choose the file to upload, set its properties, and specify its location.

Type: Font

Path to File (required): C:\Windows\Fonts\comi

Name (required): Comic Sans MS

Resource ID (required): Comic_Sans_MS

Description: Font for special reports

Save Location: /datatypes

Figure 4-36 Adding a File Resource

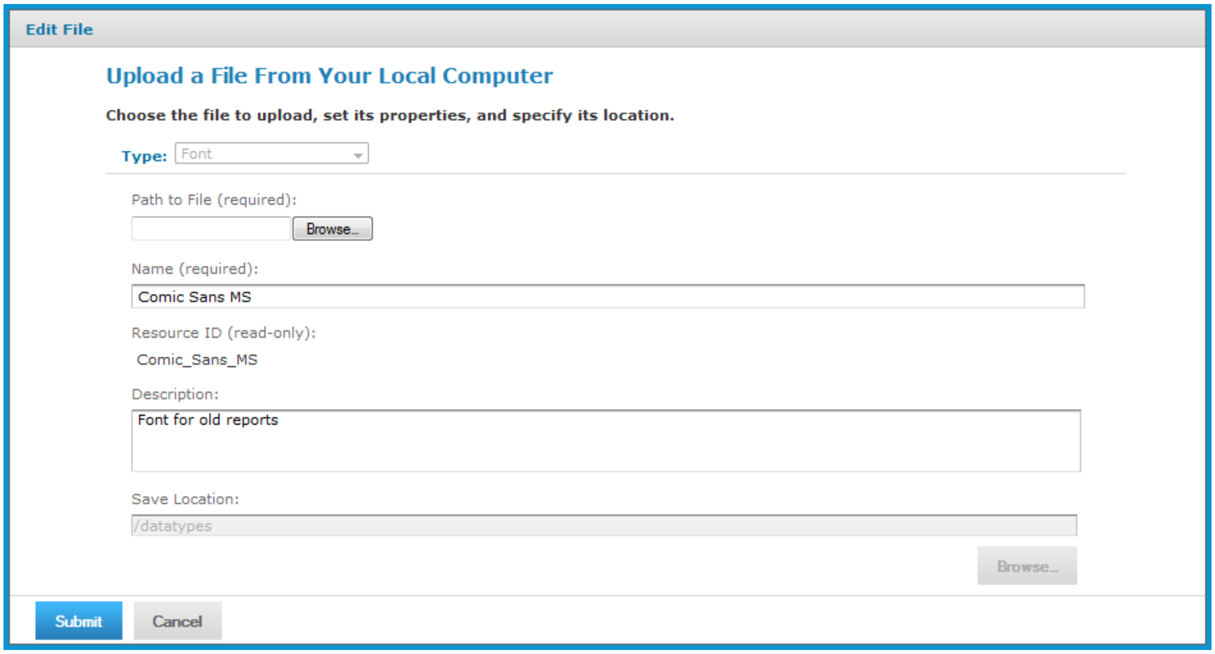
5. When done, click **Submit**. The new file resource appears in the selected folder in the Repository panel. A message confirming the addition also appears at the top of the page.

4.5.5 Editing a File Resource

The following example shows how to edit a file resource.

To edit a file resource:

1. Log on as an administrator.
2. In the repository, browse or search for the resource.
3. Right-click the resource and select **Edit** from the context menu. The Edit File dialog appears much like the Add File dialog except for some properties that cannot be changed. In this example, we edit the font resource created in section **"Creating a File Resource" on page 109**.



Edit File

Upload a File From Your Local Computer

Choose the file to upload, set its properties, and specify its location.

Type: Font

Path to File (required):

Name (required): Comic Sans MS

Resource ID (read-only): Comic_Sans_MS

Description: Font for old reports

Save Location: /datatypes

Figure 4-37 Editing a File Resource

4. Use the Edit dialog to view or modify the resource definition and its values. In **Figure 4-37**, you can see how the Description field was changed. You can also change the contents of the file resource by specifying another file to upload. The Path to File field is not required unless you want to reload the file from disk.
5. Click **Submit** to save any changes.

Chapter 5 Themes

This section describes functionality that can be restricted by the software license for JasperReports Server. If you don’t see some of the options described in this section, your license may prohibit you from using them. To find out what you're licensed to use, or to upgrade your license, contact Jaspersoft.

Themes in JasperReports Server are a mechanism to define and customize the user interface (UI) through Cascading Style Sheets (CSS), the web standard for defining the appearance of HTML content. A theme is the set of all CSS files and associated images that defines the appearance of the user interface. Themes are stored as file resources in folders in the repository, with special menus on theme folders for activating, uploading, and downloading a theme. You can store any number of themes in the repository, and administrators can switch between them, providing an easy and quick way to change the user interface.

For deployments licensed to use organizations, administrators can set the theme individually on each organization, or rely on theme inheritance to use the same theme everywhere without needing to set it explicitly. The inheritance mechanism also supports a mix of explicit and inherited settings, so that you can override any setting or image in a local organization, but inherit the rest of the theme from the parent or system-wide theme.

The theme mechanism was introduced in JasperReports Server 4.0, and the set of files in the default theme was updated in 4.7. Custom themes developed prior to 4.7 may require upgrading in order to work with the new set of files. For more information see the upgrade procedures in the *JasperReports Server Installation Guide*.

This chapter contains the following sections:

- **Introduction**
- **How Themes Work**
- **Administering Themes**
- **Working With CSS Files**

5.1 Introduction

The JasperReports Server user interface is shown in figures throughout this book. The default appearance can easily be modified to suit your needs.

The JasperReports Server user interface is based on CSS (Cascading Style Sheets) files that define the styles of the elements appearing in the HTML, itself defined in and generated from JSP (JavaServer Pages) and JavaScript.

A theme is a collection of CSS files and associated images that specify the appearance for all or part of the user interface. A theme only controls how the interface appears, for example fonts, colors, spacing, lines, and image elements of the UI. It does not control what appears, such as the contents of menus or the effect of clicking a button.

Themes are defined globally at the repository root and individually on every organization. Every user of a given organization sees the same theme, but different organizations can have their own themes. Only administrators can set the theme. Administrators can add, upload, edit, copy, and delete the files that make up the theme, just like other resources in the repository. The repository provides special actions on theme folders for downloading and uploading themes as ZIP (compressed archive) files, and for activating the theme.

Themes are fully integrated with the multi-organization architecture in JasperReports Server. Some features of themes discussed in this chapter apply only to deployments that are licensed to use multiple organizations. However, single-organization deployments use the same architecture, for example there are overrides and inheritance between themes in the single default organization and the system root.

The themes mechanism is hierarchical and very flexible, allowing administrators to easily change the global appearance or set organization-specific overrides. For example, all of the following scenarios are possible with the themes mechanism:

Scenario	Description
Use the default theme unchanged.	The UI has been updated for clarity and space considerations. After a standard installation, the default theme is set at the root level and is automatically inherited by all organizations so that every user sees the server with this interface. If the default theme suits your needs, there is no need to customize it or develop new themes.
Quickly modify the default theme.	You can specify overrides of individual CSS rules or replace images in the system theme. It is easy to create or upload the new files and activate your customizations. The inheritance mechanism ensures that every organization uses this new theme and is updated in real time when you modify it.
Create an entirely new theme.	With CSS experience or Jaspersoft Professional Services, you can change the entire look and feel of the server. The server UI can be tailored to match or blend in with nearly any other web design. The inheritance mechanism again ensures that every organization uses the new theme, while allowing you to manage the interface from a single set of files.
Override themes to customize the UI for every organization.	You can give each organization or suborganization a customization of the default theme, for example a new logo, while retaining all other aspects of the system theme. The benefit of this approach is that the system theme can still be modified and inherited by all organizations, while still retaining the organization-level overrides. This approach can be combined with the previous one, so that overrides are applied to the custom theme.

Scenario	Description
Create a new theme in every organization.	For SaaS vendors, each organization can be a different client that needs a special interface. The themes mechanism allows each organization to fully define the UI and still retain the override and inheritance mechanism for its own suborganizations. In such deployments, each organization admin can modify or create the appearance of his own user interface.

It is important to realize that a theme refers to two concepts simultaneously:

- A folder containing a set of CSS files and image files in the proper location in the repository.
- The entire appearance of the user interface after activating the theme's files. However, through the inheritance mechanism, parts of the interface are defined in the files belonging to other themes. In fact, except for the default theme, the entire user interface is rarely defined in a single theme.

For example, a very simple theme named MyLogo contains a custom image file to replace the Jaspersoft logo, and nothing else. The rest of the interface is inherited from the default theme or some custom theme. Yet we say that MyLogo is the active theme, and every user in the same organization sees the MyLogo theme.

5.2 How Themes Work

Themes are stored in a special folder named Themes that appear at the root of the repository and in every organization. Each Themes folder contains a default theme that cannot be edited and any number of custom theme folders. Each theme is stored in its own folder and is known by the name of the folder.

The folder named “default” in every Themes folder is a special theme whose contents are controlled by the server. In the Themes folder at the root, the default theme contains the complete definition of every style that makes up the default theme shipped with JasperReports Server. In organization Themes, the default is a system generated theme that contains all styles inherited by the given organization. None of the default theme folders can be modified, even by administrators.

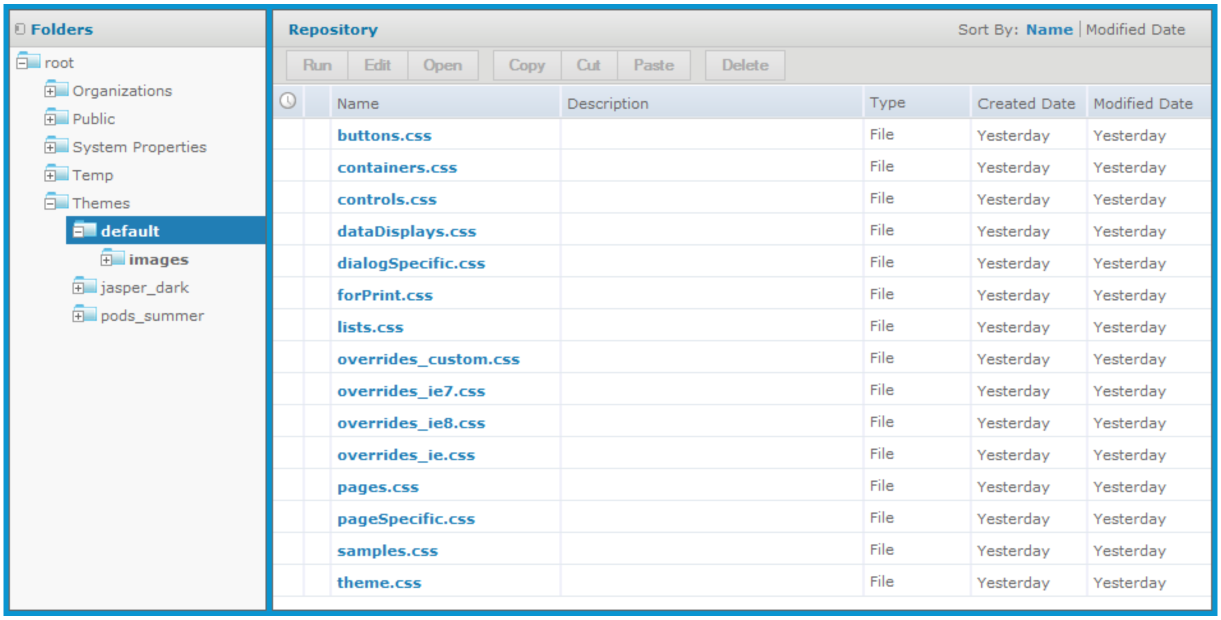
This chapter uses the following terminology to distinguish between root-level and organization-level themes. In the following table, the main folder of any organization is named Organization, and *active-theme* is the name of the theme folder that has been activated:

Name	Folder	Description
Default theme	root > Themes > default	The unmodified user interface of JasperReports Server, as it appears at first installation. The default theme is defined in the default folder in the Themes folder at the root of the repository.
System theme	root > Themes > *active-theme*	The active theme set at the root level. All users in all organizations see this theme unless there is an organization-specific theme that is activated. The system theme is also used for the login page. When JasperReports Server is first installed, the default theme is active, so it is also the system theme.

Name	Folder	Description
Inherited theme	Organization > Themes > default	The combination of all active themes in the parent organizations of a given organization, according to the inheritance rules. For any given organization, the theme inherited by that organization is stored in the default folder of that organization's Themes folder.
Active theme	Organization > Themes > *active-theme*	The theme that users of a given organization can see, because an administrator has made it active at the organization or system level. Users see a combination of the active and inherited theme, depending on the files in the active theme and the inheritance rules.

You cannot modify the files of the default theme through the repository. If you try to do so by circumventing the repository, you could inadvertently change rules such that the UI becomes unusable. In this situation you must re-install JasperReports Server to recover.

The following figure shows the default theme in the Themes folder at the root of the repository. The name of the folder (and its subfolders) are bold to indicate that it is the active theme.



Name	Description	Type	Created Date	Modified Date
buttons.css		File	Yesterday	Yesterday
containers.css		File	Yesterday	Yesterday
controls.css		File	Yesterday	Yesterday
dataDisplays.css		File	Yesterday	Yesterday
dialogSpecific.css		File	Yesterday	Yesterday
forPrint.css		File	Yesterday	Yesterday
lists.css		File	Yesterday	Yesterday
overrides_custom.css		File	Yesterday	Yesterday
overrides_ie7.css		File	Yesterday	Yesterday
overrides_ie8.css		File	Yesterday	Yesterday
overrides_ie.css		File	Yesterday	Yesterday
pages.css		File	Yesterday	Yesterday
pageSpecific.css		File	Yesterday	Yesterday
samples.css		File	Yesterday	Yesterday
theme.css		File	Yesterday	Yesterday

Figure 5-1 The default Theme in the Root Themes Folder

5.2.1 Theme Files

A complete theme consists of the files listed for the default theme, as shown in **Figure 5-1**, along with all referenced images. In addition, the default theme contains the file samples.css that is only used by the **View > UI Samples** page described in section **"User Interface Samples" on page 125**. The files overrides_ie7.css and overrides_ie8.css are only loaded with the style sheets when the user's browser is Internet Explorer 7 or 8, respectively.

The set of files in the default theme was updated in 4.7. Custom themes developed prior to 4.7 may require upgrading in order to work with the new set of files. For more information see the upgrade procedures in the *JasperReports Server Installation Guide*.

The images associated with a theme include all the icons in the user interface and backgrounds for buttons and borders. Several icons and backgrounds can be stored in the same file called a sprite. The theme also includes the favicon.ico file that appears on browser tabs. There are approximately 60 image files in the default theme.

The default theme stores referenced image files in a folder named images. In a custom theme, there are two ways to change an image of the default theme:

- Use a folder named images and an image file with the same name as the one you want to replace.
- Modify the corresponding CSS rules to redefine the location where the new image can be found.

When you modify the CSS rules, you can use any of the following ways to reference image files, or any other helper file:

- Directly in the theme folder. In this case the file is referenced without a path, for example `"myfile.png"` in CSS.
- In any folder path located in the theme folder. For example, your custom CSS file could refer to `"MyImages/myfile.png"` if you create a folder named MyImages in the theme folder and upload your images there.
- Anywhere on the Internet. Following the CSS standard, your custom CSS can refer to images, or any helper file, with a regular URL.

5.2.2 Inheritance Mechanism

In order to render the user interface, Jasper Reports Server must load each of the theme files. Because each file can be stored in multiple themes, the inheritance mechanism determines which file to load.

The server loads each of the CSS files listed in **Figure 5-1**. To locate the file, the server looks in the following locations, in the orders listed below.

For professional edition users:

1. The active theme folder for the user's organization.
2. The inherited theme stored in the folder named <organization>/Themes/default.

For other users:

1. The active theme folder.
2. The inherited theme stored in the folder named /Themes/default.

When one of the CSS files references an image file or a helper file, including any path to that file, the server looks for that path and filename in the same two locations, in the same order. In this way, each file and image is resolved first in the active theme, and if not found, then in the inherited theme.

The active theme does not need to contain all the files because the inherited theme that is maintained by the server is guaranteed to contain all the files. Maintaining the inherited theme in every organization is the second task of the inheritance mechanism.

The server maintains the inherited theme in each organization using the same algorithm. Whenever an administrator changes the active theme or modifies a file in the active theme, the server uses the same algorithm to find all files that define the active theme in this organization and makes a copy of them in every child organization. For nested levels of organizations, the algorithm repeats on each level after updating the copy of the inherited theme. In this way, any changes are propagated down to every organization.

Propagating changes to the inherited themes is computationally intensive and can take several moments after making a change to a theme. However, determining inheritance when changes are made is an effective trade-off so that CSS files for rendering client request are resolved nearly instantly.

5.2.3 CSS Priority Scheme and Custom Overrides

Once the inheritance mechanism determines which files to load, the standard CSS priority scheme determines which rules are visible, based on the order in which files are loaded.

This leads to two general ways of developing custom themes:

- The quickest way is to copy individual CSS rules from the default theme files, modify the rules to change the UI, and save them in the overrides_custom.css file. Because overrides_custom.css is always the last CSS file to be loaded, its rules override the same rules in other files. This allows you to easily change any number of rules, and manage them all in a single file.

  For example, if you want to increase the size of text on all the buttons in the default theme, you can do this with a few rules in the overrides_custom.css file. You may need to adjust the spacing for certain buttons, but the idea is you only need to change a limited number of rules.
- If you modify the user interface extensively, you can use the existing structure of CSS files in the default theme. In this case, copy the relevant files from the default theme, make your modifications, and save the files in your new theme. The inheritance mechanism uses the new files when you activate the theme.

  An example of these extensive changes would be if you want to increase the size of the buttons themselves in the default theme. You would need to rewrite the majority of the rules in the buttons.css file and create images for the new buttons. In this case, it is much easier to copy the buttons.css file than to copy dozens of rules into the overrides_custom.css file. You could still use the overrides_custom.css file to adjust the spacing of elements around the buttons, because there would be fewer of those rules to modify.

Jaspersoft recommends using the custom overrides method for most custom themes. A custom theme that changes simple appearances such as colors, fonts, and spacing has relatively few rules and is easily manageable in a single file. And many changes can be made by copying and modifying image files in the custom theme, without writing any CSS rules. Only if you change the fundamental layout or appearance of the user interface, should you consider copying and modifying the other CSS file.

Copying and modifying CSS files is more prone to error, and is slightly less flexible due to the file-based inheritance mechanism. Your copy of the file must contain all of the CSS rules as the original. If any rules are accidentally deleted or modified, even by a single character, the theme may not work properly. Also, the unmodified rules in the copy of your file now override any updates made to the same file in a parent organization.

For example, if you can copy a file that defines gray buttons with plain text, and you change the CSS rule to make the text bold, to create a theme with bold, gray buttons. However, if the theme on the parent organization or system theme is modified so that buttons are blue, your file overrides the new inherited color, and you still have bold, gray buttons. If you had defined the bold text as a single rule in the overrides_custom.css file, your theme would show bold, blue buttons now.

5.3 Administering Themes

Themes are sets of CSS and image files stored in a folder in the repository. The root of the repository and every organization has a Themes folder where active and inherited themes are stored. In the repository browser, the

Themes folder and individual theme folders have special actions for administrators to manage them. You can also use the repository search to find CSS and image files.

The folders and actions for managing themes are visible only to administrators. The Themes folder has execute-only permission for ROLE_USER so that all users can load the theme files and see the user interface, but not access the folders and files in the repository.

This section gives the basic procedures for administering existing themes, and for creating and modifying new theme folders. For information about how to work with CSS in themes, see **5.4, "Working With CSS Files," on page 123**.

5.3.1 Setting the System Theme

1. Log into JasperReports Server as system administrator (`superuser` in the professional edition; `jasperadmin` in other editions).
2. Click **View > Repository** and expand the Themes folder if necessary.
3. Right-click the new theme folder and select **Set as Active Theme**.

   For example, the sample data includes a two themes called jasper_dark and pods_summer that you can set as active.

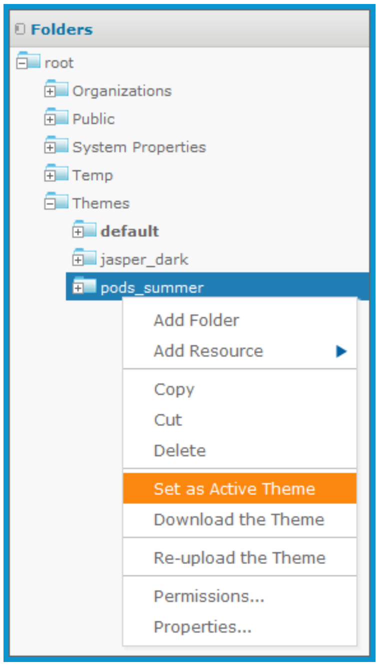
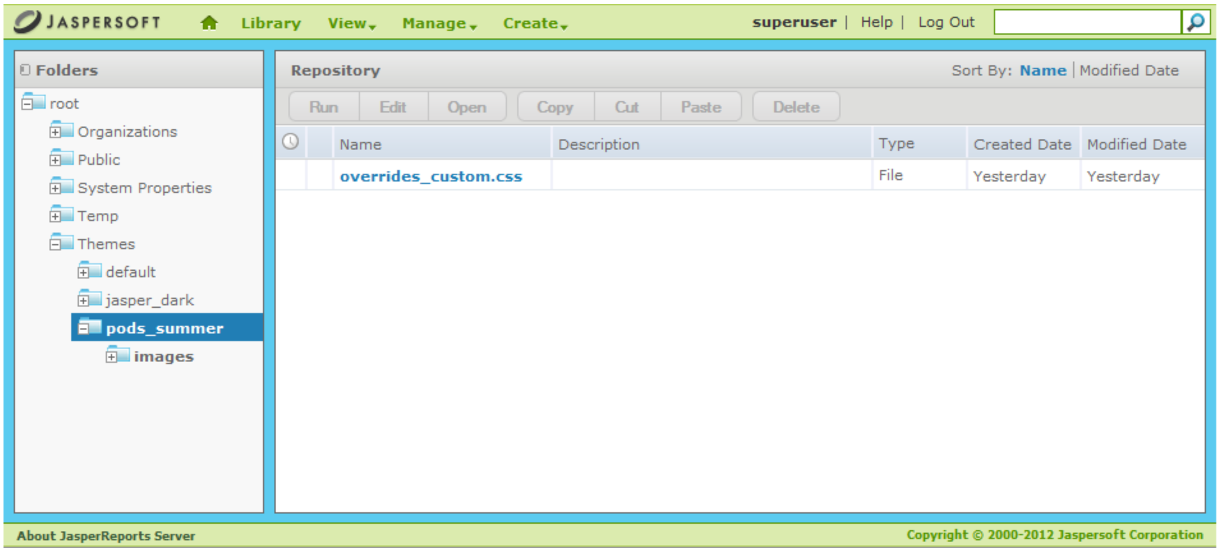


Figure 5-2 Setting a System Theme

As soon as the screen is refreshed, you see the effect of the new theme. Notice how the pods_summer theme changes the colors and the logo in the user interface with just the overrides_custom.css file and images.



Name	Description	Type	Created Date	Modified Date
overrides_custom.css		File	Yesterday	Yesterday

Figure 5-3 The Sample Theme pods_summer

Because the system theme is set at the root level, the new theme appears to all users in all organizations, unless the organization has its own theme. Also, the system theme set here applies to the login page, as shown in the following figure.

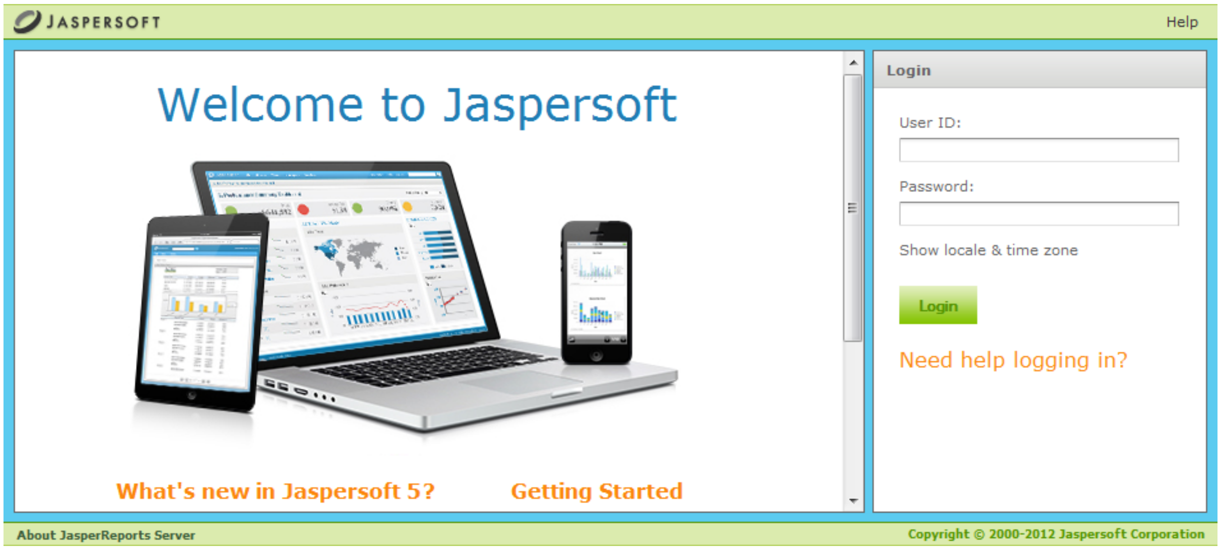


Figure 5-4 The Login Page as Seen With the New System Theme

The following procedures assume that the system theme is still set to the default theme.

5.3.2 Setting an Organization Theme

Professional edition users can give different themes to their organizations.

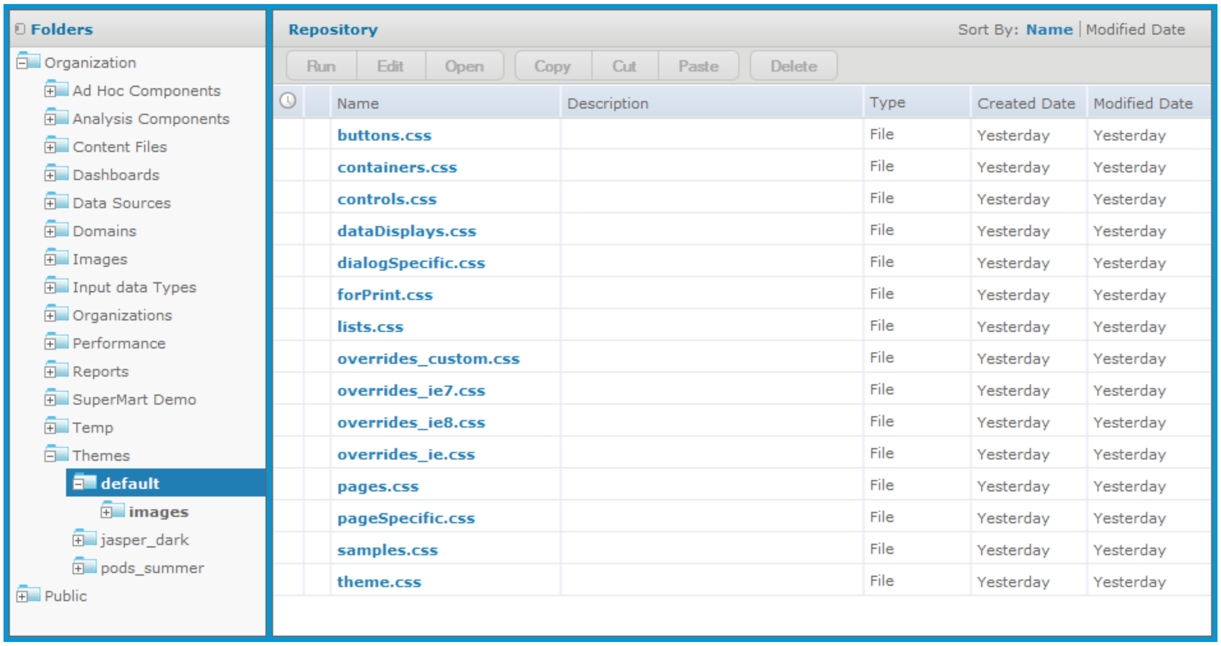
1. Log into JasperReports Server as the organization admin (jasperadmin).

In a server licensed to use multiple organizations, specify the organization ID or alias on the login page.

2. Click **View > Repository** and expand the Themes folder if necessary. The organization's Theme folder is shown in **Figure 5-5**.
3. Right-click the new theme folder name and select **Set as Active Theme**.

   As soon as the screen is refreshed, you see the effect of the new theme. The new theme applies to all organization users and is inherited by all suborganizations, if any.

Organization admins can thus customize the user interface by creating and activating new themes within their organization.



Name	Description	Type	Created Date	Modified Date
buttons.css		File	Yesterday	Yesterday
containers.css		File	Yesterday	Yesterday
controls.css		File	Yesterday	Yesterday
dataDisplays.css		File	Yesterday	Yesterday
dialogSpecific.css		File	Yesterday	Yesterday
forPrint.css		File	Yesterday	Yesterday
lists.css		File	Yesterday	Yesterday
overrides_custom.css		File	Yesterday	Yesterday
overrides_ie7.css		File	Yesterday	Yesterday
overrides_ie8.css		File	Yesterday	Yesterday
overrides_ie.css		File	Yesterday	Yesterday
pages.css		File	Yesterday	Yesterday
pageSpecific.css		File	Yesterday	Yesterday
samples.css		File	Yesterday	Yesterday
theme.css		File	Yesterday	Yesterday

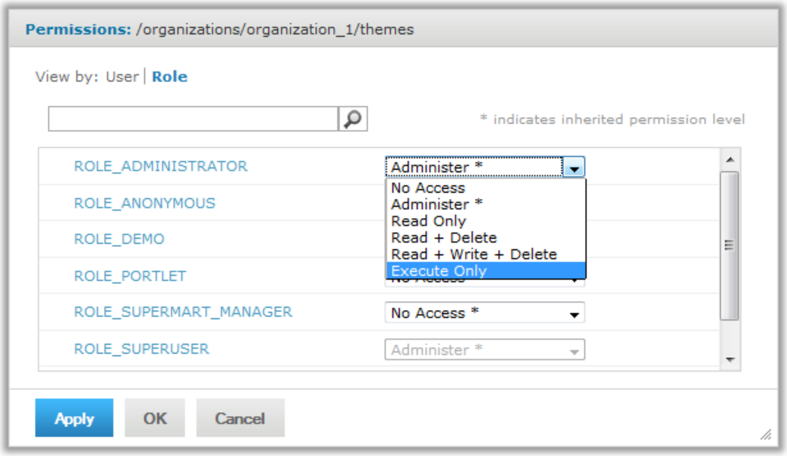
Figure 5-5 Organization Themes Seen by Organization Admin

5.3.3 Restricting Access to Themes

System admins may want to restrict access to themes, so that all themes are controlled from the system level.

This procedure only applies to system admins. Organization admins cannot modify the `ROLE_ADMINSTRATOR` permission, even in suborganizations. They must request that the system admin perform the procedure for them.

1. Log into JasperReports Server as system administrator (`superuser` or `jasperadmin`).
2. Click **View > Repository**. Community edition users can skip to step 5.
3. Expand the Organizations folder.
4. Locate the name of the organization where you want to restrict access to themes and expand its folder.
5. Right-click the Themes folder name and select **Permissions**.
6. Change the permission for the ROLE_ADMINISTRATOR from Administer to Execute Only.



Permissions: /organizations/organization_1/themes

View by: User | **Role**

* indicates inherited permission level

ROLE_ADMINISTRATOR	Administer *
ROLE_ANONYMOUS	
ROLE_DEMO	
ROLE_PORTLET	
ROLE_SUPERMART_MANAGER	No Access *
ROLE_SUPERUSER	Administer *

Figure 5-6 Restricting jasperadmin Access to Organization Themes

By setting Execute Only access, the organization admins cannot see the Themes folder in the repository, and thus cannot change themes or create a new theme.

You shouldn't change any other permissions on themes, even if the permissions dialog allows it. You could inadvertently make the user interface inaccessible.

7. To restrict access to all organizations, repeat **step 4** to **step 6** for every organization in the server, including suborganizations.
8. If you want to restrict access in the same way in all future organizations, repeat **step 5** and **step 6** in the Folder Template of every organization and suborganization in the server. Fore more information, see **5.3.4.3, "Placing Themes in the Folder Template," on page 122**.

5.3.4 Creating Theme Folders and Files

There are three ways to create the folders and files that make up a theme:

- Create them directly as resources in the repository.
- Download and upload themes as ZIP (archive) files.
- In multi-organization deployments, placing theme folders in the Folder Template.

This section explains only how to store CSS files in the repository. For information about creating CSS file contents, see **5.4, "Working With CSS Files," on page 123**.

5.3.4.1 Creating Theme Folders and File Resources

A theme is simply a folder in the repository that contains CSS and image files, with optional sub-folders. Administrators can use the repository menus to create theme folders. System admins can create theme folders and files at the system level or in any organization. Organization admins can create theme folders and files in their organization or any suborganization.

To create theme folders and file resources:

1. Log in as an administrator with access to the location where you want to place the theme.

2. Click **View > Repository** and expand the folder tree to view the Themes folder where you want to place the theme.
3. Right-click the Themes folder and select **Add Folder**. Give your folder a name and optional description as you would when creating any folder. The folder name is used as the name of the theme.

Theme folders and files can be created, copied or moved anywhere in the repository, but they can only be made active, uploaded, or downloaded when properly placed in a Themes folder.

4. Right-click your new folder and select **Add Resource > File > CSS**, and use the dialog to upload an individual CSS file. In order to be used as part of a theme, it must be one of the file names listed in section **"Theme Files" on page 114**.
5. To add images to your theme, create any image folders and upload image files with **Add Resource > File > Image**.
6. Repeat **step 4** and **step 5** to create all the files and images you need. If several themes use the same files or images, you can copy-paste the file resources or entire image folders from one theme to another.
7. If you need to change the contents of a CSS or image file, you can right-click it and select **Edit** to specify another file to upload and replace the current file.

If you upload CSS and image files into the active theme, the changes are visible after reloading the page in your browser.

Interacting with theme folders and files through the repository is a convenient and flexible way to create a theme. However, this method suffers from the limitation that, like other repository resources, you cannot download the files or images to edit them. For this purpose, the repository provides special download and upload actions on theme folders.

5.3.4.2 Downloading and Uploading Theme ZIP Files

The process of creating a theme often starts with the files of an existing theme that you modify with CSS and image editors on your computer. To support this workflow, every Themes folder has special commands for downloading and uploading themes.

Because a theme is composed of any number of files and folders, JasperReports Server uses the ZIP archive format to store a theme in a single file.

To download a theme ZIP file:

1. Log in as an administrator with access to the theme you want to download.
2. Click **View > Repository** and expand the Themes folder if necessary.
3. Right-click the theme folder you want to download and select **Download the Theme**. This menu selection appears only on theme folders inside the Themes folder.
4. The server prompts you to save the file named <theme-name>.zip. Save it anywhere on your computer.
5. Use an archiving or compression utility to extract the files from the ZIP file and save them on your computer.

Once you have the theme files extracted on your computer, you can view the individual CSS and image files that make up the theme. For example, to create your own theme, start by downloading the default theme from the root/Themes folder (as superuser). Save the extracted file on your computer and create your custom theme in another folder by copying and editing the CSS files and images of the default theme. See **"CSS Priority Scheme and Custom Overrides" on page 116** for an explanation of how to create a theme.

When you have created all the files you need in your theme, upload it with the following procedure.

To upload a ZIP file as a theme:

1. Place the CSS files, optional folders, and images files that constitute your theme in a folder on your computer.
2. Use an archiving or compression utility to create a standard ZIP file of the contents of your theme folder.

The ZIP file should include only the contents of your theme, not the theme folder itself.

1. Log in as an administrator with access to the location where you want to upload the theme.
2. Click **View > Repository** and expand the Themes folder if necessary.
3. Right-click the Themes folder and select **Upload a Theme**.

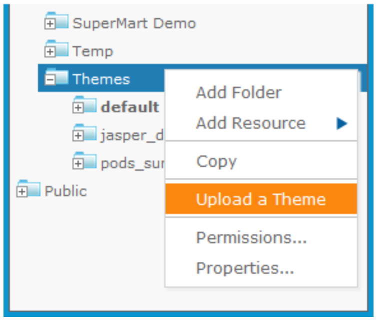


Figure 5-7 Uploading a Theme in an Organization

4. In the dialog that appears, enter a name for your theme, which becomes the name of its folder, and browse to find the ZIP file on your computer. Click **Upload**.

   You cannot use the ZIP upload dialog to overwrite an existing theme. You must specify a theme name that doesn't already exist in the chosen Themes folder.

   The server uploads your ZIP file and extracts it contents. Then it creates a folder for the new theme and creates file resources in the folder for each of the CSS and images in your ZIP file. If you had sub-folders in your theme, they are created as well. After uploading your theme ZIP file, you can make it active to see effect of your theme on the user interface.

Creating a theme is an interactive process where you often need to make changes until you have the look and feel you want. To support this process, uploading ZIP files can be combined with the uploading of individual file resources that is described in **5.3.4.1, "Creating Theme Folders and File Resources," on page 120**. In fact, after an initial upload, it is much easier to update individual files in this way than to create the ZIP file and upload it again.

5.3.4.3 Placing Themes in the Folder Template

In deployments licensed to use multiple organizations, you can place a theme in the Folder Template that is used to create new organizations. The theme folder and all of its contents are copied to the Themes folder of any new organizations that are created. Upon creation, new organizations always inherit their theme from the parent organization, but having a custom theme already present can save you time when customizing and activating it for the new organization.

The Folder Template in every organization contains a Themes folder and an empty default folder. Do not modify the empty default folder, but create a new theme folder instead and place your files there. Because the Folder Template does not contain an active theme, there is no Upload Theme menu option on its Themes folder. Instead create the folder for your theme and upload files as resources, or copy an entire theme folder from the parent organization's Themes folder.

If you want to restrict access to the themes in created organizations, you can also set the permissions on the Themes folder in the Folder Template. To do this, follow the procedure in **5.3.3, "Restricting Access to Themes," on page 119**.

5.4 Working With CSS Files

This section is not a CSS tutorial but rather a collection of tips and tricks for working with the CSS that makes up the themes in JasperReports server. This section focuses on how to test the themes you develop and match the CSS to its behavior in the JasperReports Server UI. Additionally, there are many different editors for CSS and tools for testing it, so the recommendations in this section are just one way of developing a theme.

5.4.1 Theme Development Workflow

The major choice to make when developing a theme is whether to use simple theme overrides or to duplicate and modify theme files, as described in section **"CSS Priority Scheme and Custom Overrides" on page 116**. Usually, the extent of your modifications determines which method to use.

Once you have made that determination, you are ready to create your theme. The principal steps in a theme development workflow are as follows:

Step	Reference
1. Download the default theme so you have a copy of the files and CSS rules that you want to modify.	**"Downloading and Uploading Theme ZIP Files" on page 121**
2. Create your new CSS rules, CSS files, and image files.	**"Firebug Plug-in for Firefox" on page 124**, a tool to help you create CSS rules
3. Upload your new files to a test platform, and activate the theme or place them in an active theme.	**"Creating Theme Folders and File Resources" on page 120**
4. Verify your changes wherever they occur in the UI.	**"Test Platform" on page 124** and **"User Interface Samples" on page 125**
5. Repeat **step 2** through **step 4** for all your changes until the theme is finalized.	
6. Deploy your theme to your users.	**"Setting the System Theme" on page 117** or **"Setting an Organization Theme" on page 118**.

5.4.2 Firebug Plug-in for Firefox

One tool to help you find, modify, and view CSS rules in **step 2** above is the Firebug plug-in for the Mozilla Firefox browser. Firebug displays the HTML, JavaScript, and CSS rules of web pages as you browse. It has a dynamic interface that lets you select an element on the web page, and it displays the specific CSS rules that apply to the element. It also allows you to modify those rules and immediately see the effect on the web page.

The Firebug tool is ideal for modifying themes in JasperReports Server. Once you locate the pages and elements that you want to modify, you can prototype your changes directly within the tool. For example, you can see overall effect of changing a color or modifying the spacing.

If you are implementing your theme through custom overrides, you can copy the CSS rules from the Firebug frame directly into the overrides_custom.css file. Firebug displays the entire rule from its original file, so the copy overrides it exactly. If you are modifying other files from the default theme, Firebug show you the filename and line number of the rule, so that you can easily find it in your copy of the file.

And when you are testing a theme that uses overrides, Firebug displays both the active CSS rule from overrides_custom.css and the original rule in the regular theme file of the inherited theme. The original rule is displayed in strike-through, so you can easily tell which rule is active and which rule it overrides.

For more information and downloads, see the Firebug website.

5.4.3 Test Platform

When you upload a theme and make it active, it is immediately visible to every user in the organization (if using the community edition, every user on the server), or in the case of a system theme, to every user on the server. Even editing or uploading a file into an active theme is reflected immediately in the user interface. Because developing a theme requires many iterations of uploading, activating, and testing CSS rules, you shouldn’t develop themes on a production server.

In the simplest case, you can develop and test your themes before putting your JasperReports Server into production. As you test your server during the deployment, you can develop your themes without impacting real users.

For multi-organization deployments that are in production, you can test on your production server as long as you create a test organization. The test organization inherits from the system theme, creating a very realistic test environment where you can see how your theme overrides the inherited theme. Make sure your test organization reflects your real organizations, for example having OLAP views if your real organizations perform OLAP analysis. This can help you test your theme with the elements of the user interface that your organization users see the most.

For single-organization deployments that don’t have a license to create organizations, you can test your themes on a second installation of the server. For example, you could download the evaluation copy of JasperReports Server and install it on the same computer where you develop the theme. This lets you see how your theme appears either as a system theme or in the default organization. As in the case of the test organization, test your theme with all the server features, for example the Ad Hoc Editor, Dashboard Designer, input controls on reports, scheduling, and the like.

When your theme is well-tested and nearly complete, you should test it on the production server. Upload your theme to the Themes folder where you intend to deploy it, but do not activate it. Log in as a test user and add the following parameter to any URL, for example the home page URL:

```
&theme=<theme-name>
```

This activates your theme for the test user on all pages that you access until the user session times out. This allows you to navigate the entire application and see the effect of your theme in the production environment, without affecting other users.

To set the theme back to the default append the &theme parameter to the URL with the string default (`&theme=default`). This is especially useful if a problem with the current theme has inadvertently disabled any functionality.

On all of these test platforms, you should look at the user interface generated by your theme with the same browsers and browser versions that your users have. If you see errors, you can also use Firebug to look at the CSS rules that are involved, even if the errors do not show up on Firefox.

5.4.4 Modifying the Appearance of Jaspersoft OLAP

Jaspersoft OLAP relies on a module called jPivot to display data when performing OLAP analysis. The jPivot module does not use all of the features of the new UI framework, but it supports some customizations through themes. For example, it does not use panels that can be hidden, and images for icons are not stored in a theme. However, some display characteristics of the analysis table are controlled by the theme, through the use of the `analysisView` ID in the theme file dataDisplays.css.

For example, you can change the lines between cells in the analysis table with the following rule in your overrides_custom.css file:

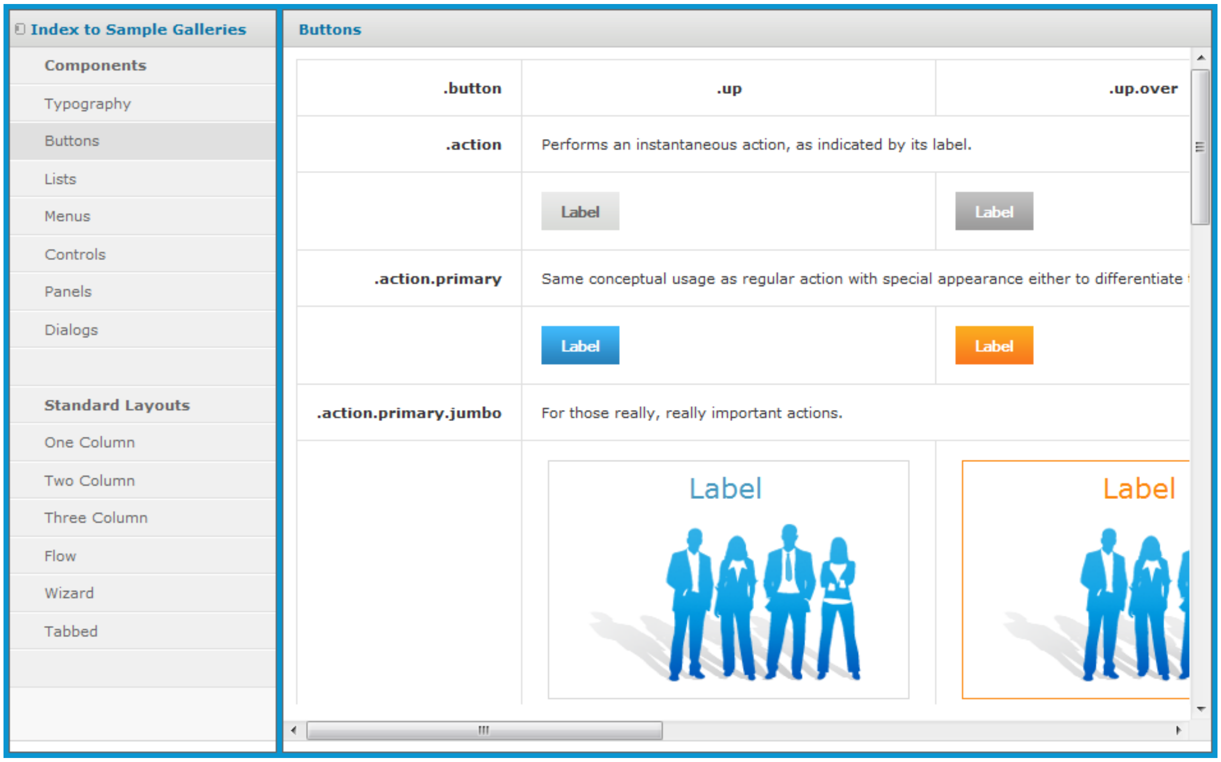
```
#analysisView td { border: thin solid black; }
```

5.4.5 User Interface Samples

When testing your theme, you should look at its effect across all pages and dialogs of JasperReports Server. Your test organization and test users should access all the features of the server to view the user interface under all conditions. An additional test is to look at the user interface samples with the theme you are developing.

The user interface sample page is a new page included with the redesign of the interface. It is only accessible to administrators:

1. Log in as administrator in your test environment at the level where you want to test your theme (`superuser` or `jasperadmin` of an organization or suborganization).
2. If you haven't already done so, upload your theme to the Themes folder at this level. See **"Creating Theme Folders and Files" on page 120**.
3. Select **View > UI Samples** from the main menu on any page.
4. Look at all the sample components in each of the sample galleries. For example, the buttons gallery shows all the different types of buttons in every possible action state.



.button	.up	.up.over
.action	Performs an instantaneous action, as indicated by its label.	
	Label	Label
.action.primary	Same conceptual usage as regular action with special appearance either to differentiate	
	Label	Label
.action.primary.jumbo	For those really, really important actions.	
	Label	Label

Figure 5-8 All Possible Button Components in the Sample Galleries

5. When you click on the standard layouts, the sample replaces the samples page. Select **View > UI Samples** from the main menu again to return to the galleries.

The samples page relies on an extra CSS file that is not required in a theme, but that can be included. The file samples.css is located in the default theme in the system-level Themes folder. If the sample elements do not appear as you expect, add this file to your theme and customize its rules as necessary. The rules in this file are not used anywhere else in the user interface, so it should not be included in your final theme.

Viewing the sample galleries can help you quickly find errors in your theme, especially if you are changing many rules and replacing entire files in your theme. Using these samples along with the testing procedures and tools described previously, you can verify that your theme properly implements the custom user interface that you intend. Having a well-tested theme minimizes the chances of errors when you activate the theme in your production server.

CHAPTER 6 IMPORT AND EXPORT

The import and export tools enable you to extract resources from, or add resources to, a JasperReports Server repository. The utilities also handle scheduled jobs, users, and roles that the server stores internally. Import and export can be helpful when migrating between versions of JasperReports Server or when moving between test and production environments.

JasperReports Server provides both a user interface and command-line utilities to perform import and export. The functionality in the user interface (UI) is available only to system admins (`superuser` by default) and the command-line utilities require access to the file system where the server is installed.

This chapter contains the following sections:

- **Import and Export Catalogs**
- **Setting the Import-Export Encryption Key**
- **Importing Unencrypted Catalogs**
- **Import and Export through the Web UI**
- **Import and Export through the Command Line**
- **Configuring Import-Export Utilities**
- **Alternate Import-Export Scripts**

6.1 Import and Export Catalogs

The output of the export command and the input to the import command is called a catalog. It is a set of folders and files that represent the contents of the server's internal database, including organizations, users, roles, scheduled jobs, and repository resources such as reports and associated files. When you don't need the entire database, you can specify options to export only the contents you need, for example one role and its users.

The resources in the repository often have dependencies on other resources, for example a report that relies on images, input data types, and a data source. Exporting one resource includes all of its dependencies, even if they are stored in folders that were not specified in the export command. Importing a catalog that contains such dependencies will re-create the same folder structure in the target repository. Once imported, you can move and redefine the dependencies of these resources.

The catalog can be exported either as a hierarchy of folders and files, or as a single zip file (compressed archive) containing the same information. Regardless of the catalog format, the contents of the catalog are not intended for external access. Objects in the database, such as users, roles, and folders, are described in XML files, and repository resources are stored in various private formats consisting of data files and subfolders. The XML syntax of the catalog files is not publicly defined, and the data files aren't meant to be accessed.

To access and interact with the server's internal objects, use the REST v2 API. This web service has well defined data types and resource descriptors in XML or JSON formats and a complete set of methods for reading and writing objects on the server. For more information, see the *JasperReports Server Web Services Guide*.

As of JasperReports Server 5.5, user passwords and data source passwords are encrypted in exported catalogs as well as in the server’s internal database. You should still take appropriate measures to secure the catalog file from unauthorized access. Catalog files contain sensitive metadata such as user names, database URLs, and internal or external organizations. Catalog files may also contain data in the form of report output such as the PDF of an executive report.

6.2 Setting the Import-Export Encryption Key

As of JasperReports Server 5.5, all sensitive passwords in exported catalogs are encrypted for security. In order for two servers to share the encrypted contents of an exported catalog, they must share a private key. The default key is an AES 128-bit string stored in a configuration file.

This encryption is separate from the server's own internal encryption. All user passwords are stored encrypted in the internal database, as described in **“Encrypting User Passwords” on page 155**. The import-export encryption applies only to export catalogs.

Setting the Import-Export Encryption Key		
Configuration File		
.../WEB-INF/applicationContext-security.xml		
Property	**Bean**	**Description**
`<property name="keyBytes"> <value>0x2b 0x6c 0x34 0x22 0x44 0x42 0x6f 0xb5 0x7f 0x34 0xd3 0x5a 0x1f 0x92 0xcd 0xdc</value> </property>`	`importExportCipher`	Set the value of the keyBytes property to the same hexadecimal value (16 bytes = 128 bits) on all servers that will exchange export catalogs.

However, be aware that when you change a private key on a server, all previous exports become unusable. Therefore, you must configure your new server soon after installing it, and you should configure it with the key from an existing server, if you have one. This way all your servers and all your export catalogs will use the same key and be mutually compatible.

6.3 Importing Unencrypted Catalogs

Versions prior to 5.5 did not encrypt the user passwords upon export. These passwords appear in plain text within the files of the export catalog. For backwards compatibility, unencrypted catalogs are still supported and can be imported into a 5.5 server, even when an encryption key is configured.

Passwords that are encrypted by an export operation in JasperReports Server 5.5 or later have encryption markers, so older passwords without the markers can be detected and imported as plain text. Once plain-text passwords are imported, they are stored internally with encryption, and will be encrypted in any future export.

6.4 Import and Export through the Web UI

JasperReports Server provide functionality to import and export resources and users through the user interface:

- **Exporting From the Repository UI**
- **Exporting From the Settings UI**
- **Importing From the Settings UI**

When importing and exporting through the web interface, remember the following:

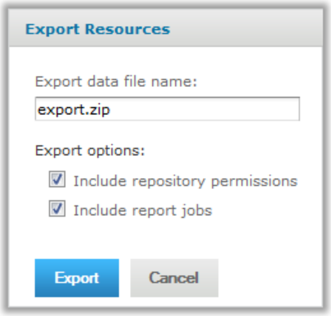
- If you are importing to a different server, you must configure an encryption key on both servers, as described in **Setting the Import-Export Encryption Key**. Then you must enter the keystore password when prompted by the import operation.
- Make sure the output location specified for an export is writable to the local user running the app server containing JasperReports Server.

6.4.1 Exporting From the Repository UI

To export individual resources or an entire folder of the repository:

1. Log in as system administrator (`superuser` by default).
2. Select **View > Repository**. You can also export reports, Ad Hoc views, dashboards, and OLAP views from the **Library** page.
3. Locate the resource you want to export. Select one or more resources (using Control- and Shift-click) in the main panel, or when viewing the repository, select a folder in the left-hand panel.
4. Right-click the selected folder or the selected resources and select **Export** from the context menu.

   The Export Resources dialog appears:



Export data file name:
export.zip

Export options:
☑ Include repository permissions
☑ Include report jobs

Figure 6-1 Export Resources Dialog in the Repository

5. Specify the name of the zip file for the exported catalog. In order to download the catalog, the dialog supports only the zip archive format.
6. Specify the following options if desired:

- Clear the **Include repository permissions** box to export resources and folders without permissions. Upon import, the folders and resources will inherit the permissions of the destination repository. By default, this box is checked.
- Check **Include report jobs** if you want to include scheduled report jobs with any reports included in the selection.

7. Click Export. The server generates the catalog zip file and your browser prompts you to save the file. Depending on the size of your repository and the options you've selected, it may take several minutes to generate the catalog file.

Resources are exported along with any dependencies, even if they are not located in the selected folders. For more information, see **"Import and Export Catalogs" on page 127**.

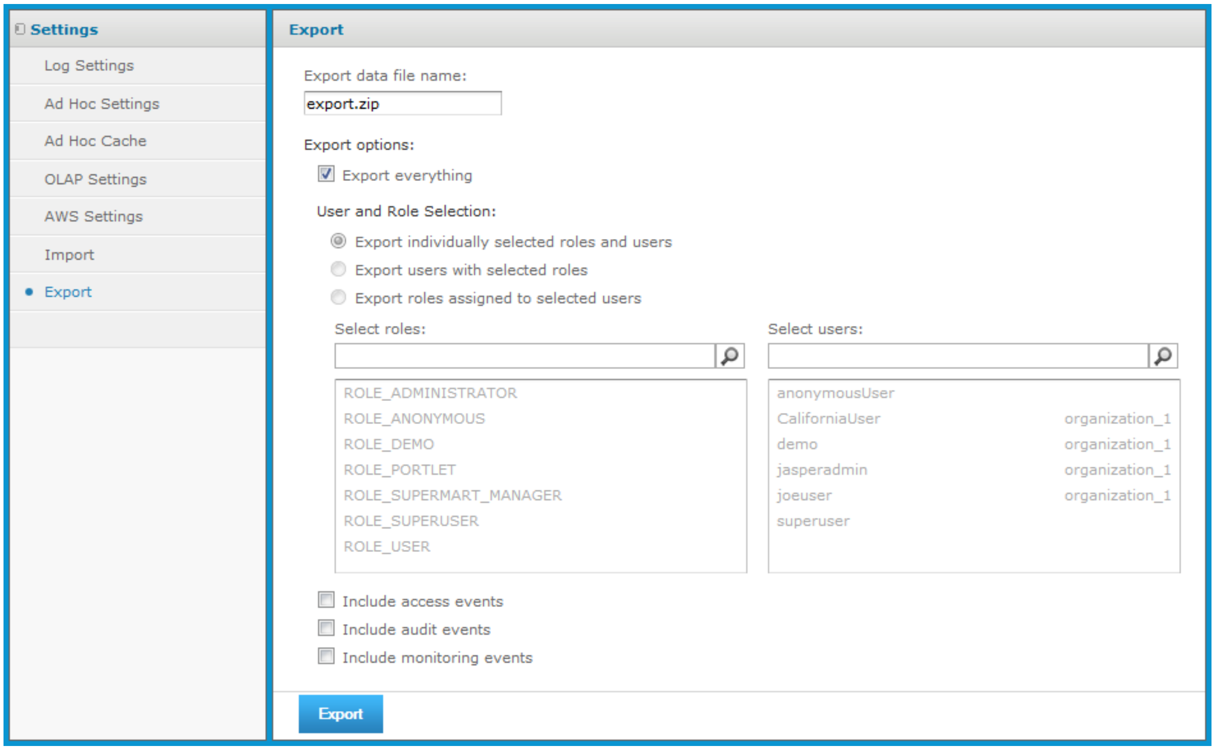
6.4.2 Exporting From the Settings UI

To export users and roles in addition to, or instead of, repository contents, use the server settings pages for system administrators. This page offers more options than the contextual export from the repository UI.

As of JasperReports Server 5.5, all exports contain encrypted passwords and if you are importing to a different server, you must configure an encryption key on both servers. See **"Setting the Import-Export Encryption Key" on page 128** for details.

To export data through the web UI:

1. Log in as system administrator (`superuser` by default).
2. Select **Manage > Server Settings** and choose **Export** in the left-hand panel.



Export

Export data file name: export.zip

Export options:

☑ Export everything

User and Role Selection:

● Export individually selected roles and users
○ Export users with selected roles
○ Export roles assigned to selected users

Select roles:

ROLE_ADMINISTRATOR
ROLE_ANONYMOUS
ROLE_DEMO
ROLE_PORTLET
ROLE_SUPERMART_MANAGER
ROLE_SUPERUSER
ROLE_USER

Select users:

anonymousUser	
CaliforniaUser	organization_1
demo	organization_1
jasperadmin	organization_1
joeuser	organization_1
superuser	

☐ Include access events
☐ Include audit events
☐ Include monitoring events

Figure 6-2 User Interface for Export

3. Specify the name of the zip file for the exported catalog.

   The web UI supports only the zip archive format.
4. Use the check boxes and multi-select lists to choose the contents of your exported catalog file:
   a. Check **Export Everything** to export the entire repository, including permissions and report jobs, as well as all organizations, users, and roles. Check the box for **Include access events** if you want to include resource modification times.
   b. Clear the box for **Export Everything** and select only users and roles to export.

   If you cleared the box for **Export Everything**, you must specify users and roles to export.

   The User and Role Selection radio buttons control the way you select the users and roles to export. You can directly select users and roles to export, or you can select them indirectly. For example, if you click the **Export users with selected roles** radio button, you can select users to export; the server also exports the roles assigned to the users you selected.
5. To select specific users and roles:
   a. Select **Export individually selected roles and users**.

      The **Select users** and **Select roles** lists become active.
   b. Select the users and roles to export.
6. To select roles:
   a. Select **Export users with selected roles**.
   b. Select the roles to export. The server will also export the users that are assigned those roles.

      The users assigned the roles you selected are highlighted.
7. To select users:
   a. Select **Export roles assigned to selected users**.
   b. Select the users to export. Their roles will also be exported.

      The roles assigned the users you selected are highlighted.
8. In commercial editions of JasperReports Server, you can check **Include audit events** and **Include monitoring events** as needed.
9. Click **Export**. The server generates the catalog zip file and your browser prompts you to save the file. Depending on the size of your repository and the options you've selected, it may take several minutes to generate the catalog file.

6.4.3 Importing From the Settings UI

The Settings pages for system administrators include a user interface to simplify the import procedure.

This import operates on a running instance of the server, and all imported resources are visible immediately. In addition, any configuration or security settings in the imported catalog take effect immediately, without requiring you to restart the server.

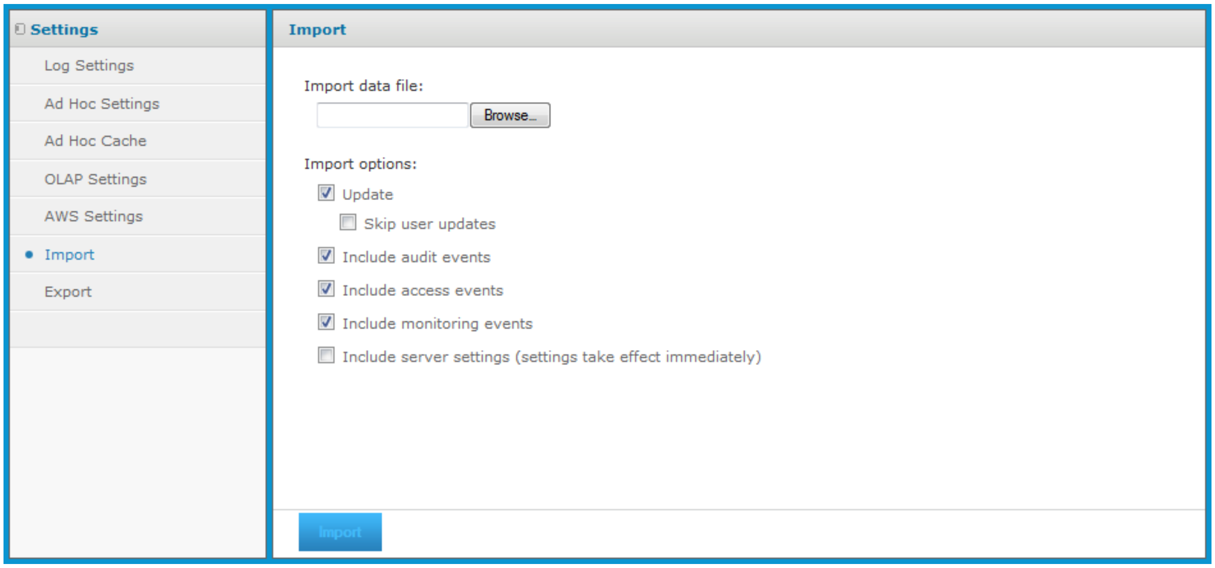
As of JasperReports Server 5.5, all exports contain encrypted passwords and if you are importing to a different server, you must configure an encryption key on both servers. See **Setting the Import-Export Encryption Key** for details.

You cannot use the import UI to import a catalog from a JasperReports Server 5.2 or earlier if it was created with the "export everything" option. Theme files contained in export catalogs from previous versions of the server will overwrite newer themes, but they are not compatible and cause HTML display errors. To import a catalog from a previous version of the server, use the command line utility <js-install>/buildomatic/js-import.bat or .sh with the --skip-themes option.

If you have a custom theme to import, you can use the Theme UI to download it from the source server and upload it to the target server. If your theme contains the file pageSpecific.css, you must remove it from the ZIP file before uploading, and then redo your changes to the file based on pageSpecific.css in the target server from 5.5 or later. For more information, see **"Downloading and Uploading Theme ZIP Files" on page 121**.

To import data through the web UI:

1. Log in as system administrator (`superuser` by default).
2. Select **Manage > Server Settings** and choose **Import** in the left-hand panel.



Import data file:

Import options:

☑ Update

☐ Skip user updates

☑ Include audit events

☑ Include access events

☑ Include monitoring events

☐ Include server settings (settings take effect immediately)

Figure 6-3 User Interface for Import

3. Click **Browse** to choose the catalog zip file to import. The web UI supports only the zip archive format. You can import any catalog zip file created by the export UI or the command-line export utility.
4. Use the check boxes to change the behavior of the import operation:
   - When checked, the **Update** option will import only resources that are newer than ones with the same URI in the current repository. The **Skip user updates** option allows you to keep the current definition of any users that also exist in the imported catalog.
   - When checked, the **Include access events** option imports the modification times of resources from the catalog. When cleared, resources keep their existing access times if they already exist.
   - In commercial editions of JasperReports Library, the **Include audit events** and **Include monitoring events** determine whether access and monitoring events from the catalog, if any, are imported.
   - The **Include server settings** option determines whether the system configuration is updated from the catalog. There are two pre-requisites in order for the catalog to contain configuration settings:

- The originating server settings must be modified through the UI. Thus, only Log Settings, Ad Hoc Settings, AWS Settings, and OLAP Settings are affected. For more information, see **8.1, "Configuration Settings in the User Interface," on page 168**
- The catalog must be exported with the "everything" option from the user interface or the command-line utility.

When server settings are imported, they take effect immediately and they appear in the Settings UI.

5. Click **Import**.

   The server uploads the catalog zip file and imports its contents into the repository. Depending on the size of the catalog and the options you've selected, it may take several minutes to perform the import.

6.5 Import and Export through the Command Line

This section includes:

- **Command-Line Utilities**
- **Exporting From the Command Line**
- **Importing From the Command Line**

6.5.1 Command-Line Utilities

The import and export utilities are shell scripts located in the <js-install>/buildomatic folder:

Windows:	<js-install>\buildomatic\js-import.bat <js-install>\buildomatic\js-export.bat
Linux:	<js-install>/buildomatic/js-import.sh <js-install>/buildomatic/js-export.sh

The examples in this chapter use the shortened Windows commands without the optional .bat extension on the command line. If you are running JasperReports Server in Linux, be sure to add the .sh file extension.

If you installed JasperReports Server from the binary installer, the command-line utilities were configured by the installer. If you installed the WAR file distribution, you must follow the instructions in **"Configuring Import-Export Utilities" on page 137** before you can run the utilities.

When using the import and export utilities, keep in mind the following:

- JasperReports server should be stopped when using the import and export utilities. This is very important for the import utility to avoid issues with caches, configuration, and security.
- All command line options start with two dashes (--).
- You must specify either a directory or a zip file to export to or import from.
- If you are importing to a different server, you must configure an encryption key on both servers, as described in **Setting the Import-Export Encryption Key**. Then you must enter the keystore password when prompted by the import command.
- Make sure the output location specified for an export is writable to the user running the command.
- All URIs are repository paths originating at the root. The repository paths shown in this chapter assume you are using a commercial edition of the server. In the community edition, paths don't include organizations, for example:

Commercial editions:	/organizations/organization_1/reports/interactive/CustomersReport
Community project:	/reports/interactive/CustomersReport

6.5.2 Exporting From the Command Line

Usage: `js-export [OPTIONS]`

Jaspersoft recommends you stop your server instance before running the export utility. For instructions see the *JasperReports Server Installation Guide*.

Specifies repository resources such as reports, images, folders, and scheduled jobs to export to the file system. You can also export the internal definitions for scheduled jobs, users, roles, as well existing audit data. The export output is known as a repository catalog; it is either an archive file or a set of files in a folder structure:

Table 6-1 Options in `js-export` Command

Option	Explanation
--everything	Export everything except audit and monitoring data: all repository resources, permissions, report jobs, users, and roles. If any server settings have been modified in the UI, those are included as well. This option is equivalent to: --uris --repository-permissions --report-jobs --calendars --users --roles
--help	Displays brief information about the available options.
--include-access-events	Access events (date, time, and user name of last modification) are exported.
--output-dir	Path of a directory in which to create the output catalog folder.
--output-zip	Path and filename of the output catalog zip file to create.
--report-jobs	Comma separated list of repository report unit and folder URIs for which report unit jobs should be exported. For a folder URI, this option exports the scheduled jobs of all reports in the folder and recursively in all subfolders.
--calendars	When specified, the export will include any and all calendars of all types (holiday, recurring, ...) defined in the scheduler. When calendars are present in an export catalog, they are always processed and added upon import.
--repository-permissions	When this option is present, repository permissions are exported along with each exported folder and resource. This option should only be used in conjunction with --uris.
--roles	Comma separated list of roles to export; if no roles are specified with this option, all roles are exported.
--role-users	When this option is present, each role export triggers the export of all users belonging to the role. This option should only be used in conjunction with --roles.
--uris	Comma separated list of folder or resource URIs in the repository.

Option	Explanation
--users	Comma separated list of users to export; if no users are specified with this options, all users are exported. Exporting a user includes all user attributes and, in order to maintain consistency, also exports all roles assigned to the user. When specifying users, you must give their organization ID if applicable, for example: --users superuser, "jasperadmin|organization_1", ...
--include-audit-events	Include audit data for all resources and users in the export.
--include-monitoring-events	Include monitoring data for all resources and users in the export.

User passwords are encrypted during the export by default, but exported catalogs may contain sensitive data. Take appropriate measures to secure the catalog file from unauthorized access.

Examples:

- Export everything in the repository:

```
js-export --everything --output-dir myExport
```

- Export the /reports/interactive/CustomersReport report unit to a catalog folder:

```
js-export --uris /organizations/organization_1/reports/interactive/
CustomersReport --output-dir myExport
```

- Export the /images and /fonts folders:

```
js-export --uris /organizations/organization_1/images,/organizations/organization_
1/reports --output-dir myExport
```

- Export all resources (except users, roles, and job schedules) and their permissions to a zip catalog:

```
js-export --uris / --repository-permissions --output-zip myExport.zip
```

- Export all resources and report jobs:

```
js-export --uris / --report-jobs / --output-dir myExport
```

- Export the report jobs of the /reports/interactive/CustomersReport report unit:

```
js-export --report-jobs /organizations/organization_1/reports
/interactive/CustomersReport --output-dir myExport
```

- Export all roles and users:

```
js-export --roles --users --output-dir myExport
```

- Export the ROLE_USER and ROLE_ADMINISTRATOR roles along with all users belonging to either role:

```
js-export --roles ROLE_USER, ROLE_ADMINISTRATOR --role-users --output-dir myExport
```

The `--uris` option allows you to specify one or more resource URIs. A URI can specify a resource such as a report. In this case, all associated resources (such as images, subreports, data sources, resource bundles, and class files) are exported. A URI can also specify a folder. If a folder is specified, the export operation exports all resources and folders contained in the folder. In addition, it recurses through all its subfolders.

The folder named Temp at the root and in every organization is a special folder. None of the folders or resources in a Temp folder are exported.

6.5.3 Importing From the Command Line

See **"Command-Line Utilities" on page 133** for guidelines when running the command-line utilities.

When using the js-import command line utility, the server must be stopped to avoid issues with caches, configuration, and security. For instructions see the *JasperReports Server Installation Guide*.

Usage: `js-import [OPTIONS]`

Reads a repository catalog from the your file system and creates the named resource in the JasperReports Server repository. The repository catalog must have been created by the export interface or the `js-export` command, either as a ZIP archive file or a folder structure.

As of JasperReports Server 5.5, all exports contain encrypted passwords and if you are importing to a different server, you must configure an encryption key on both servers. See **Setting the Import-Export Encryption Key** for details.

Table 6-2 Options in `js-import` Command

Option	Explanation
--help	Displays brief information about the available options.
--input-dir	Path for importing a catalog from a directory.
--input-zip	Path and filename for importing a catalog from a zip file.
--update	Resources in the catalog replace those in the repository if their URIs and types match.
--skip-user-update	When used with --update, users in the catalog are not imported or updated. Use this option to import catalogs without overwriting currently defined users.
--include-access-events	Restores access events (date, time, and username of last modification) on imported resources.
--include-audit-events	Professional edition only. Imports any audit data that exists in the catalog.
--include-monitoring-events	Professional edition only. Imports any monitoring data that exists in the catalog.
--include-server-settings	Determines whether the system configuration is updated from the catalog. There are two pre-requisites in order for the catalog to contain configuration settings: • The originating server settings must be modified through the UI (Log Settings, Ad Hoc Settings, Ad Hoc Cache, and OLAP Settings). For more information, see **"Configuration Settings in the User Interface" on page 168**. • The catalog must be exported with the "everything" option from the user interface or the command-line utility. When server settings are imported, they take effect as soon as the server is started.

Option	Explanation
--skip-themes	This flag is required when importing a catalog that includes a theme, such as when using --export-everything, from a server version 5.2 or before to version 5.5 or later. If you have a custom theme to import, you can use the Theme UI to download it from the source server and upload it to the target server. If your theme contains the file pageSpecific.css, you must remove it from the ZIP file before uploading, and then redo your changes to the file based on pageSpecific.css in the target server from 5.5 or later. For more information, see **"Downloading and Uploading Theme ZIP Files" on page 121**.

Examples:

- Import the myExport.zip catalog archive file:

```
js-import --input-zip myExport.zip
```

- Import the myDir catalog folder, replacing existing resources if their URIs and types match those found in the catalog:

```
js-import --input-dir myDir --update
```

- Import the myExport.zip catalog archive file but ignore any users found in the catalog:

```
js-import --input-zip myExport.zip --update --skip-user-update
```

- Import the myDir catalog folder with access events:

```
js-import --input-dir myDir --include-access-events
```

The default behavior when a resource is found in the target repository that has the same URI as the resource that you are attempting to import is to skip the creation operation and leave the existing resource unchanged (no overwrite occurs). To delete the existing resource and replace it with a new one (of the same type and with the same URI), use the `--update` option. Note that, if the resource in the export catalog is of a different type than the existing resource, the server returns an error and skips the update operation.

When you import a user, if its roles exist in the repository, the user is given these roles. User properties are imported with the user.

When you import access events, the date and time of the last modification before export is restored on import for every resource. The catalog folder must have been created with access events. If you do not import access events, or if they don't exist in the imported files, the date and time of the import are used.

6.6 Configuring Import-Export Utilities

If you installed JasperReports Server from the binary installer, the import-export utilities were configured by the installer. If you installed the WAR file distribution, you must configure several files before you can use the import-export utilities.

Another option is to use the **"Alternate Import-Export Scripts" on page 138** because they do not require any configuration, regardless of the installation method.

1. Depending on the database you use, copy the installation configuration file:

   from: <js-install>/buildomatic/sample_conf/<database>_master.properties

   to: <js-install>/buildomatic/default_master.properties

2. Edit the default_master.properties file to set values specific to your installation. For more information about the settings in this file, see the *JasperReports Server Installation Guide*.

> Oracle users can set the sysUsername and sysPassword to the same name as dbUsername and dbPassword in the default_master.properties. The system user name and password are not required because js-import and js-export do not make changes to database schema.

3. Run the following command:

   ```
   js-ant clean-config gen-config
   ```

   This command will generate the following files with the values you added to the default_master.properties file:

   - <js-install>/buildomatic/build_conf/default/js.jdbc.properties
   - <js-install>/buildomatic/build_conf/default/js.quartz.properties (only for DB2 and PostgreSQL)

4. Make sure the JDBC driver for your database is located in the following folder:

   <js-install>buildomatic/conf_source/iePro/lib

   If necessary, you can find links for downloading JDBC drivers from the Jaspersoft Community website:

   http://community.jaspersoft.com/wiki/downloading-and-installing-database-drivers

6.7 Alternate Import-Export Scripts

Regardless of your installation method, JasperReports Server provides a third way to run import-export commands. Buildomatic is another command-line script that is based on the Apache Ant tool to automate installations. It includes targets (sub-commands) to perform import and export operations with the same options as the scripts. The following examples compare the two commands:

Shell Scripts:	`js-export.sh --everything --output-file=js-catalog-exp.zip`
Buildomatic:	`js-ant export-everything -DexportFile=js-catalog-exp.zip`

Both types of scripts are located in the `<js-install>/buildomatic` folder.

6.7.1 Running Import from Buildomatic

The `import` target for ant has the following syntax:

Windows:	`js-ant import -DimportFile=<filename> [-DimportArgs="<import-options>"]`
Linux and Mac OSX:	`./js-ant import -DimportFile=<filename> [-DimportArgs=\"<import-options>\"]`

The imported file is handled as a ZIP archive if its name ends in .zip, otherwise it is handled as a directory. The `importArgs` argument is optional and can contain more than one import option. On Linux, all double quotation marks (") must be escaped with a backslash (\).

> When performing a large import using js-ant, the server should be stopped (or put into a mode with reduced load) to avoid issues with caches, configuration, and security.

The following examples are typical import commands on Windows:

```
js-ant import-help-pro
js-ant import -DimportFile=my-reports.zip
js-ant import -DimportFile=my-datasources -DimportArgs="--update"
```

The following examples are typical import commands on Linux:

```
./js-ant import-help-pro
./js-ant import -DimportFile=my-reports.zip
./js-ant import -DimportFile=my-datasources.zip -DimportArgs=\"--update\"
```

6.7.2 Running Export from Buildomatic

The `export` target for ant has the following syntax:

Windows:	`js-ant export -DexportFile=<filename> -DexportArgs="<export-options>"`
Linux and Mac OSX:	`./js-ant export -DexportFile=<filename> -DexportArgs=\"<export-options>\"`

The export file format is a ZIP file or a set of files under a new directory name. If you specify the .zip extension for your output filename, a ZIP archive is created automatically. Otherwise, a directory with files and sub-directories is created as a uncompressed set of files.

The `exportArgs` argument requires double quotation marks (`"`) and can contain more than one export option, as shown in these Windows examples:

```
js-ant export-help-pro
js-ant export -DexportFile=my-domains.zip
    -DexportArgs="--uris /organizations/organization_1/Domains"
js-ant export -DexportFile=my-reports-and-users.zip
    -DexportArgs="--uris /organizations/organization_1/reports
    --users jasperadmin|organization_1,joeuser|organization_1"
js-ant export -DexportFile=my-datasources
    -DexportArgs="--uris /organizations/organization_1/datasources --roles ROLE_USER"
js-ant export -DexportFile=js-everything.zip -DexportArgs=js="--everything"
```

On Linux, all double quotation marks (`"`) and other characters, such as the vertical bar (`|`), which separates login user and organization names must be escaped with a backslash (\). In addition, when listing user names, enclose the list in single quotation marks (`'`), as shown in this Linux example:

```
./js-ant export-help-pro
./js-ant export -DexportFile=my-reports-and-users.zip
    -DexportArgs=\"--uris /organizations/organization_1/reports
    --users 'jasperadmin\|organization_1,joeuser\|organization_1'\"
```

CHAPTER 7 APPLICATION SECURITY

This chapter describes the configuration settings that protect JasperReports Server and its users from unauthorized access. The configuration properties appear in two locations:

- Some properties must be configured during the installation and deployment phase, before users access the server. These settings are configured through files used by the installation scripts. These settings are only available when performing a WAR file installation.
- Other properties are located in files in various folders after installation. Configuration files paths are relative to the <js-install> directory, which is the root of your JasperReports Server installation. To change the configuration, you edit these files and then restart the server.

Because the locations of files described in this chapter vary with your application server, the paths specified in this chapter are relative to the deployed WAR file for the application. For example, the applicationContext.xml file is shown as residing in the WEB-INF folder; if you use the Tomcat application server bundled with the installer, the default path to this location is:

```
C:\Program Files\jasperreports-server-5.6\apache-tomcat\webapps\jasperserver-pro\WEB-INF
```

Use caution when editing the properties described in this chapter. Inadvertent changes may cause unexpected errors throughout JasperReports Server that may be difficult to troubleshoot. Before changing any files, back them up to a location outside of your JasperReports Server installation.

Do not modify settings that are not described in the documentation. Even though some settings may appear straightforward, values other than the default may not work properly and cause errors.

This chapter includes:

- **Encrypting Passwords in Configuration Files**
- **Configuring User Password Options**
- **Configuring the User Session Timeout**
- **Configuring CSRF Prevention**
- **Configuring Input Validation**
- **Defining a Cross-Domain Policy for Flash**
- **Encrypting User Passwords**
- **Configuring Ad Hoc**

7.1 Configuring User Password Options

The user password options determine whether passwords can be remembered by the browser, whether users may change their own passwords, and whether password changes are mandatory or optional.

By default, passwords are stored in an encrypted format in the server's private database. For information about how to change the way passwords are encrypted, see **7.8, "Encrypting User Passwords," on page 155**

7.1.1 Configuring Password Memory

Most browsers have a feature to "remember passwords" that stores passwords for the user. JasperReports Server can send the property `autocomplete="off"` to indicate that its users' passwords should not be stored or filled in automatically. Users must then type in their full username and password every time they log in.

As a general security policy, sensitive passwords should not be stored in browsers. Most browsers do not protect the passwords with a master password by default, which makes them vulnerable. Setting autocomplete to off helps ensure that JasperReports Server users do not store their passwords, thus avoiding this possible security risk. Actual behavior depends on the user's browser settings and how the browser responds to the `autocomplete="off"` property.

Login encryption described in section **"Encrypting User Session Login" on page 158** is not compatible with password memory in the browser. Independently of the autocomplete setting, the JavaScript that implements the login encryption clears the password field before submitting the page. As a result, most browsers will not prompt to remember the password when login encryption is enabled, even if the user has password memory enabled in his browser.

When `autoCompleteLoginForm` is true, as in the default installation, you should ensure that all of your users have a master password in their browser.

Password Memory in the Browser		
Configuration File		
.../WEB-INF/jasperserver-servlet.xml		
Property	**Value**	**Description**
`autoCompleteLoginForm`	`true` <default> `false`	When false, the server sets autocomplete="off" on the login page and browsers will not fill in or prompt to save Jaspersoft passwords. When true, the autocomplete property is not sent at all, and browser behavior depends on user settings.

7.1.2 Enabling Password Expiration

If your security policies require your users to change their passwords at regular intervals, you can enable password expiration. In this case, JasperReports Server prompts users to change their passwords at the interval you specify. For example, if you set the password expiry to 90 days, the server prompts your users to change their passwords every three months. When a user's password expires, the user cannot log in until she changes her password. The default value is 0; in this case, passwords don't expire and users are never prompted.

When this option is enabled, the server automatically enables the **Change Password** option on the Login page, even if `allowUserPasswordChange` is set to false.

If your users are externally-authenticated, for example with LDAP, do not enable this option.

<table>
<tr><th colspan="3">Password Administration Option</th></tr>
<tr><th colspan="3">Configuration File</th></tr>
<tr><td colspan="3">.../WEB-INF/jasperserver-servlet.xml (controls the Login page)
.../WEB-INF/applicationContext-security-web.xml (controls web services)</td></tr>
<tr><th>Property</th><th>Value</th><th>Description</th></tr>
<tr><td><code>passwordExpirationInDays</code></td><td><code>0</code> &lt;default>
<any other value&gt;</td><td>Set the value to any positive, non-zero value to specify the number of days after which a password expires.</td></tr>
</table>

7.1.3 Allowing Users to Change their Passwords

To allow users to change their passwords, this setting option makes the **Change Password** link that appears on the Login page. By default, this option is false, and an administrator must define user passwords initially or reset a forgotten password. Enabling the password expiration option (described in the previous section) automatically enables the ability of users to change their passwords.

If your users are externally authenticated, for example with LDAP, do not enable this option.

<table>
<tr><th colspan="3">Password Administration Option</th></tr>
<tr><th colspan="3">Configuration File</th></tr>
<tr><td colspan="3">.../WEB-INF/jasperserver-servlet.xml</td></tr>
<tr><th>Property</th><th>Value</th><th>Description</th></tr>
<tr><td><code>allowUserPasswordChange</code></td><td><code>false</code> &lt;default>
<code>true</code></td><td>Set the value to <code>true</code> to enable the <b>Change Password</b> link. Any other value disables it.</td></tr>
</table>

7.1.4 Enforcing Password Patterns

If you allow or force users to change their passwords, you can enforce patterns for valid passwords. Such password patterns are used typically to ensure strong passwords, such as a minimum length and a mix of uppercase, lowercase, and numbers. The default pattern accepts any password of any length, including an empty password.

If your users are externally authenticated, for example with LDAP, do not enable this option.

Password Administration Option		
Configuration File		
.../WEB-INF/applicationContext.xml		
Property	**Bean**	**Description**
`allowedPasswordPattern`	`userAuthorityService`	A regular expression that matches valid passwords. The default pattern `^.*$` matches any password. Change the regular expression to enforce patterns such as: • Minimum and maximum password length • Both uppercase and lowercase characters • At least one number or special character Be sure that your pattern allows whitespace and international characters if needed by your users.

When you enforce a password pattern, you should set the following message to inform users why their password was rejected. Be sure to change the message in all locales that you use.

Password Administration Option	
Configuration File	
.../WEB-INF/bundles/jsexceptions_messages[_locale].properties	
Property	**Description**
`exception.remote.weak.password`	Message displayed to users when password pattern matching fails.

7.2 Configuring the User Session Timeout

The user session timeout is the length of time a user's session can remain inactive before the server automatically logs the user out. JasperReports Server now implements a pop-up reminder that tells users their session is about to expire and gives them the chance to continue without being logged out.

User Session Timeout		
Configuration File		
.../WEB-INF/web.xml		
Property	**Value**	**Description**
<session-config> <session-timeout>	20 <default>	Set the number of minutes that a user session can remain idle before automatic logout. Set the value to 0 (zero) to prevent sessions from ever timing out.

Note that the session timeout also applies to how long a session remains in memory after a web services call finishes. If there is another web service call with the same credentials within the timeout period, the server reuses the same session. If the timeout is too short for this case, you may have performance issues caused by a high load of web service calls.

Conversely, if the timeout is too long, a user session may stay active for a long time (even indefinitely with a timeout of 0) if a user leaves his browser open. The risk of allowing long sessions is that the in-memory session is not updated with any role changes until the user logs out manually (ending the session) and logs in again (creating a new session).

7.3 Configuring CSRF Prevention

Cross-Site Request Forgery (CSRF) is an exploit where the attacker impersonates a valid user session to gain information or perform actions on behalf of the attacker. In JasperReports Server, the security framework protects every page with a CSRF token in the post header, for example:

```
JASPER_CSRF_TOKEN: BVSY-UBBJ-K8E9-L4NZ-5866-Z4P2-ZG75-KKBW-U53Z-I833-V0OJ-BRK5-OFG5-
ZL6X
```

In the default configuration of the server, CSRF prevention is active. Jaspersoft does not recommend changing this setting:

CSRF Prevention		
Configuration File		
.../WEB-INF/classes/esapi/security-config.properties		
Property	**Value**	**Description**
security.validation.csrf.on	true <default> false	Turns CSRF prevention on or off. By default, CSRF prevention is on. Any other value besides case-insensitive “false” is equivalent to true.

7.4 Configuring Input Validation

To block potential security threats such as cross-site scripting and SQL injection, the security framework has a powerful mechanism to validate all user input and values passed to reports. Input validation prevents values with dangerous side-effects such as malicious scripts and queries. Administrators can monitor the server logs to search for evidence of attempted security breaches.

However, input that was allowed in previous version of the server may be blocked, and users may see errors when entering values. In particular:

- Parameter names and values cannot have tags (< and >). If your business data contains tags, you need to update the security configuration to allow them.
- SQL queries should start with SELECT and cannot have comments. Multiple queries separated by semi-colons (;) are also prohibited. If your reports or Domains have such queries, you need to either change them or update the security configuration to allow them.

If users see recurring errors, administrators can examine logs to determine what input is not allowed. Preferably, users should modify their input to remove special characters that are security risks. If that is not feasible, administrators can configure the security framework to modify security rules or turn off the security restrictions, based on their perceived threat level.

Input validation rules were added to comply with security guidelines for web applications. Turning off input validation or modifying the validation rules may make the server more vulnerable to web attacks.

Input validation is a complex mechanism that is configured in the following files:

File	Contents
<js-webapp>/WEB-INF/classes/esapi/security-config.properties	Top-level configuration for enabling or disabling input validation.
<js-webapp>/WEB-INF/bundles/security.properties	Text of validation error messages shown to users.
<js-webapp>/WEB-INF/classes/esapi/security.properties	Defines the input validation rules for each field of the server's web pages and report input.
<js-webapp>/WEB-INF/classes/esapi/validation.properties	Defines the regular expressions used in security rules.

Input validation is based on UTF-8 encoded input. Make sure your application server is configured for UTF-8 URIs as described in section **"UTF-8 Configuration" on page 249**.

Input validation is enabled by default when installing JasperReports Server. To turn off one or more of the protection features:

Input Validation
Configuration File
.../WEB-INF/classes/esapi/security-config.properties

Input Validation		
Property	**Value**	**Description**
`security.validation.input.on`	`true` <default> `false`	Turns field input validation on or off for the server web application. Any other value besides case-insensitive "false" is equivalent to true.
`security.validation.sql.on`	`true` <default> `false`	Turns SQL query validation on or off in the server. Any other value besides case-insensitive "false" is equivalent to true.

7.4.1 Customizing Security Error Messages

When input validation blocks input that violates a security rule, the server displays an error. By default, the security messages are intentionally generic so that potential attackers are not aware that they have triggered a security error.

Jaspersoft highly recommends that external deployments customize the security error messages to be unique, yet still generic. You can change both the message and the error number. Choose any combination of numbers or letters so that administrators can easily search the logs to detect security violations.

Input Validation Messages	
Configuration File	
.../WEB-INF/bundles/security.properties	
Property	**Value**
`message.validation.input`	`An error has occurred. Please contact your system administrator. (5321)`<default>
`message.validation.sql`	`An error has occurred. Please contact your system administrator. (6632)` <default>

Set these properties to messages and error codes that match the rest of your application. The goal is to display a message that attackers will not recognize as a security error, yet that administrators can uniquely identify in the logs.

If you translate your application into other languages, be sure to create a locale-specific copy of this file and translate these messages as well.

7.4.2 Configuring Input Validation Rules

Input validation rules determine what input is allowed when users send information to the server. This information generally consists of parameter-value pairs, for example the fields of an input form. For each known parameter-value pair, an input validation rule defines the following:

- What characters are allowed in the parameter name.

- What characters are allowed in the input value.
- The maximum allowable length for the parameter name and the input value (the same limit applies to both separately).
- Whether the value can be blank.

Allowed characters are determined by a regular expression called a validator. Validators are named regular expressions that can be used in any number of input validation rules. Even though validators can be used in several rules, each validation rule should be as specific as possible to the allowable input.

7.4.2.1 Editing Input Validation Rules

The predefined input validation rules in JasperReports Server are designed to allow all data and normal user input, while blocking potential attacks on the server. If your data or your user input causes security errors (false positives), you may choose to modify the input validation rules to allow your input.

1. Locate the "SECURITY FAILURE" message in your logs that was created by the security error. For more information about logs, see **"Configuring System Logs" on page 188**. The log message contains the name of the parameter and context where the parameter was used.
2. Make a backup copy of the file <js-webapp>/WEB-INF/classes/esapi/security.properties, then open it for editing.
3. Locate the parameter name and context. For example, this is the input validation rule for the entities parameter on the Manage Roles page:

   ```
   entities=Alpha,AlphaNumPunctuation,5000,true,entities-Manage_Roles_context
   ```

   The input validation rule has the following format:

   <parameter>=<nameValidator>,[!]<valueValidator>,<charLimit>,<blankAllowed>,<parameter>-<context>_context
4. Modify the rule to allow your input:
   a. Usually, you need to change the value validator to one that allows your input characters. Select a value validator from the file <js-webapp>/WEB-INF/classes/esapi/validation.properties that allows your input, or create one as described in the next section.
   b. If your input is atypically long, increase the character limit.
   c. Do not change any other part of the rule.
5. Save your changes and redeploy the JasperReports Server webapp, or restart your application server.

Recommendations:

- Try to keep the character limit as close to the expected value as possible.
- Try to use a validator that is as close to the expected values as possible. If a parameter's value is expected to be numbers only, then use the Numeric validator.
- Most validators are whitelists that specify character patterns that are allowed. A validator may be preceded by an exclamation mark (`!`) to indicate that everything but those values are permitted. When used with a validator that matches characters or words, this syntax implements a blacklist. Some rules are easier to define as whitelists, others as blacklists.
- If a parameter can have radically different values or the same parameter is used in different situations, then you can apply more than one rule to that parameter. To do this, simply copy a parameter rule and add incremental integers to the parameter name. For example:

  ```
  standAlone=Alpha,Alpha,50,true,standAlone-Report_PopupMenu_context
  ```

  Updated to:

  ```
  standAlone=Alpha,AlphaNum,50,true,standAlone-Report_PopupMenu1of3_context
  ```

```
standAlone2=Alpha,JSONObject,50000,true,standAlone-Report_PopupMenu2of3_context
standAlone3=Alpha,JSONArray,500000,true,standAlone-Report_PopupMenu3of3_context
```

With multiple rules for the same parameter, each rule is applied in the order listed until one passes (equivalent to a logical OR). If they all fail, then the input is blocked and the user is notified with the generic error message. The rules that fail still appear as security warnings in the logs. Use numbering in the context names, as shown above, to easily identify these false-positive messages. When using multiple rules, define the most used rule or the most permissive rule first to optimize the validation and reduce false-positive log messages.

7.4.2.2 Creating Validator Expressions

The validators are Java-based regular expressions that specify which characters are allowed (whitelist) or forbidden (blacklist), depending on how it is used in a validation rule.

Do not modify the default validator expressions provided with the server. These expressions have been thoroughly tested by Jaspersoft to provide reasonable input validation security while allowing for the general use of the application. Also, a validator can be used in several input validation rules, so modifying them may have unintended consequences. You should *always* create new validators with new names.

1. Make a backup copy of the file <js-webapp>/WEB-INF/classes/esapi/validation.properties, then open it for editing.
2. Locate the validator used in the input validation rule you want to modify, for example the Alpha validator expression allows for any letters in any language:

    ```
    Validator.Alpha=^[\\p{L}\\p{M}]*$
    ```

3. Copy the entire rule on a new line and give it a new name with the following format:

    Validator.<validatorName>=<regularExpression>

    Remember to use double backslashes (\\) in properties files for single backslashes in the expression. You should also use the `\p{}` syntax to match international letters and their accent marks, for example:

    ```
    Validator.AlphaDotSpace=^[\\p{L}\\p{M}\\.\\s]*$
    ```

4. Use the new value validator name in your input validation rule, as described in the previous procedure.
5. Save your changes and redeploy the JasperReports Server webapp, or restart your application server.

7.4.2.3 Validating New Input Parameters

If you customize JasperReports Server to accept new input parameters, you must add the corresponding input validation rules in order to maintain server security.

1. Make a backup copy of the file *<js-webapp>/WEB-INF/classes/esapi/security.properties*, then open it for editing.
2. Create a new input validation rule that has the following format:

    <parameter>=<nameValidator>,<valueValidator>,<charLimit>,<blankAllowed>,<parameter>-<context>_context

    The context is the string that will appear in the log when a security validation error occurs, so it should contain the exact parameter name.

3. Look at existing rules in the file <js-webapp>/WEB-INF/classes/esapi/validation.properties to find validators for the parameter name and value that allow your new input. If necessary, create new validator expressions as described in the previous procedure.
4. Save your changes and redeploy the JasperReports Server webapp, or restart your application server.

7.4.3 Query Validation

Query validation is a special case of input validation, where the server ensures that all queries being issued by the server meet a preset pattern for a safe query. When query validation is enabled, all queries in reports and Domains use the following validator:

```
Validator.ValidSQL=^\\s*((?i)select)\\s+[^;]+$
```

As a result:

- SQL comments are forbidden.
- Ensure that you have only one executable query statement per query. Multiple queries separated by semi-colons (`;`) will be rejected. The following example will cause a security error:

  ```
  SELECT f1,f2 FROM tbl_1 WHERE f1=f2; SELCT f3 from tbl_2;
  ```
- Queries for reports must retrieve data only, in other words, only use the SELECT statement. The following statements are forbidden:

  ```
  DROP, INSERT, UPDATE, DELETE
  ```
- If you want to use stored procedures, you must add the following validator to the file <js-webapp>/WEB-INF/classes/esapi/validation.properties:

  ```
  Validator.ValidSPROC=^\\s*\\(((?i)call)\\s+[^;]+\\)$
  ```

  And then modify the validation rule for the corresponding parameter or field where you want to allow stored procedure calls. If you want to allow stored procedure calls in addition to select statements, specify multiple validation rules as shown in section **"Editing Input Validation Rules" on page 148**.
- When SQL validation fails, the logs contain the message described in section **"Customizing Security Error Messages" on page 147**, such as the following:

  ```
  2011-11-21 13:54:28,007 ERROR ValidatorImpl,"http-bio-8090"-exec-12:48 - An error has
  occurred. Please contact your system administrator. (6632)
  ```

  ```
  org.owasp.esapi.errors.ValidationException: SQL_Query_Executor_context: Invalid
  input. Please conform to regex ^\s*((?i)select)\s+[^;]+$ with a maximum length of
  50000
  ```

7.4.4 Further Configuration

The configuration files contain some miscellaneous default settings for the security framework. In particular they define default action for input that has no validation rules. Changing these defaults is possible but not recommended:

Advanced Input Validation		
Configuration File		
.../WEB-INF/classes/esapi/security-config.properties		
Property	**Default Value**	**Description**
`log.msg.security.off`	SECURITY for [%s] is OFF	If security is turned OFF, this message will be logged. This message in the logs can alert administrators if the security configuration has been tampered with.
`msg.no.rule`	No rule for parameter [%s]. Using default validation on input=[%s].	If a request parameter is not previously known, this message is logged.
`msg.cannot.load`	Security configuration [%s] cannot be loaded.	If there is an error in the security configuration files, this message is logged. This is a severe error and should be resolved by the administrator.
Configuration File		
.../WEB-INF/classes/esapi/security.properties		
Property	**Default Value**	**Description**
`DEFAULT`	`Alpha,AlphaNumPunctuationBrackets,200000,true,DEFAULT`	If an input parameter does not have any defined validation rule, this validation rule is applied. The validator for values, `AlphaNumPunctuationBrackets` is fairly permissive, and can be changed to something more restrictive. The DEFAULT property name is a keyword and should never be changed.

7.5 Restricting File Uploads

Several dialogs in JasperReports Server prompt the user to upload a file to the server. For performance and security reasons, you may want to restrict file uploads by name and size.

The following setting is the global file upload limit for the entire server. Any single upload that exceeds this limit will trigger an error and a stack trace message. It is intended to be an absolute maximum to prevent a worse out-of-memory error that affects the entire server.

Global File Size Upload Limit		
Configuration File		
…/WEB-INF/js.config.properties		
Property	Value	Description
`file.upload.max.size`	`-1` <default>	Maximum size in bytes allowed for any file upload. The default value, -1, means there is no limit to the file size, and a large enough file could cause an out-of-memory error in the JVM. Some file uploads such as importing through the UI are necessarily large and must be taken into account. Set this value larger than your largest expected import and less than your available memory.

The following settings apply to most file upload dialogs in the user interface, such as uploading a JRXML or a JAR file to create a JasperReport in the repository. These settings in the `fileResourceValidator` bean restrict the file size and the filename pattern.

File Upload Restrictions		
Configuration File		
…/WEB-INF/flows/fileResourceBeans.xml		
Property	Value	Description
`maxFileSize`	`-1` <default>	Maximum size in bytes allowed for a file uploaded through most UI dialogs. If an upload exceed this limit, the server displays a helpful error message. The default value, -1, means there is no limit to the file size, and an upload could reach the global limit if set, or an out-of-memory error. Usually, files required in resources are smaller, and a limit of 10 MB is reasonable.
`fileNameRegexp`	`^.+$` <default>	A regular expression that matches allowed file names. The default expression matches all filenames of one or more characters. A more restrictive expression such as [a-zA-Z0-9]{1,200}\.[a-zA-Z0-9]{1,10} would limit uploads to alpha-numeric names with an extension.
`fileName ValidationMessageKey`	`<null/>` <default>	The name of a Java property key whose value is a custom message to display when the uploaded filename does not match `fileNameRegexp`. For example, you could add the following line to WEB-INF/js.config.properties: `my.filename.validation=The name of the uploaded filename must contain only alphanumeric characters and have a valid extension.`

The following setting restricts the extension of the uploaded file. The upload dialogs will only browse for files with the given extensions. Add or remove extensions to change the file type restrictions:

File Upload Extensions	
Configuration File	
<jasperserver-pro-war>/scripts/resource.locate.js	
Property	**Value**
ALLOWED_FILE_ RESOURCE_EXTENSIONS	By default, the following extensions are allowed: "css", "ttf", "jpg", "jpeg", "gif", "bmp", "png", "jar", "jrxml", "properties", "jrtx", "xml", "agxml", "docx", "doc", "ppt", "pptx", "xls", "xlsx", "ods", "odt", "odp", "pdf", "rtf", "html"

7.6 Hiding Stack Trace Messages

By default, JasperReports Server displays stack traces in certain error messages. Stack traces reveal some information about the application, and security experts recommend that an application not display them.

The following setting turns off stack traces in error messages. However, more serious error messages still display Java exceptions without the stack trace.

Hiding Stack Trace Messages		
Configuration File		
.../WEB-INF/applicationContext-security-web.xml		
Property	**Bean**	**Description**
showStacktrace Message	webAppSecurity Filter	Set this value to false to prevent stack traces from appearing in error messages.

Restart your application server or redeploy the JasperReports Server web app for this change to take effect.

7.7 Defining a Cross-Domain Policy for Flash

For security reasons, a Flash animation playing in a web browser is not allowed to access data that resides outside the exact web domain from which the SWF originated. JasperReports Server uses Flash for the advanced Fusion-based charts such as gauges and maps.

As a result, even servers in subdomains cannot share data with a server in the parent domain unless they define a cross-domain policy that explicitly allows it. The file crossdomain.xml, located at the root of the server that contains the data, defines what domains may access the data without prompting the user to grant access in a security dialog. Therefore, the server where the data is located determines which other servers may access the data.

The following crossdomain.xml sample only allows access from the example domain or any of its subdomains. This example is saying that the server with this file only trusts example.com to use its data.

```
<?xml version="1.0" ?>
    <!DOCTYPE cross-domain-policy SYSTEM
        "http://www.macromedia.com/xml/dtds/cross-domain-policy.dtd">

    <cross-domain-policy>
        <allow-access-from domain="example.com" />
        <allow-access-from domain="*.example.com" />
    </cross-domain-policy>
```

Behind a firewall, servers and users often refer to other computers in the same domain without using the domain name. Flash considers this a different domain and blocks access to data unless the computer name is given in the policy:

```
    <cross-domain-policy>
        <allow-access-from domain="myserver.example.com" />
        <allow-access-from domain="myserver" />
    </cross-domain-policy>
```

When using web services, use the `allow-http-request-headers-from` element so that actions encoded in the request header are allowed. The following example allows standard requests and web service requests from any subdomain of example.com.

```
    <cross-domain-policy>
        <site-control permitted-cross-domain-policies="master-only"/>
        <allow-access-from domain="*.example.com"/>
        <allow-http-request-headers-from domain="*.example.com" headers="*"
            secure="true"/>
    </cross-domain-policy>
```

For a description of all possible properties, see the cross-domain policy file specification.

To define a cross-domain policy for Flash-based reports, create a file such as the ones above on the server that contains the data being accessed. Be sure to place the crossdomain.xml file at the root of the filespace that is being served. For example, if you use Apache Tomcat, place your files in the following locations:

File	Location
crossdomain.xml	<website-B-tomcat-dir>/webapps/ROOT/crossdomain.xml
XML data (*.xml)	<website-B-tomcat-dir>/webapps/ROOT/<any-dir>/*.xml
Flash component (*.swf)	<website-A-tomcat-dir>/webapps/<appname>/<any-dir>

7.8 Encrypting User Passwords

User passwords are stored along with user profiles in JasperReports Server's own private database. By default, password encryption is enabled in JasperReports Server and passwords are stored as cipher text in the database. With the following procedure, system administrators can turn on or off user password encryption, or change the encryption algorithm and specify the salt key used to initiate the encryption algorithm.

To Configure User Password Encryption:

1. As a precaution, you must back up the server's private `jasperserver` database. To back up the default PostgreSQL database, go to the <js-install> directory and run the following command:

   ```
   pg_dump -U postgres jasperserver > js-backup.sql
   ```

   To back up DB2, Oracle, Microsoft SQL Server, and MySQL databases, refer to your database product documentation.
2. You can now stop your application server. You should leave your database running.
3. Export the entire contents of the repository, which includes user profiles and their passwords, with the following commands. Note that there are two dashes (--) in front of the command options:

   Windows:
   ```
   cd <js-install>\buildomatic
   js-export.bat --everything --output-dir js-backup-catalog
   ```

   Linux:
   ```
   cd <js-install>/buildomatic
   js-export.sh --everything --output-dir js-backup-catalog
   ```

   In the export operation, passwords are decrypted using the existing user password ciphers and re-encrypted with the import-export encryption key. This is a separate encryption that ensures that passwords are never in plain text, even when exported. For more information, see **"Setting the Import-Export Encryption Key" on page 128**
4. Edit the properties in the following table to configure different ciphers. Both the server and the import-export scripts access the user profiles and must be configured identically. Make the same changes in both files:

Table 7-1 User Password Encryption Configuration

Configuration Files		
<jasperserver-pro-war>/WEB-INF/applicationContext-security.xml <js-install>/buildomatic/conf_source/iePro/applicationContext-security.xml		
Property	**Bean**	**Description**
`allowEncoding`	`passwordEncoder`	With the default setting of `true`, user passwords are encrypted when stored. When `false`, user passwords are stored in clear text in JasperReports Server's private database. Jaspersoft does not recommend changing this setting.

keyInPlainText	passwordEncoder	When true, the secretKey value is given as a plain text string. When false, the secretKey value is a numeric representation that can be parsed by Java's Integer.decode() method. By default, this setting is false, and the secretKey is in hexadecimal notation (0xAB).
secretKey	passwordEncoder	This value is the salt used by the encryption algorithm to make encrypted values unique. This value can be a text string or a numeric representation depending on the value of keyInPlainText.
secretKeyAlgorithm	passwordEncoder	The name of the algorithm used to process the key, by default DESede.
cipher Transformation	passwordEncoder	The name of the cipher transformation used to encrypt passwords, by default DESede/CBC/ PKCS5Padding.

You should change the secretKey value so that it is different from the default.

The secretKey, secretKeyAlgorithm, and cipherTransformation properties must be consistent with each other. For example, the secretKey must be 24 bytes long in hexadecimal notation or 24 characters in plain text for the default cipher (DESede/CBC/PKCS5Padding). Different algorithms expect different key lengths. For more information, see Java's javax.crypto documentation.

5. Next, drop your existing jasperserver database, where the passwords had the old encoding, and recreate an empty jasperserver database. Follow the instructions for your database server:
   - **Dropping and Recreating the Database in PostgreSQL**
   - **Dropping and Recreating the Database in MySQL**
   - **Dropping and Recreating the Database in Oracle**
   - **Dropping and Recreating in the Database in Microsoft SQL Server**
6. Import your exported repository contents with the following commands. The import operation will restore the contents of JasperReports Server's private database, including user profiles. As the user profiles are imported, the passwords are encrypted using the new cipher settings.

   Note that there are two dashes (--) in front of the command options:

   Windows:
   ```
   cd <js-install>\buildomatic
   js-import.bat --input-dir js-backup-catalog
   ```
   Linux:
   ```
   cd <js-install>/buildomatic
   js-import.sh --input-dir js-backup-catalog
   ```

   During the import operation, passwords are decrypted with the import-export encryption key and then re-encrypted in the database with the new user password encryption settings. For more information, see **"Setting the Import-Export Encryption Key" on page 128**.
7. Using a database client such as the SQuirreL tool, check the contents of the JIUser table in the jasperserver database and verify that the password column values are encrypted.
8. Restart your application server. Your database should already be running.
9. Log into JasperReports Server to verify that encryption is working properly during the log in process.

7.8.1 Dropping and Recreating the Database in PostgreSQL

1. Change directory to `<js-install>/buildomatic/install_resources/sql/postgresql`.
2. Start psql using an administrator account such as postgres:

   ```
   psql -U postgres
   ```
3. Drop the `jasperserver` database, create a new one, and load the `jasperserver` schema:

```
drop database jasperserver;
create database jasperserver encoding='utf8';
\c jasperserver
\i js-pro-create.ddl
\i quartz.ddl
```

7.8.2 Dropping and Recreating the Database in MySQL

1. Change directory to `<js-install>/buildomatic/install_resources/sql/mysql`.
2. Log into your MySQL client:

   ```
   mysql -u root -p
   ```
3. Drop the jasperserver database, create a new one, and load the jasperserver schema:

```
mysql>drop database jasperserver;
mysql>create database jasperserver character set utf8;
mysql>use jasperserver;
mysql>source js-pro-create.ddl;
mysql>source quartz.ddl;
```

7.8.3 Dropping and Recreating the Database in Oracle

1. Change directory to `<js-install>/buildomatic/install_resources/sql/oracle`.
2. Log into your SQLPlus client, for example:

   ```
   sqlplus sys/sys as sysdba
   ```
3. Drop the `jasperserver` database, create a new one, and load the `jasperserver` schema:

```
SQL> drop user jasperserver cascade;
SQL> create user jasperserver identified by password;
SQL> connect jasperserver/password
SQL> @js-pro-create.ddl
SQL> @quartz.ddl
```

7.8.4 Dropping and Recreating in the Database in Microsoft SQL Server

1. Change directory to `<js-install>/buildomatic/install_resources/sql/sqlserver`.
2. Drop the `jasperserver` database, create a new one, and load the `jasperserver` schema using the SQLCMD utility:

```
cd <js-install>\buildomatic\install_resources\sql\sqlserver
sqlcmd -S ServerName -Usa -Psa
1> DROP DATABASE [jasperserver]
2> GO
1> CREATE DATABASE [jasperserver]
2> GO
1> USE [jasperserver]
2> GO
1> :r js-pro-create.ddl
2> GO
1> :r quartz.ddl
2> GO
```

7.9 Encrypting User Session Login

By default, JasperReports Server does *not* enable the Secure Socket Layer/Transport Layer Security (SSL/TLS) to encrypt all data between the browser and the server, also known as HTTPS. Enabling HTTPS, as documented in the *JasperReports Server Ultimate Guide*, requires a certificate and a careful configuration of your servers. Jaspersoft recommends implementing HTTPS but recognizes that it is not always feasible.

Without HTTPS, all data sent by the user, including passwords, appear unencrypted in the network traffic. Because passwords should never be visible, JasperReports Server provides an independent mechanism for encrypting the password values without using HTTPS. The encryption mechanism is used in the following cases:

- Passwords sent from the login page.
- Passwords sent from the change password dialog (see **7.1, "Configuring User Password Options," on page 142**.
- Passwords sent from the user management pages by an administrator.

When a browser requests one of these pages, the server generates a private-public key pair and sends the public key along with the page. A JavaScript in the requested page encrypts the password when the user posts it to the server. Meanwhile, the server saves its private key and uses it to decrypt the password when it arrives. After decrypting the password, the server continues with the usual authentication methods.

Login encryption is not compatible with password memory in the browser. Independently of the autocomplete setting described in section **"Configuring Password Memory" on page 142**, the JavaScript that implements login encryption clears the password field before submitting the page. As a result, most browsers will never prompt to remember the encrypted password.

The disadvantage of login encryption is the added processing and the added complexity of web services login. For backward compatibility, login encryption is disabled by default. To enable login encryption, set the following properties. After making any changes, redeploy the JasperReports Server webapp or restart the application server.

When login encryption is enabled, web services and URL parameters must also send encrypted passwords. Your applications must first obtain the key from the server and then encrypt the password before sending it. See the *JasperReports Server Web Services Guide* and *JasperReports Server Ultimate Guide*, respectively.

Login Encryption		
Configuration File		
.../WEB-INF/classes/esapi/security-config.properties		
Property	**Value**	**Description**
`encryption.on`	`truefalse` <default>	Turns login encryption on or off. Encryption is off by default. Any other value besides case-insensitive “false” is equivalent to true.
`encryption.type`	`RSA` <default>	Encryption algorithm; currently, only RSA is supported.
`encryption.key.length`	integer power of 2 `1024` <default>	The length of the generated encryption keys. This affects the strength of encryption and the length of the encrypted string.
`encryption.dynamic.key`	`true` <default> `false`	When true, a key will be generated per every single request. When false, the key will be generated once per application installation. See descriptions in **Dynamic Key Encryption** and **Static Key Encryption** below.

Encryption has two modes, dynamic and static, as determined by the `encryption.dynamic.key` parameter. These modes provide different levels of security and are further described in the following sections.

7.9.1 Dynamic Key Encryption

The advantage of encrypting the password at login is to prevent it from being seen, but also to prevent it from being used. For password encryption to achieve this, the password must be encrypted differently every time it is sent. With dynamic key encryption, the server uses a new public-private key pair with every login request.

Every time someone logs in, the server generates a new key pair and sends the new public key to the JavaScript on the page that sends the password. This ensures that the encrypted password is different every time it is sent, and a potential attacker won't be able to steal the encrypted password to log in or send a different request.

Because it is more secure, dynamic key encryption is the default setting when encryption is enabled. The disadvantage of dynamic keys is that generating keys slows down each login, though it is not usually visible to users. Another effect of dynamic key encryption is that it does not allow remembering passwords in the browser. While this may be an inconvenience, it is actually more secure to not store passwords in the browser (where they may be compromised) and require typing in the password for every login (because computers can be stolen). See **“Configuring Password Memory” on page 142**.

7.9.2 Static Key Encryption

However, if dynamic key encryption is not desired, JasperReports Server also supports static key encryption. In this case, a unique key pair is generated automatically on the first user login and remains the same for the entire server installation. Because the key is always the same, the encrypted value of a user's password is always the same. This means that an attacker could steal the encrypted password and use it to access the server.

Static key encryption is very insecure and is recommended only for intranet server installation where the network traffic is more protected. The only advantage of static encryption over no encryption at all is that passwords cannot be deciphered and used to attack other systems where users might have the same password.

Before setting `encryption.dynamic.key=false` to use static encryption, you must also configure the secure file called keystore where the key pair is kept. Be sure to customize the keystore parameters listed in the following table to make your keystore file more unique and secure.

For security reasons, always change the default keystore passwords immediately after installing the server.

Keystore Configuration (when encryption.dynamic.key=false)		
Configuration File		
.../WEB-INF/classes/esapi/security-config.properties		
Property	**Value**	**Description**
`keystore.location`	`keystore.jks` <default>	Path and filename of the keystore file. This parameter is either an absolute path or a file in the webapp classpath, for example <tomcat>/webapps/jasperserver-pro/WEB-INF/classes>. By default, the keystore.jks file is shipped with the server and doesn't contains any keys.
`keystore.password`	`jasper123` <default>	Password for the whole keystore file. This password is used to verify keystore's integrity.
`keystore.key.alias`	`jasper` <default>	Name by which the single key is retrieved from keystore. If a new alias is specified and does not correspond to an existing key, a new key will be generated and inserted into the keystore.
`keystore.key.password`	`jasper321` <default>	Password for the key whose alias is specified by keystore.key.alias.

When changing the key alias, the old key will not be deleted; it can be used again by resetting the key alias. Also, once key has been created with a password, you cannot change the password through the keystore configuration. To delete keys or change a keystore password, the server administrator must use the Java `keytool.exe` utility in the bin directory of the JRE or JDK. If you change the keystore password or the key password, the keystore configuration above must reflect the new values or login will fail for all users.

7.10 Encrypting Passwords in Configuration Files

In JasperReports Server version 5.5 or greater, a new feature allows administrators to obfuscate passwords that appear in the configuration files. This satisfies security audit requirements and protects the passwords from being observed by unauthorized individuals. Typically, the following are encrypted:

- The password to JasperReports Server's internal database (`jasperserver`).
- The passwords to the sample databases (`foodmart` and `sugarcrm`).
- On Tomcat and tcServer, passwords in JNDI resource definitions.

You can also change the configuration to encrypt the following:

- The password for the mail server used by the scheduler (`quartz.mail.sender.password`)
- The password for LDAP external authentication.

Passwords in configuration files are encrypted during JasperReports Server installation. If the installation deploys to the Tomcat application server, the database password is automatically encrypted in the JNDI configuration as well (in the file context.xml).

> Full password security cannot be guaranteed from within JasperReports Server. A user with sufficient privileges and knowledge of JasperReports Server can gain access to the encryption keys and the configuration passwords. While one could ask for passwords on every server restart, it is impractical for most users. The only practical way to guarantee password security is through backup and restriction of access to the keystore property file.

7.10.1 Encrypting Configuration Passwords on Tomcat (or Spring tcServer)

To encrypt passwords in a Tomcat or tcServer installation, modify the installation procedure as follows:

1. Depending on the database you use, copy the installation configuration file as usual:

   from: <js-install>/buildomatic/sample_conf/<database>_master.properties

   to: <js-install>/buildomatic/default_master.properties
2. Edit the default_master.properties file:
   - Enter values specific to your installation.
   - Enter your passwords in plain text.
   - Turn on configuration file encryption by uncommenting the `encrypt=true` property. You do not have to uncomment any of the other encryption properties because they all have the default values shown.
   - Except, if you are using Oracle, uncomment `propsToEncrypt` and set it to `dbPassword,sysPassword`.
   - Optionally, specify additional properties to encrypt as described in **"Encrypting Additional Properties in default_master.properties" on page 162**.
   - Optionally, change the settings for configuration file encryption as described in **"Encryption Options" on page 164**.
3. Run the buildomatic installation script (js-install) and all other installation steps according to the *JasperReports Server Installation Guide*. This will have the following effects:

   a. The plain text passwords in default_master.properties are overwritten with their encrypted equivalents. There is no warning when you run js-install with `encrypt=true`.

   b. The encrypted passwords are propagated to all configuration files.

   c. The installation proceeds and files are copied to their final locations.
4. After installation, passwords are encrypted in the following locations:
   - In all server configuration files in .../WEB-INF/applicationContext*.xml.

- In JNDI definitions in .../META-INF/context.xml.
- In the default_master.properties files that remains after installation.

If you have an error such as the following when restarting the server:

```
javax.naming.NamingException: KeystoreManager.init was never called or there are errors
instantiating an instance
```

you may need to add the following to your Tomcat service start properties:

```
-Duser.home=c:\Users\<TomcatUser>
```

7.10.2 Encrypting Configuration Passwords on Enterprise Servers

Most enterprise servers, such as JBoss, Glassfish, WebSphere, and WebLogic, have proprietary ways to set up password encryption. You should use these encryption methods. JasperReports Server does not automatically set up encrypted passwords for these servers during deployment. In this case, you can additionally encrypt the passwords in the buildomatic file after deployment:

1. Deploy JasperReports Server to your enterprise server as specified in the *JasperReports Server Installation Guide*. The resulting JasperReports Server instance will have unencrypted JNDI data source passwords. If you want to encrypt these passwords, refer to your application server's documentation.
2. After the server has been successfully configured, encrypt the JasperReports Server configuration files as follows:
   a. In default_master.properties, turn on encryption by uncommenting `encrypt=true`.
   b. Run the target `js-ant refresh-config`, which will remove and recreate all the configuration files without deploying them to the application server. Now the buildomatic files will have the database passwords encrypted. You should still be able to execute import/export or other scripts.

Do not run `js-install` or `js-ant deploy-webapp-pro`. These commands will overwrite the war file created in step 1 and render the server data sources inaccessible. If you need to redeploy the WAR file, reset the database password(s) to plain text in your default_master.properties and start again with step 1.

7.10.3 Encrypting Additional Properties in default_master.properties

You can encrypt additional properties in the default_master.properties file. To work correctly, these properties need to be decrypted when they are used. Currently, decryption is supported for properties that are loaded into the Spring application context via the `propertyConfigurer` bean in applicationContext-webapp.xml.

If a property is defined via JNDI, we recommend pointing there versus encrypting:

```
<property name="password">
    <jee:jndi-lookup jndi-name="java:comp/env/emailPassword" />
</property>
```

The following code sample shows the `propertyConfigurer` bean in applicationContext-webapp.xml:

```
<bean id="propertyConfigurer" class="com.-
jaspersoft.jasperserver.api.common.properties.DecryptingPropertyPlaceholderConfigurer">
    <property name="locations">
      <list>
        <value>/WEB-INF/hibernate.properties</value>
        <value>/WEB-INF/js.quartz.properties</value>
        <value>/WEB-INF/js.spring.properties</value>
        <value>/WEB-INF/js.scheduling.properties</value>
        <value>/WEB-INF/mondrian.connect.string.properties</value>
        <value>/WEB-INF/js.diagnostic.properties</value>
        <value>/WEB-INF/js.aws.datasource.properties</value>
        <value>/WEB-INF/js.config.properties</value>
        <value>/WEB-INF/js.externalAuth.properties</value>
      </list>
    </property>
    ...
</bean>
</pre>
```

Because Jaspersoft extended Spring's `PropertyPlaceholderConfigurer` class as `DecryptingPropertyPlaceholderConfigurer`, all the loaded properties are scanned for the special marker `ENC-<value>-`. If that marker is found around the property value, that property is decrypted before being loaded into Spring context.

To determine if your property is scanned by `propertyConfigurer`, search the files in `propertyConfigurer`'s locations to see if it is defined in one of these files.

For example, suppose you want to encrypt the `password` property of the `reportSchedulerMailSender` bean in applicationContext-report-scheduling.xml:

```
<bean id="reportSchedulerMailSender" class="org.springframework.mail.javamail.JavaMailSenderImpl">
  <property name="host" value="${report.scheduler.mail.sender.host}"/>
  <property name="username" value="${report.scheduler.mail.sender.username}"/>
  <property name="password" value="${report.scheduler.mail.sender.password}"/>
  <property name="protocol" value="${report.scheduler.mail.sender.protocol}"/>
  <property name="port" value="${report.scheduler.mail.sender.port}"/>
  <property name="javaMailProperties">
    <props>
      <prop key="mail.smtp.auth">false</prop>
    </props>
  </property>
</bean>
```

`${report.scheduler.mail.sender.password}` tells you that `report.scheduler.mail.sender.password` is most likely defined via the `propertyConfigurer` bean. Search through the `propertyConfigurer` locations to verify. This property is defined in /WEB-INF/js.quartz.properties as follows: `report.scheduler.mail.sender.password=${quartz.mail.sender.password}`.

Once you have verified that the `quartz.mail.sender.password` property can be encrypted using default-master.properties, you set up encryption prior to installation as follows:

1. Set the desired password for `quartz.mail.sender.password` in default-master.properties:

   `quartz.mail.sender.password=XXYYZZ`
2. Uncomment the `encrypt=true` property in the same file.
3. Uncomment `propsToEncrypt=dbPassword` in default-master.properties.
4. Add `quartz.mail.sender.password` to `propsToEncrypt`:

```
quartz.mail.sender.password=XXYYZZ
encrypt=true
propsToEncrypt=dbPassword,quartz.mail.sender.password
```

5. Configure and install your JasperReports Server war installation as described in the *JasperReports Server Installation Guide*.
6. Verify that `report.scheduler.mail.sender.password` was encrypted in both default-master.properties and in /WEB-INF/js.quartz.properties.

7.10.4 Password Encryption for External Authentication

As of JasperReports Server 5.6, it's possible to encrypt the passwords in the external authentication configuration files for LDAP and external database authentication. To do this, we introduced context properties to the sample configuration files instead of simple strings. For example, if you are using LDAP to authenticate, the sample configuration file contains the following:

```
<bean id="ldapContextSource"
    class="com.jaspersoft.jasperserver.api.security.externalAuth.ldap.JSLdapContextSource">
  <constructor-arg value="${external.ldap.url}" />
  <property name="userDn" value="${external.ldap.username}" />
  <property name="password" value="${external.ldap.password}"/>
</bean>
```

The values referenced by the `${...}` format are defined in the js.externalAuth.properties file and are imported into Spring context via the `propertyConfigurer`. For example, the LDAP properties are defined in js.externalAuth.properties as follows:

```
external.ldap.url=${external.ldapUrl}
external.ldap.username=${external.ldapDn}
external.ldap.password=${external.ldapPassword}
```

The `${...}` values can be configured in default_master.properties before installation or upgrade. The following example shows the syntax of the properties in the default_master.properties file:

```
external.ldapUrl=ldap://hostname:389/dc=example,dc=com

external.ldapDn=cn=Administrator,dc=example,dc=com

external.ldapPassword=password
```

To encrypt the password property, you would also set the following:

```
external.ldapPassword=XXYYZZ
encrypt=true
propsToEncrypt=dbPassword, external.ldapPassword
```

7.10.5 Encryption Options

In buildomatic installation scripts, the passwords are symmetrically encrypted: the same secret key is used for both encryption and decryption. The key and its containing keystore file are randomly generated on each machine during the first JasperReports Server installation. All the subsequent JasperReports Server installations on the same server rely on the same keystore; they do not regenerate the key.

The keystore is an encrypted file that is used to securely store secret keys. To access the keystore, JasperReports Server accesses keystore properties. Both the keystore and keystore properties files are created by default in the user home directory. Alternatively, before running js-install, you can specify different locations for the keystore and keystore properties files via the environmental variables ks and ksp, respectively.

By default, database passwords are encrypted with the AES-128 algorithm in Cipher Block Chaining mode with PKCS5 padding. The AES algorithm is the current industry encryption standard. You can choose to modify the encryption strength by choosing either a different algorithm, a longer secret key size (for example AES-256), or a different encryption mode.

Edit the following properties in your default_master.properties set these options. If a property is commented out, the default is used:

Property	**Description**	**Default**
build.key.algo	Algorithm used to encrypt the properties in configuration files.	AES
build.key.size	Size of the encryption key as in AES-128. To increase the key size, if it has not been done before, you might have to install "Unlimited Strength Jurisdiction Policy Files" off the Oracle site for your Java version. To install the files, download US_export_policy.jar and local_policy.jar. AFTER backing up the old files, extract the jars into %JAVA_HOME%/jre/lib/security directory. Alternatively, you may download one of the reputable providers such as Bouncy Castle (ships with JasperReports Server). You would need to add the Bouncy Castle provider to to the list in %JAVA_HOME%/jre/lib/security/java.security file: security.provider.<seq number>= org.bouncycastle.jce.provider.BouncyCastleProvider	128 (bits)
enc.transformation	So-called encryption mode. See the see Java's `javax.crypto` documentation to understand the modes and padding better.	AES/CBC /PKCS5 Padding
enc.block.size	The size of the block that is encrypted. Encrypted text can contain many blocks. Usually the block is changed together with the encryption algorithm.	16 (bytes)
propsToEncrypt	A comma separated list of the properties to encrypt.	dbPassword

CHAPTER 8 SYSTEM CONFIGURATION

You can change the default behavior of JasperReports Server by editing the system's configuration. The configuration is defined by a set of properties and their values. The configuration properties are stored in two locations:

- All properties are stored in configuration files located in various folders under the <js-install> directory, which is the root of your JasperReports Server installation. To change the configuration, you edit these files and then restart the server.
- A few of the most commonly edited properties are available to the system admin through the user interface (UI). Changes to these properties take effect immediately, are stored in the repository, and override the equivalent values stored in files, even after the server restarts (as of version 5.0).

This chapter describes a subset of the properties in the configuration files. Settings that affect security are covered in **"Application Security" on page 141**. Configuration of the auditing feature is covered in **"Configuring Auditing and Monitoring" on page 219**. More options are described in the *JasperReports Server Installation Guide*.

Because the locations of files described in this chapter vary with your application server, the paths specified in this chapter are relative to the deployed WAR file for the application. For example, the applicationContext.xml file is shown as residing in the WEB-INF folder; if you use the Tomcat application server bundled with the installer, the default path to this location is:

```
C:\Program Files\jasperreports-server-5.6\apache-tomcat\webapps\jasperserver-pro\WEB-INF
```

Use caution when editing the properties described in this chapter. Inadvertent changes may cause unexpected errors throughout JasperReports Server that may be difficult to troubleshoot. Before changing any files, back them up to a location outside of your JasperReports Server installation.

Do not modify settings that are not described in the documentation. Even though some settings may appear straightforward, values other than the default may not work properly and cause errors.

This section describes functionality that can be restricted by the software license for JasperReports Server. If you don't see some of the options described in this section, your license may prohibit you from using them. To find out what you're licensed to use, or to upgrade your license, contact Jaspersoft.

In addition to configuration described in this chapter, you can also configure Liferay Portal or JBoss Portal to display the reports stored in your JasperReports Server instance. You can download the JasperReports Server portlets for these environments from the Jaspersoft Support Portal. For information about how to deploy the portlet, refer to the documentation in the portlet download package.

This chapter includes:

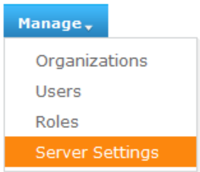
- Configuration Settings in the User Interface
- Configuration for Using Proxies
- Configuration for Session Persistence
- Configuring Ad Hoc
- Enabling Data Snapshots
- Configuring System Logs
- Configuring Amazon Web Services
- Configuring Domains
- Configuring JasperReports Library
- Configuring Input Control Behavior
- Configuring the Scheduler
- Configuring the Heartbeat
- Configuring the Online Help

8.1 Configuration Settings in the User Interface

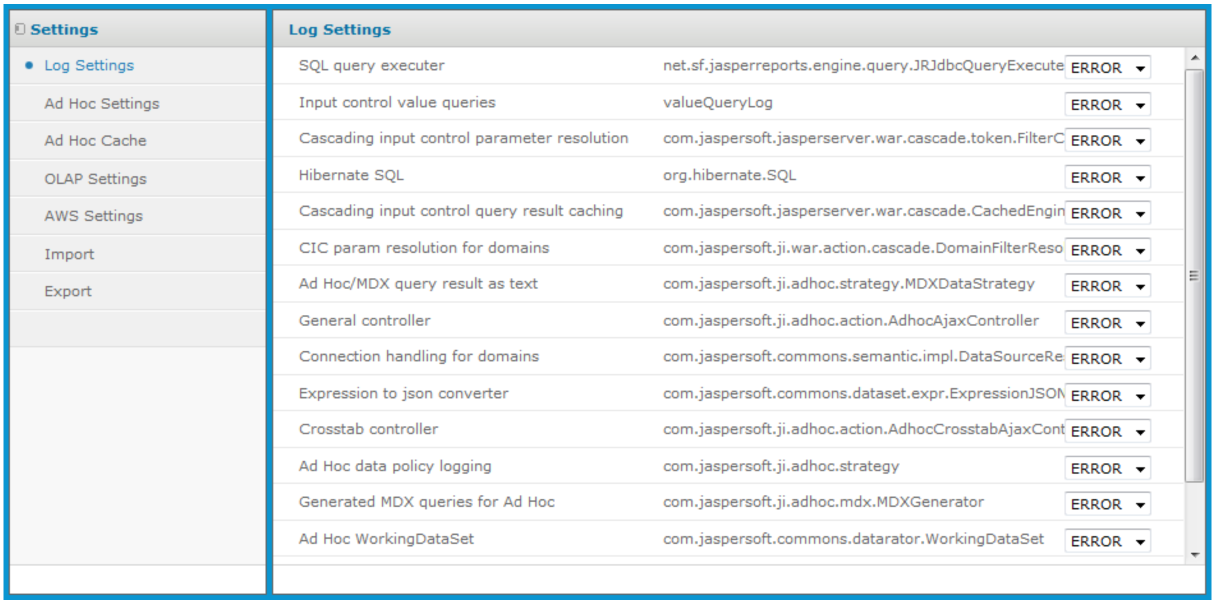
As of version 5.0, changes to configuration settings in the JasperReports Server user interfaces are persistent through server restarts. Previously, changes to setting in the user interface would not be stored, and upon restart, configuration settings would revert to values stored in the configuration files.

To make persistent configuration changes through the JasperReports Server user interface:

1. Log in as system administrator (`superuser` by default).
2. Select **Manage > Server Settings**:



3. Choose a category of settings or administrator actions from the left-hand panel of the Settings:



SQL query executer	net.sf.jasperreports.engine.query.JRJdbcQueryExecute	ERROR
Input control value queries	valueQueryLog	ERROR
Cascading input control parameter resolution	com.jaspersoft.jasperserver.war.cascade.token.FilterC	ERROR
Hibernate SQL	org.hibernate.SQL	ERROR
Cascading input control query result caching	com.jaspersoft.jasperserver.war.cascade.CachedEngin	ERROR
CIC param resolution for domains	com.jaspersoft.ji.war.action.cascade.DomainFilterReso	ERROR
Ad Hoc/MDX query result as text	com.jaspersoft.ji.adhoc.strategy.MDXDataStrategy	ERROR
General controller	com.jaspersoft.ji.adhoc.action.AdhocAjaxController	ERROR
Connection handling for domains	com.jaspersoft.commons.semantic.impl.DataSourceRe	ERROR
Expression to json converter	com.jaspersoft.commons.dataset.expr.ExpressionJSON	ERROR
Crosstab controller	com.jaspersoft.ji.adhoc.action.AdhocCrosstabAjaxCont	ERROR
Ad Hoc data policy logging	com.jaspersoft.ji.adhoc.strategy	ERROR
Generated MDX queries for Ad Hoc	com.jaspersoft.ji.adhoc.mdx.MDXGenerator	ERROR
Ad Hoc WorkingDataSet	com.jaspersoft.commons.datarator.WorkingDataSet	ERROR

Figure 8-1 The User Interface for Configuration Settings

4. Find the configuration setting you want to change and edit its value. In the case of log levels, the new value takes effect immediately. In the case of other settings, click **Change** beside the individual setting.

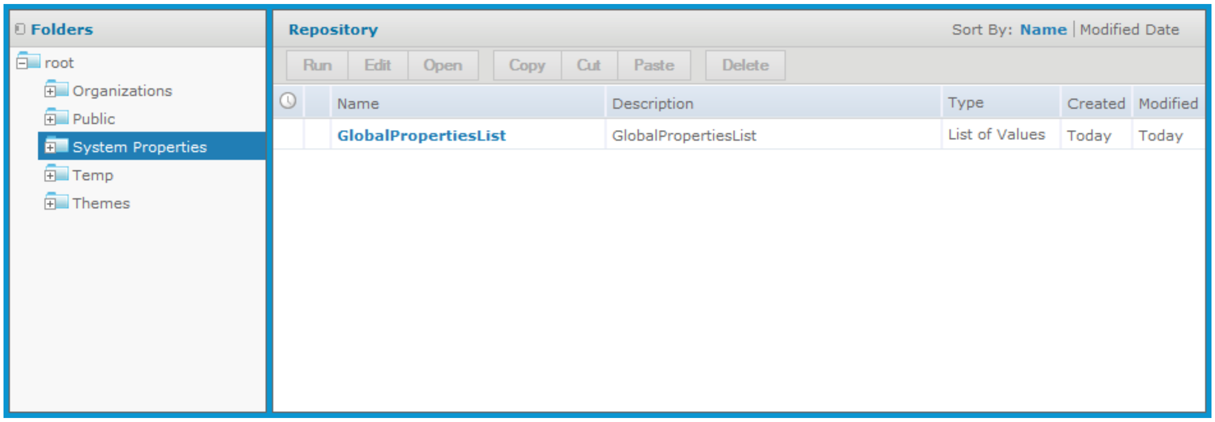
   These settings and administrator actions are documented in their respective sections:

Settings	Documentation
Log Settings	**"Configuring System Logs" on page 188**
Ad Hoc Settings	**"Ad Hoc Query Settings" on page 174**
Ad Hoc Cache	**"Ad Hoc Cache Management" on page 180**
OLAP Settings	*Jaspersoft OLAP User Guide*
AWS Settings	**"Configuring Amazon Web Services" on page 194**
Import	**"Importing From the Settings UI" on page 131**
Export	**"Exporting From the Settings UI" on page 130**

When viewing or modifying configuration settings that appear in the user interface (Log Settings, Ad Hoc Settings, and OLAP Settings), keep in mind the following guidelines:

- The Settings pages display a subset of the configuration settings that are available in configuration files. Therefore, all settings in the UI also exist in a configuration file.
- By default, the Settings pages display the values of settings that exist in the corresponding configuration file. If you modify the files and restart the server, your new file settings take effect on the server and are visible in the UI.

- When you change a value on the Settings pages, the new setting takes effect immediately, but the new value is *not* written to the corresponding configuration file. Instead, it is stored in a special resource in the repository, called the GlobalPropertiesList. The GlobalPropertiesList is located in the System Properties folder at the root of the repository and is only visible to the system admin (`superuser`).



Name	Description	Type	Created	Modified
GlobalPropertiesList	GlobalPropertiesList	List of Values	Today	Today

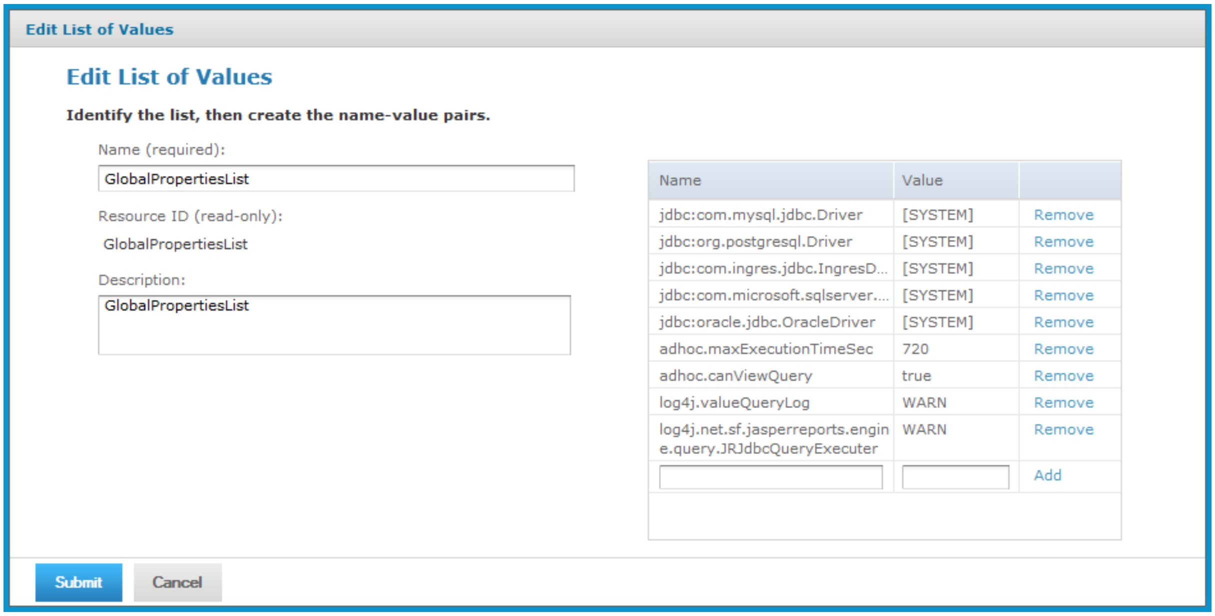
Figure 8-2 The System Properties Folder Visible to System Admins

Only configuration settings that have a value modified on the Settings pages of the UI are stored and made persistent in the GlobalPropertiesList.

- When the server restarts, the values in the GlobalPropertiesList take precedence over values for the same settings in the configuration files. However, each setting is independent, so a value that is not modified in the Settings UI is read from the corresponding file.
- The Settings pages display the values of settings that are in effect on the server. Therefore, settings in the GlobalPropertiesList appear on the Settings pages where they can be changed again if necessary.

Be aware that the configuration values that appear on the Settings pages are possibly a mixture of values loaded from configuration files and from the persistent GlobalPropertiesList.

- Right-click the GlobalPropertiesList and select Edit to view the configuration values it stores. If a setting has been modified in the UI, it appears in this list so that the setting is persistent. If you want to reset a setting so that it takes its value from the configuration file instead, click **Remove** next to that setting and then restart the server. Otherwise, Jaspersoft does not recommend modifying this list of values directly.



Edit List of Values

Identify the list, then create the name-value pairs.

Name (required): GlobalPropertiesList

Resource ID (read-only): GlobalPropertiesList

Description: GlobalPropertiesList

Name	Value	
jdbc:com.mysql.jdbc.Driver	[SYSTEM]	Remove
jdbc:org.postgresql.Driver	[SYSTEM]	Remove
jdbc:com.ingres.jdbc.IngresD...	[SYSTEM]	Remove
jdbc:com.microsoft.sqlserver....	[SYSTEM]	Remove
jdbc:oracle.jdbc.OracleDriver	[SYSTEM]	Remove
adhoc.maxExecutionTimeSec	720	Remove
adhoc.canViewQuery	true	Remove
log4j.valueQueryLog	WARN	Remove
log4j.net.sf.jasperreports.engine.query.JRJdbcQueryExecuter	WARN	Remove
		Add

Figure 8-3 The GlobalPropertiesList Containing Persistent Configuration Settings

- The GlobalPropertiesList also includes JDBC drivers configured during the installation or through the data source creation wizard. For more information, see **4.1, "Data Sources," on page 65**.
- Storing configuration values in the GlobalPropertiesList in the repository makes it possible to export them to different servers or re-import them after a server upgrade. For more information, see **6.4.3, "Importing From the Settings UI," on page 131**,

8.2 Configuration for Using Proxies

When setting up JasperReports Server to use a proxy server, there are two additional settings to make in the server configuration. JasperReports Server exposes some URLs to itself through the UI and when using the scheduler to send emails. When using a proxy, those URLs must be configured so that they expose the desired URL, not actual URL of the server instance.

Change the following settings so that JasperReports Server exposes the proxy URL.

Configuration for Using Proxies
Configuration File
.../WEB-INF/js.config.properties

Configuration for Using Proxies	
Property	**Description**
`deploy.base.url`	Set this property to the full URL for exposing the JasperReports ServerUI through the proxy. This URL must include the application name, for example: `http://bi.example.com/jasperserver-pro`
Configuration File	
.../WEB-INF/js.quartz.properties	
Property	**Description**
`report.scheduler.web.deployment.uri`	This is the base URL used by the scheduler to generate links to reports in emails. Set this property to the full URL, including application name, that you expose through your proxy. It should be the same as `deploy.base.url`.

8.3 Configuration for Session Persistence

Many application servers have the ability to store user sessions while a web app is offline, for example when changing JasperReports Server configuration files. The app server remembers all the information about a user's session, such as the session ID and what page was being viewed, and when the web app restarts, the user session is restored. The user does not have to log in again, and often will not even notice that the server was temporarily unavailable. This is called session persistence.

Sessions are not persisted when redeploying a web app in the application server, only when restarting the web app.

JasperReports Server supports a limited form of session persistence. When session persistence in enabled in the app server for JasperReports Server, user sessions can be restored in the following cases:

- Browsing the repository, expanding folders in the repository tree and viewing folder contents.
- Searching the repository, including all search filters and results.
- Repository permissions dialog, including state and selections.
- Add folder dialog.
- Add resource dialogs, including adding or editing a data source, JasperReport, and other repository objects.
- Copy, cut, and pasting resources in the repository.
- Scheduling a report, including all information such as a schedule and notifications.

If the server becomes unavailable when using the pages or dialogs above, the user will see a pause only when performing an action on these pages, such as submitting. When the server has finished restarting, the user can continue interacting with these pages or dialogs. If the user does not perform any action while the server is unavailable, he may not even notice that there was a failure.

However, for other interactive dialogs in JasperReports Server, the state is too large to store in the user session. The following features do not support session persistence:

- Ad Hoc editor - The state of the report layout and data in the Ad Hoc editor cannot be restored, so any unsaved changes are lost.
- Dashboard designer - The contents and state of the canvas cannot be restored, so any unsaved changes are lost.
- Interactive report viewer - The data in the report, as well as the state of column sorting and filtering cannot be saved, so any unsaved changes are lost.
- Domain designer - Any tables, joins, filters, calculated fields, and display names cannot be restored, and so any unsaved changes are lost.
- OLAP viewer - The data in the OLAP view and current MDX expression cannot be restored, so any unsaved changes would need to be created again.
- Administration dialogs (when creating or editing an organization, user, or role) - The information entered in an administration dialog cannot be restored if it was not submitted.

In the cases listed above, the user's work is interrupted, and any unsaved work is lost. However, when the server restarts, the user does not have to log in again, the server displays a message about the session that could not be fully restored, and the server redirects the user to the home page. The user must relaunch the interactive feature and recreate any unsaved work.

Session persistence also affects web service calls. The REST API supports a login to store a session ID, and with persistence enabled, that session ID will still be valid when the application server restarts. This simplifies the code you need to handle timeouts. In general, web service calls do not support interactive work such as designing an Ad Hoc view, a dashboard, a Domain, or exploring data in OLAP, so they are not affected by the lack of session persistence in those cases. However, web service calls are affected in the following case:

- Report execution - All asynchronous API calls for running and exporting reports rely on the large JasperPrint object that cannot be persisted. When the server restarts, the asynchronous calls will return errors because the reports could not be saved in the session. Your application needs to detect this error and include code for re-running the report.

JasperReports Server also supports session replication between multiple instances of the server in a cluster. However, session replication has the same limitations because it is based on session persistence. For more information, see the *JasperReports Server Ultimate Guide*.

The following procedure gives the configuration in JasperReports Server and the Apache Tomcat application server to enable session persistence. For other application servers, refer to that server's documentation.

To configure JasperReports Server and Apache Tomcat for session persistence:

1. Edit the file <web-app>/META-INF/context.xml to comment out the Manager property as follows:

```
<!-- Manager pathname="" /-->
```

2. Edit the file <web-app>/WEB-INF/web.xml to make the following changes.

   a. Locate the listener of class `RequestContextListener` and replace it with the listener of class `TolerantRequestContextListener`. The new listener class is given in comments that you need to uncomment as follows:

```
    <listener-class>com.jaspersoft.jasperserver.core.util.TolerantRequestContextListener
        </listener-class>
    <!--listener-class>org.springframework.web.context.request.RequestContextListener
        </listener-class-->
```

   b. Locate the `ClusterFilter` that is given in comments and uncomment it as follows:

```
<filter>
    <filter-name>ClusterFilter</filter-name>
    <filter-class>com.jaspersoft.jasperserver.war.TolerantSessionFilter</filter-class>
</filter>
```

c. Locate the corresponding mapping for the `ClusterFilter` and uncomment it as well. You must also uncomment the `<distributable>` element below it as follows:

```
<filter-mapping>
    <filter-name>ClusterFilter</filter-name>
    <url-pattern>/*</url-pattern>
</filter-mapping>
<distributable/>
```

3. Add the following property to your JVM environment:

```
-Dorg.apache.catalina.session.StandardSession.ACTIVITY_CHECK=true
```

4. Restart your Apache Tomcat application server.

8.4 Configuring Ad Hoc

Ad Hoc functionality is only available to JasperReports Server Professional edition users.

Ad Hoc settings help you fine-tune the Ad Hoc Editor and the views it creates. You must be logged in as a user with `ROLE_SUPERUSER` to manage the Ad Hoc settings and cache. This section covers the following ways to configure Ad Hoc:

- **Ad Hoc Query Settings**
- **Ad Hoc Data Policies**
- **Ad Hoc Data Policies for Big Data**
- **Ad Hoc Templates and Report Generators**
- **Ad Hoc Configuration File**
- **Ad Hoc Cache Management**
- **Ad Hoc OLAP Filter Configuration**

8.4.1 Ad Hoc Query Settings

The Ad Hoc settings apply to Ad Hoc views based on Topics or Domains. Ad Hoc views based on OLAP connections use the OLAP settings described in the *Jaspersoft OLAP User Guide*.

The Ad Hoc settings includes the following:

- General Settings to modify the Ad Hoc editor user interface:
  - **Configure View Query**. Determines whether users can see a button in the Ad Hoc Editor to display the SQL or MDX query generated for the view. This can be useful for advanced users, but you should consider your data security before enabling this. System admins can always view queries in the Ad Hoc Cache (see **8.4.6, "Ad Hoc Cache Management," on page 180**).
  - **Display Null as Zero**. Determines the appearance of null values in crosstabs and time-series charts. By default, this setting is disabled and null values are displayed as empty cell in crosstabs or missing

points in time series charts (thus causing irregular intervals). When checked, null values are displayed as zero in crosstabs and in time-series (creating regular intervals). Regardless of this setting, null values are always displayed as zero in all other chart types.

- Query Limits to preserve resources used by queries when Ad Hoc views are designed and run:
    - **Ad Hoc Filter List of Values Row Limit**. The maximum number of items that should be displayed in the Condition Editor when a user defines filters for an Ad Hoc view that is based on a Domain. If this limit is exceeded when users define filters, JasperReports Server displays a message to that effect. Setting this to a lower value can improve performance.
    - **Ad Hoc Dataset Row Limit**. The maximum number of rows that an Ad Hoc view will request in a query. Be aware that JasperReports Server truncates the data displayed in the report when the limit is reached. Setting this to a lower number may improve performance, but your reports may not reflect the full data set.
    - **Ad Hoc Query Timeout**. The number of seconds the server should wait before timing out an Ad Hoc view while running its query. Setting this to a lower number may prevent exceptions when users run Ad Hoc views. Setting this to a higher number may prevent complex calculations from timing out, but may use more database connections.
- Data Policies that determine how JasperReports Server handles data loading and processing for certain kinds of Ad Hoc views. See **Ad Hoc Data Policies** in the next section.

To configure the Ad Hoc query settings:

1. Log in as system administrator (`superuser` by default).
2. Select **Manage > Server Settings** and choose **Ad Hoc Settings** in the left-hand panel.
3. Set the configuration values as described above.
4. Click **Change** beside each value you modified to make your changes effective. Or click **Cancel** to reset it to the previously saved value.

As of JasperReports Server version 5.0, Ad Hoc settings made through the user interface are persistent, even when the server is restarted. For details, see **“Configuration Settings in the User Interface” on page 168**.

8.4.2 Ad Hoc Data Policies

Data snapshots, described in sections **3.2.5 on page 48** and **8.5 on page 186**, apply only to reports displayed in the report viewer. This section covers data policies that only apply to views in the Ad Hoc Editor.

Data policies determine how data is cached and where certain calculations occur. All Ad Hoc work is based on a query, either from a Domain or Domain Topic, or from the JRXML of a plain Topic. Data policies determine whether the Ad Hoc engine uses the query as-is and process the data in memory, or whether it rewrites the query so that the database processes data and returns only what Ad Hoc needs to display.

By default, the data accessed by Domain-based reports is grouped, sorted, and aggregated in the database, rather than having the server process it in memory. By doing so, the server retrieves only the columns that appear in the report rather than the entire set of fields in the Domain. As of JasperReports Server 5.5, calculated fields are also processed by the database. For Topic queries based on JDBC (and JNDI) data sources, the default behavior is to request the entire result set and process the columns for display in memory. Note that independent check boxes control the behavior: one for Domains and another for JDBC data sources.

When these check boxes are cleared, the server loads the entire set of fields associated with a Domain or Topic into memory, and then applies the necessary calculations, grouping, sorting, and aggregation. This is also the case for Ad Hoc views that do not rely on Domains or JDBC data sources; in these cases, the server processes the data in memory.

Generally, Jaspersoft recommends that these settings be enabled, especially when working with large datasets. In deciding whether JasperReports Server should process the data in memory or push that processing to the database, consider these factors:

- The size and complexity of your reports. Reports with calculated fields, complex sorting, grouping, or aggregation may perform better when the server optimizes the queries so that the database performs the work.
- The amount of data in your data sources. If your data sources include a great deal of data, reports against them may perform better when the server optimizes the queries.
- The number of users editing and running Ad Hoc views. If you have a large number of users creating and running Ad Hoc views, performance may be better when the server optimizes the queries. Implementations with fewer users may perform better when the options are disabled.
- The performance characteristics of your data source. If the database or other source of data is tuned for maximum performance, Ad Hoc views may perform better when the server optimizes the queries.
- If your data source is hosted by MySQL, Jaspersoft recommends that you keep the default (unchecked) for the **Optimize Queries for JDBC-based Reports** setting. MySQL has poor performance with the nested queries that this setting would generate.
- The amount of memory allocated to JasperReports Server's Java Virtual Machine (JVM). If the JVM of the application server hosting JasperReports Server is allocated plenty of memory, Ad Hoc views may perform better when JasperReports Server optimizes the queries. This is especially true if your data source tends to be slow.

To decide whether JasperReports Server should optimize queries for Ad Hoc views, Jaspersoft recommends disabling the settings, opening and saving some representative reports, and testing their performance. If the performance improves, leave the settings disabled and open and save the remaining reports.

The data polices that you can set are:

- **Optimize Queries for JDBC-based Reports**. When checked, Ad Hoc rewrites the query to calculate, filter, group, sort, and aggregate columns when using Topics based on JDBC and JNDI data sources. Otherwise, the queries run unaltered and calculated fields, filtering, grouping, sorting, and aggregation take place in memory.
- **Optimize Queries for Domain-based Reports**. When checked, Ad Hoc rewrites the query to calculate filter, group, sort, and aggregate columns when using Domains or Domain Topics. Otherwise, the queries run unaltered and calculated fields filtering, grouping, sorting, and aggregation take place in memory.

These data policy settings do not retroactively update the existing reports created from Ad Hoc views in your repository. To change the data policy for an existing report, select the appropriate policy setting, open the corresponding view in the Ad Hoc Editor, and save the report again.

To configure the Ad data policies:

1. Log in as system administrator (`superuser` by default).
2. Select **Manage > Server Settings** and choose **Ad Hoc Settings** in the left-hand panel.
3. Select **Optimize Queries for JDBC-based Reports** to optimize and rewrite queries for JDBC-based Topics.

4. Select **Optimize Queries for Domain-based Reports** to optimize and rewrite queries for Domain-based reports.
5. Click **Change** beside each value you modified to make your changes effective. Or click **Cancel** to reset it to the previously saved value.

As of JasperReports Server version 5.0, Ad Hoc settings made through the user interface are persistent, even when the server is restarted. For details, see **"Configuration Settings in the User Interface" on page 168**.

8.4.3 Ad Hoc Data Policies for Big Data

When handling large datasets (big data) from a Domain source in the Ad Hoc Editor, fields summarized by distinct count are computationally intensive. You can speed up the display of your data by requesting distinct count calculations from the data source, as opposed to performing the calculations in memory. Database servers are usually optimized for these calculations, which improves the overall performance of the Ad Hoc Editor.

Ad Hoc for Big Data		
Configuration File		
.../WEB-INF/applicationContext-adhoc.xml		
Property	**Bean**	**Description**
`calcMethod`	`Distinct Count`	Change this property from value="sqlGroupBy" (the default) to value="sqlUnionAll". The UnionAll is the modified query that provides distinct count computed by the database.

After making this change, redeploy the JasperReports Server web app or restart the application server.

Performing distinct count aggregates in the database applies only in the following cases:

- Crosstabs based on Domains contain measures aggregated by distinct count.
- Tables based on Domains contain groups aggregated by distinct count, but no detail rows.

This setting has no effect when there is a row or column group involving a time, timestamp, or date. In this case, Ad Hoc performs the distinct count summary calculations in memory, regardless of the `calcMethod` setting.

8.4.4 Ad Hoc Templates and Report Generators

JasperReports Server5.5 introduced Ad Hoc templates and report generators. Ad Hoc templates are JRXML files in the repository that define the format for reports generated from Ad Hoc views. Report generators are custom beans that create custom output from Ad Hoc views.

In the user interface, users can select either the default template, browse for a different template, or select a report generator, if any are defined. For more information about the report template interface, see the JasperReports Server User Guide. This section explains how to configure these controls.

8.4.4.1 Changing the Default Ad Hoc Template

The default Ad Hoc template creates a report that resembles the Ad Hoc user interface. It is meant for online viewing and does not restrict the size of the contents for printing. To set a different template, modify the following property:

Default Ad Hoc Template		
Configuration File		
.../WEB-INF/applicationContext-adhoc.xml		
Property	**Bean**	**Description**
`defaultTemplateUri`	`util:map id="reportGeneratorDefaultConf"`	Specify the repository path of your new default template. Make sure the template has permissions so that it is accessible to all users. The default value is /public/templates/actual_size.510.jrxml.

8.4.4.2 Modifying the Ad Hoc Template Folders

Ad Hoc templates must be uploaded to specific folders in the repository. The default folders are /templates (in every organization) and /public/templates. To set different folders, modify the following property:

Ad Hoc Template Folders		
Configuration File		
.../WEB-INF/applicationContext-adhoc.xml		
Property	**Bean**	**Description**
`templateURIParentSQLPatternList`	`adhocEngineService`	Add, change, or remove the values in this list to specify the folders in the repository where the server looks for Ad Hoc templates.

The default Ad Hoc template locations contain the default template. If you move or delete those folders in the repository, be sure to update the definition of the default Ad Hoc template as described in the previous section.

Also, organization templates include the adhoc/templates folder so that it appears in every new organization. You should update all organization templates if you change or remove the %/templates value. For more information, see **Default Folders for Organizations**.

8.4.4.3 Adding Ad Hoc Report Generators

By default, the server has no custom report generators defined, and none appear in the user interface.

To add a custom report generator:

1. Create a Java class that implements the com.jaspersoft.ji.adhoc.service.AdhocReportGenerator interface.
2. Compile the class and place the resulting JAR file in <js-webapp>/WEB-INF/lib.
3. Open the file .../WEB-INF/applicationContext-adhoc.xml for editing and register your class as a Spring bean as shown in the following example:

```
<bean id="myCustomReportGenerator" class="com.example.myCustomReportGenerator">
    <property name="id" value="my-custom-generator"/>
    <property name="..." value="..."/>
    ...
</bean>
```

4. In the same file, update the `reportGeneratorFactory` bean to include your custom generator bean:

```
<bean id="reportGeneratorFactory" class="com.-
jaspersoft.ji.adhoc.service.ReportGeneratorFactoryImpl">
    <property name="reportGenerators">
        <list>
            <ref bean="myCustomReportGenerator" />
            <!--<ref bean="actualSizeReportGenerator" />-->
            <!--<ref bean="letterPortraitReportGenerator" />-->
            <!--<ref bean="letterLandscapeReportGenerator" />-->
            <!--<ref bean="a4PortraitReportGenerator" />-->
            <!--<ref bean="a4LandscapeReportGenerator" />-->
        </list>
    </property>
</bean>
```

5. Edit the .../WEB-INF/bundles/adhoc_messages.properties file to add a UI label for your custom generator. The key has the form ADH_REPORT_GENERATOR_<generator-id>. Add the same key to other language bundles if you want to support other languages.

```
    ADH_REPORT_GENERATOR_my-custom-generator=Corporate Template
```

6. Restart the server or redeploy the JasperReports Server web app. The label for your custom generator appears in the list of report generators when users create and save a report from an Ad Hoc view.

8.4.5 Ad Hoc Configuration File

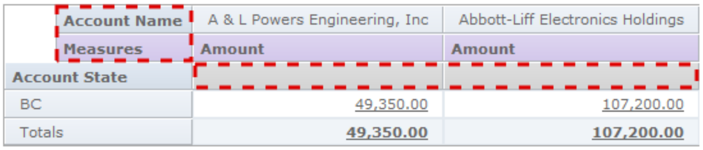
The following properties are among those that can be configured in the WEB-INF/applicationContext-adhoc.xml file:

Table 8-1 Configurable Properties in WEB-INF/applicationContext-adhoc.xml

Property	Description
`JrxmlScriptURI`	The location in the file system of the state2jrxml.js script, which generates the JRXML report based on the current Ad Hoc Editor selections. By default, this file is located in the /adhoc folder of the repository.

`realmsURI` and `realmsURIParent`
`SQLPatternList`
	The repository locations where Topics should reside. The defaults are /adhoc/topics and /public/adhoc/topics.

`defaultTheme`	The name of the default style for Ad Hoc views. This name must match a style defined in both a CSS and a JRXML file. The default is `default`.

<table>
<tr><th>Property</th><th>Description</th></tr>
<tr><td><code>aruFolder</code></td><td>The repository location where users are allowed to save their Ad Hoc views. The default is /. This allows your users to save Ad Hoc views anywhere. If you have a folder specifically for user content, specify this folder; for example, /userviews.</td></tr>
<tr><td><code>tempFolderName</code></td><td>The repository location where JasperReports Server saves reports created from Ad Hoc views. The default is /temp relative to root and to every organization.
The server allows users with ROLE_ADMINISTRATOR or ROLE_SUPERUSER to view the temporary folders and their contents. The server manages these temporary files automatically, but files may accumulate in certain cases. As part of regular maintenance, you should periodically delete the files in these folders.</td></tr>
<tr><td><code>maxSafeGroupMembers</code></td><td>The maximum number of row groups or column groups a crosstab can display before the editor prompts the user for confirmation. This limit is a safeguard to avoid performance issues when grouping a field with too many values. The default is 100. Set it higher to allow more groups to appear without prompting users.</td></tr>
<tr><td><code>createColumn CrosstabHeaders</code></td><td>This property is located in the <code>actualSizeReportGenerator</code> bean. With the default setting of <code>false</code>, column group headers appear in the Ad Hoc view but not in the report generated from the view (this is the historical behavior). When set to <code>true</code>, column group headers appear in both the Ad Hoc view and in the generated report. When column group headers are included in a crosstab, an extra row is added below the column headers for spacing.

<table>
<tr><td>Account Name</td><td>A &amp; L Powers Engineering, Inc</td><td>Abbott-Liff Electronics Holdings</td></tr>
<tr><td>Measures</td><td>Amount</td><td>Amount</td></tr>
<tr><td>Account State</td><td></td><td></td></tr>
<tr><td>BC</td><td>49,350.00</td><td>107,200.00</td></tr>
<tr><td>Totals</td><td>49,350.00</td><td>107,200.00</td></tr>
</table></td></tr>
</table>

The repository URI locations are relative to each and every organization in the server instance. For example, for a user in the default organization, the URI /adhoc actually refers to /organizations/organization_1/adhoc.

8.4.6 Ad Hoc Cache Management

The Ad Hoc cache applies to Ad Hoc views based on Topics or Domains, and any reports generated from those Ad Hoc views. Ad Hoc views based on OLAP connections use the OLAP cache. For a comparison of the two caches, see **"Comparison with Jaspersoft OLAP" on page 184**. For instructions on setting the OLAP cache, see the *Jaspersoft OLAP User Guide*.

JasperReports Server can temporarily cache ad hoc query result sets for re-use. The cache is populated by the data that results from queries when creating or running Ad Hoc views. The datasets are uniquely identified by a key that references the query itself, the data source URI, and parameters used when the query was issued.

Caching reduces database loads and delivers frequently-used datasets to the user quickly. Caching applies when reports are created as well as when they are run. JasperReports Server version 5.0 introduces a new cache implementation called Ehcache that allows the administrator to view cache entry memory size and set limits on memory usage. You can configure the Ad Hoc cache to optimize memory usage and response time for your usage patterns.

8.4.6.1 Setting the Cache Granularity

By default, datasets for each user are cached separately; a parameter in the cache key identifies the user. This per-user caching can result in duplicate datasets when different users run the same query, impairing performance. You can configure JasperReports Server to share cached datasets across users by editing the /WEB-INF/applicationContext-datarator.xml file.

The following code configures the `cacheKeyInterceptor` bean to ignore logged-in users' credentials when creating the cache keys:

```
<property name=”ignoredParameters”>
    <list>
        ...
        <value>LoggedInUser</value>
        <value>LoggedInUsername</value>
    </list>
</property>
```

Restart JasperReports Server after saving the modified file.

8.4.6.2 Configuring the Cache

Caching improves overall performance of data retrieval and sorting, but unused datasets can consume memory and cached data can become stale. To address these concerns, the cache automatically removes datasets periodically. By default, datasets are removed from the cache if they are not accessed for 30 minutes. They are also cleared after 90 minutes, regardless of how recently they were accessed.

To configure the frequency with which the cache is automatically cleared, edit the following configuration file:

Ad Hoc Cache Expiration		
Configuration File		
.../WEB-INF/adhoc-ehcache.xml		
Property	**Default Value**	**Description**
`maxBytesLocalHeap`	`300m`	The maximum memory usage of the entire cache, by default 300 MB. Use `k` for kilobytes, `m` for megabytes, and `g` for gigabytes. If left unbounded, the Ad Hoc cache can use up all available memory in your JVM. Set this value according to your server's available memory, the size of your datasets, and the number of cache entries you expect based on concurrent Ad Hoc usage and the time settings below. Jaspersoft recommends setting this value to about half of the maximum heap size you configured for the JVM (-Xmx setting).

Ad Hoc Cache Expiration		
`timeToIdleSeconds`	`1800`	The number of seconds to wait after a dataset is has been accessed before removing it from the cache. The default is equivalent to 30 minutes. Use 0 (zero) for no limit.
`timeToLiveSeconds`	`5400`	The maximum time that a dataset is stored in the cache, even if it is being repeatedly accessed. Ensures that stale data is periodically replaced. The default is equivalent to 90 minutes. Use 0 (zero) for no limit.

Restart JasperReports Server after modifying these values.

8.4.6.3 Manually Clearing the Cache

Administrators can also use the server interface to view the queries whose datasets are in the cache. Administrators can see the full query but never the contents of the dataset. The Ad Hoc cache page also displays performance data about each query. This information can be helpful when trying to resolve performance issues. The interface displays several values for every query:

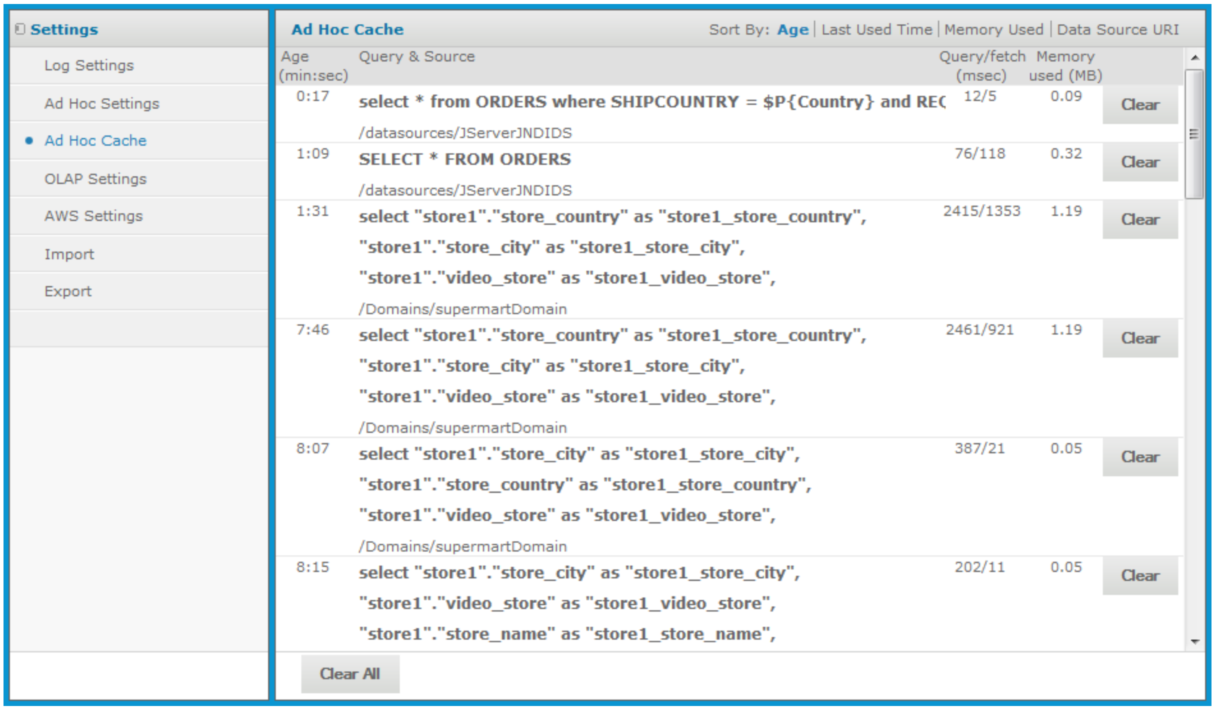
- Age (min:sec) – Time since the dataset was first stored in the cache.
- Query (msec) – Time in milliseconds from when query was sent to the data source (database) until the first row was received.
- Fetch (msec) – Time in milliseconds from when first row was received from the data source (database) until the last row was received.
- Memory used (MB) – Size in megabytes of the resulting dataset being stored in the cache entry.

The Ad Hoc cache page also allows administrators to manually remove datasets if necessary. Removing a dataset from the cache forces the server to get fresh data the next time a user creates or runs an Ad Hoc view with that query.

To view queries and manually clear the Ad Hoc cache:

1. In JasperReports Server, log in as system administrator (`superuser` by default).
2. Click **Manage > Server Settings** and choose **Ad Hoc Cache** in the left-hand panel.

   The Ad Hoc Cache page appears, displaying all the datasets that are in the cache, sorted by age.



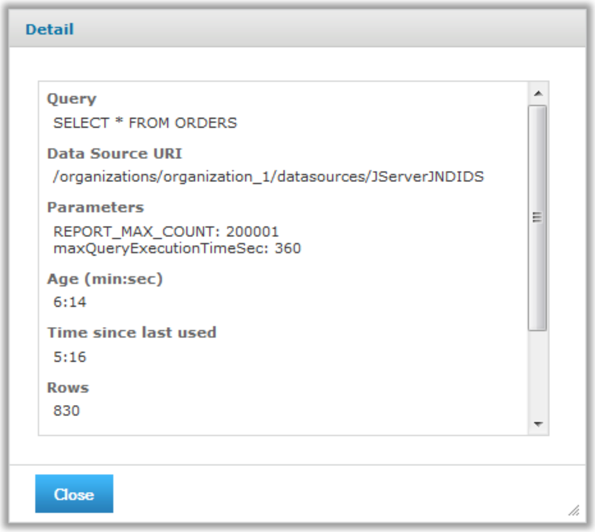
Age (min:sec)	Query & Source	Query/fetch (msec)	Memory used (MB)	
0:17	select * from ORDERS where SHIPCOUNTRY = $P{Country} and REC /datasources/JServerJNDIDS	12/5	0.09	Clear
1:09	SELECT * FROM ORDERS /datasources/JServerJNDIDS	76/118	0.32	Clear
1:31	select "store1"."store_country" as "store1_store_country", "store1"."store_city" as "store1_store_city", "store1"."video_store" as "store1_video_store", /Domains/supermartDomain	2415/1353	1.19	Clear
7:46	select "store1"."store_country" as "store1_store_country", "store1"."store_city" as "store1_store_city", "store1"."video_store" as "store1_video_store", /Domains/supermartDomain	2461/921	1.19	Clear
8:07	select "store1"."store_city" as "store1_store_city", "store1"."store_country" as "store1_store_country", "store1"."video_store" as "store1_video_store", /Domains/supermartDomain	387/21	0.05	Clear
8:15	select "store1"."store_city" as "store1_store_city", "store1"."video_store" as "store1_video_store", "store1"."store_name" as "store1_store_name",	202/11	0.05	Clear

Figure 8-4 Ad Hoc Dataset Caching Administration Page

As shown in **Figure 8-4**, each dataset is listed by its corresponding query and data source. Recall that Ad Hoc Topics have user-defined queries, so they tend to be short, whereas the query for Domains are generated from the design of the Domain and user selections in the Data Chooser dialog. The Ad Hoc Cache page only displays the first few lines of a query, as well as the data source.

3. To remove all datasets, click **Clear All** at the bottom of the Ad Hoc Cache page. This also clears the Teiid cache used by virtual data sources, including a virtual data source that wraps a data source for big data.
4. To remove a specific dataset from the cache, and click **Clear** beside the corresponding query.
5. To find a specific cache entry, you can change the sorting in the upper-left by clicking **Age**, **Last Used Time**, **Memory Used**, or **Data Source URI**.
6. To view the details of a specific query, including the full query string, click the query itself in the Query & Source column.

   The Detail page appears, displaying additional information for the selected query, such as the number of rows in the cached dataset.



Query
SELECT * FROM ORDERS

Data Source URI
/organizations/organization_1/datasources/JServerJNDIDS

Parameters
REPORT_MAX_COUNT: 200001
maxQueryExecutionTimeSec: 360

Age (min:sec)
6:14

Time since last used
5:16

Rows
830

Figure 8-5 Typical Dataset in Ad Hoc Cache

8.4.6.4 Comparison with Jaspersoft OLAP

The following table contrasts the key features of the Ad Hoc cache in JasperReports Server and Jaspersoft OLAP.

Table 8-2 Ad Hoc Caching in JasperReports Server and Jaspersoft OLAP

Cache Feature	JasperReports Server	Jaspersoft OLAP
Structure of cache	Result caches are held at the query level: query text and language, plus data source URI and query parameters.	Result caches are held at the analysis connection level: schema plus database connection.
Sharing	Not by default, but can be enabled as described in **Setting the Cache Granularity**, above.	There is only one cache; it is shared across all queries and users.
Security	Applied to cache control so that users are not allowed to see privileged data.	
Populating	Queries populate the cache. You can also schedule reports to pre-populate the cache during off-hours.	
Size	Limited by available JVM memory (heap). Not configurable. Running out of memory is unusual. It can only happen if a single query returns too many elements for available memory. The report fails with an out-of-memory error.	

Cache Feature	JasperReports Server	Jaspersoft OLAP
Automatic time-based cache policy	Configurable, as described in **Configuring the Cache** above.	In low-memory situations, cached items are removed automatically by JVM garbage collection; the least-recently-used items are cleared first. There is no way to remove data based on how long it has been in memory.
Clearing selected datasets manually	Configurable, as described in section **Manually Clearing the Cache** above.	Cache regions can be defined and cleared programmatically with APIs.
Clearing all datasets manually	Configurable, as described in **Manually Clearing the Cache** above.	In JasperReports Server, select **Manage > Server Settings**, then select **OLAP Settings** and click **Flush OLAP Cache**. For additional methods, see the *Jaspersoft OLAP Ultimate Guide*.

8.4.6.5 Disabling the Ad Hoc Cache

Disabling either cache is a server-wide setting that applies to all data sources or connections used in any Ad Hoc view. Make sure that other views aren't negatively affected by this change.

There are two reasons to consider disabling the Ad Hoc cache:

- You have a high-performance database that returns results so fast that additional caching in the server does not improve response times. In this case, the slight overhead of the cache may actually impact performance.
- Your database manages real-time data, and you create Ad Hoc views that present up-to-the-minute information from this data source. In this case, you do not want to retrieve old data out of the cache.

To disable the Ad Hoc cache for Topics and Domains, set the value of `maxBytesLocalHeap` to 1 (1 byte). For instructions, see **"Configuring the Cache" on page 181**. This effectively turns off the cache so that every query is retrieved directly from the data source.

To disable the OLAP cache for OLAP connections used in the Ad Hoc Editor, check the `mondrian.rolap.star.disable-Caching` setting on the **Manage > Server Settings > OLAP Settings** page. For more information, see the *Jaspersoft OLAP User Guide*.

In addition, if you have modified any of these three properties in applicationContext-adhoc.xml, set them back to false:

```
<property name="applyQueryFilterInMemory" value="false"/>

<property name="applySecurityFilterInMemory" value="false"/>

<property name="applyDynamicFilterInMemory" value="false"/>
```

8.4.7 Ad Hoc OLAP Filter Configuration

When using filters in Ad Hoc OLAP, the server queries the database to display a list of values to select from. To avoid performance issues, there is a limit on the number of items in a filter. By default, the limit is 250 possible values.

If your filters reach this limit and your list of values is truncated, you should first consider using a different filter operation. For example, instead of “city is one of <list>,” use “City starts with <letter>.” If you still need to change this limit, modify the following property:

Ad Hoc OLAP Filter Limit		
Configuration File		
.../WEB-INF/applicationContext-adhoc-dataStrategy.xml		
Property	**Bean**	**Description**
`maxFilterValues`	`mdxDataStrategy`	Set the value to the maximum number of filter values you expect. Setting this value higher than the default of 250 may cause performance issues.

8.5 Enabling Data Snapshots

The data snapshot feature was introduced in JasperReports Server release 4.7 to store report data in the server. Data snapshots create a significant change in the user experience:

- Without data snapshots – Whenever users run a report, the server queries the data source and displays the latest data. When the same report is run over and over, the data source is often returning the same data each and every time. This is the behavior of all releases prior to 4.7, and the default behavior of release 4.7.
- With data snapshots – The first time a report runs, it queries the data source and stores a copy of the data with the report in the repository. Users who view the report later see the data from the saved snapshot, not from querying the data source. Reports accessed through web service APIs are also based on the saved snapshot. For large reports or frequently viewed reports, the persisted snapshot provides a significant performance gain and reduces load on your data sources. Every user who has access to the report will see the data from the same snapshot. For users who require it, the report viewer provides a button to manually refresh the data snapshot anytime. In addition, when the scheduler runs a job on a report it always updates the snapshot. Data snapshots are implemented in JasperReports Server 4.7, but must be enabled manually.

Jaspersoft encourages enabling data snapshots with the following recommendations:

- If you have a new installation of JasperReports Server, then enable snapshots to get the full server functionality. In the future, persistent data snapshots may be enabled by default.
- If you are upgrading from a release prior 4.7, first proceed with the upgrade procedure and verify the outcome, as instructed in the *JasperReports Server Installation Guide*. Then, before enabling data snapshots, notify your users about this new functionality.
- Data snapshots are stored in the server’s repository, which must be sized accordingly. If you have a large number of reports, or very large reports, consider the performance of your repository database before enabling snapshots. If your users rely on data that changes frequently or if they expect to see real-time data when opening a report, do not enable snapshots. Alternatively, you can enable snapshots selectively as described below.

8.5.1 Global Data Snapshot Configuration

The server-level settings determines whether the snapshot feature is available or not on the server:

Data Snapshots Server-Level Configuration		
Configuration File		
.../WEB-INF/applicationContext-data-snapshots.xml		
Property	**Bean**	**Description**
`snapshot Persistence Enabled`	`dataSnapshot Service`	When set to `true`, it allows the JasperReports Server report viewer to save data snapshots in the repository and open them the next time the report is run. By default, this is set to `false`.

There is also a property named `snapshotRecordingEnabled` that caches a snapshot in the report viewer memory when sorting and filtering columns interactively. This allows the report viewer to refresh the display without querying the database every time. Regardless of persistence, `snapshotRecordingEnabled` improves report viewing performance and decreases database load, and thus should remain set to `true`.

8.5.2 Report-Level Data Snapshot Configuration

At the report level, the following property can be specified to disable snapshots on a specific report by setting the following property in the report's JRXML:

```
net.sf.jasperreports.data.cache.persistable=false
```

This report-level property depends on the snapshot mechanism in JasperReports Server. This property has no effect in other report viewers without such a mechanism, such as the viewer integrated in Jaspersoft iReport Designer.

There are two ways to control snapshots at the report level. In the case above:

- Data snapshots are enabled on the server, so most reports use them.
- If there are a few reports that do not benefit from data snapshots, those reports can explicitly disable snapshots in their own JRXML.

As with all report-level properties, you may set server-wide default values, as described in **Configuring JasperReports Library**:

Data Snapshots Default Report-Level Configuration	
Configuration File	
.../WEB-INF/classes/jasperreports.properties	
Property	**Description**
`net.sf.jasperreports.data.cache.persistable=false`	When set to `false`, the server-wide default for reports is to not use data snapshots, however, they are still available if a report overrides this value to true in its own JRXML.

Because the report-level property take precedence over the server-level property, this enables a second way to control snapshots:

- Data snapshots are enabled on the server.
- But the server-wide default is set to false, so most reports do not use them.
- If there are a few reports that benefit from data snapshots, those reports can explicitly enable snapshots in their own JRXML with:

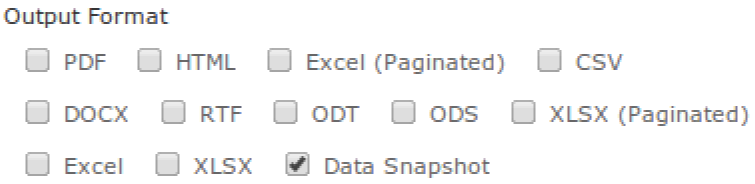
```
net.sf.jasperreports.data.cache.persistable=true
```

8.5.3 Data Snapshots in the Scheduler

Scheduled jobs always run the report by accessing the data source, and so they have up-to-the-minute data when they generate output. When data snapshots are enabled on reports, the job always updates the data snapshot with this new data after it runs. In this way, when you schedule a report, it also refreshes the data snapshot periodically, whether hourly, daily, weekly, or whatever suits your data requirements.

When data snapshots are enabled on the server, the scheduler interface has an extra option to output the data snapshot. Selecting this option, as shown in the following figure, generates a copy of the report with the new data snapshot. This copy is stored in the repository as a JasperReport, identical to the report being run. Over time, this will create an archive of your report data.

If you clear the Data Snapshot Output Format option, no copy of the report is saved with the new data snapshot, but the data snapshot on the original report is still updated when the job runs. Also, you must select at least one other output format in order to schedule the report.



Output Format

□ PDF □ HTML □ Excel (Paginated) □ CSV

□ DOCX □ RTF □ ODT □ ODS □ XLSX (Paginated)

□ Excel □ XLSX ☑ Data Snapshot

Figure 8-6 The Data Snapshot Output Option in the Scheduler

Finally, when data snapshots are enabled, you can also update them through REST web services calls. When specifying the report to run with the rest_v2/reportExecutions service, you can add arguments to explicitly update or not update the associated data snapshot. For more information, see the *JasperReports Server Web Services Guide*.

8.6 Configuring System Logs

This section describes the settings that control the information JasperReports Server writes to its logs.

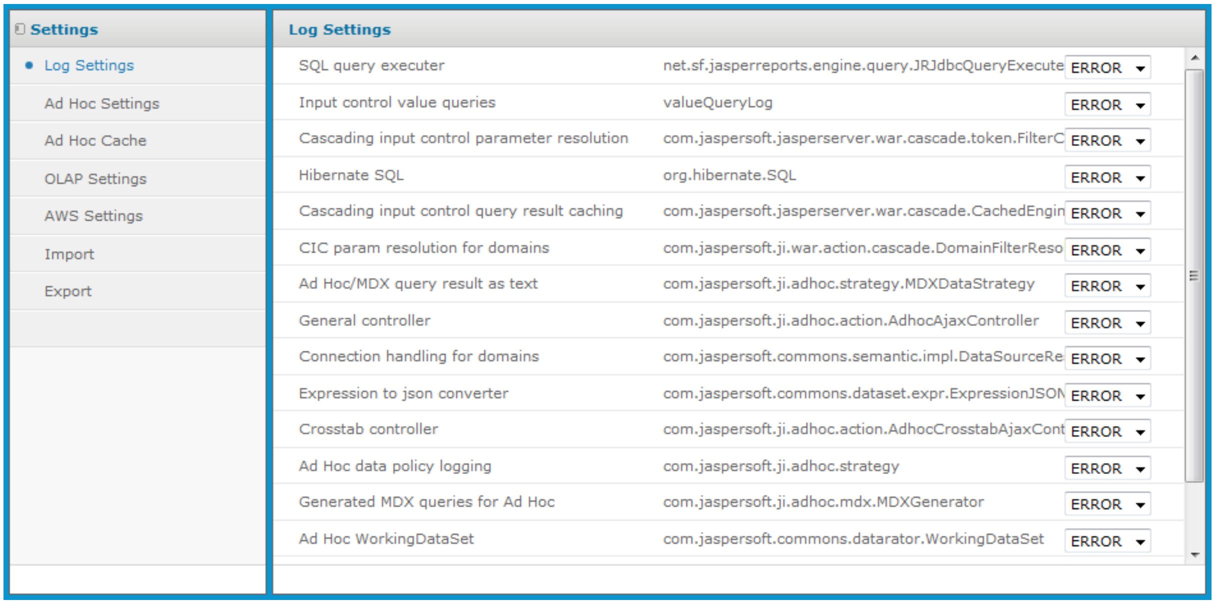
The log files contain important information about how the server is running. JasperReports Server uses the Apache log4j package to generate log files. Jaspersoft uses the slf4j facade to wrap log4j.

- The default log file is WEB-INF\logs\jasperserver.log.
- The default log configuration file is WEB-INF\log4j.properties.

8.6.1 Managing Log Settings

To set the current logging levels:

1. Log in as system administrator (`superuser` by default).
2. Select **Manage > Server Settings** and choose **Log Settings** in the left-hand panel.
3. In the Log Settings panel that appears, use the drop-down selectors to change the log level for each class being logged.



SQL query executer	net.sf.jasperreports.engine.query.JRJdbcQueryExecute	ERROR
Input control value queries	valueQueryLog	ERROR
Cascading input control parameter resolution	com.jaspersoft.jasperserver.war.cascade.token.FilterC	ERROR
Hibernate SQL	org.hibernate.SQL	ERROR
Cascading input control query result caching	com.jaspersoft.jasperserver.war.cascade.CachedEngin	ERROR
CIC param resolution for domains	com.jaspersoft.ji.war.action.cascade.DomainFilterReso	ERROR
Ad Hoc/MDX query result as text	com.jaspersoft.ji.adhoc.strategy.MDXDataStrategy	ERROR
General controller	com.jaspersoft.ji.adhoc.action.AdhocAjaxController	ERROR
Connection handling for domains	com.jaspersoft.commons.semantic.impl.DataSourceRe	ERROR
Expression to json converter	com.jaspersoft.commons.dataset.expr.ExpressionJSON	ERROR
Crosstab controller	com.jaspersoft.ji.adhoc.action.AdhocCrosstabAjaxCont	ERROR
Ad Hoc data policy logging	com.jaspersoft.ji.adhoc.strategy	ERROR
Generated MDX queries for Ad Hoc	com.jaspersoft.ji.adhoc.mdx.MDXGenerator	ERROR
Ad Hoc WorkingDataSet	com.jaspersoft.commons.datarator.WorkingDataSet	ERROR

Figure 8-7 System Log Settings

The page lists some of the currently-enabled loggers (ones that typically need their logging levels adjusted from time to time) with their logging level. Any change to the logging levels takes effect immediately, without restarting JasperReports Server.

These logging levels override the levels in the log4j.properties file. As of JasperReports Server version 5.0, these settings will persist even when the server is restarted. Therefore the values on the Log Settings page that are in effect on the server may differ from settings in the log4j.properties file. For details, see **"Configuration Settings in the User Interface" on page 168**.

The four logging levels indicate the type of event that is recorded by a logger:

Setting	Level of Information
ERROR	Writes minimal information to the log describing serious program faults.
WARN	Writes error and warning messages to the log. Warning messages contain cautionary information to help you to decide whether the logged events require your attention.

Setting	Level of Information
INFO	Writes error, warning, and informational messages to the log. Informational messages describe significant events, such as those that affect application performance.
DEBUG	Writes error, warning, informational, and additional messages to the log. Debug messages are very detailed and often voluminous. Use this setting only to diagnose a problem. DEBUG can impact system performance and should not be used in production environments. If several loggers are set to DEBUG, the server may generate huge logs, and performance can suffer.

JasperReports Server's default root logger setting is ERROR, as configured in log4j.properties. A logger that does not have an assigned value inherits the setting of its parent in log4j.properties.

The following table lists each logger name as it appears on the Log Settings page, the identifier to use to find a particular log in the log file, and a description of the logger.

Logger Name	Identifier in Log	Description
SQL query executer	JRJdbcQueryExe cuter	Logs SQL text and parameter values for queries that are run by the SQL query executer.
Input control value queries	valueQueryLog	Logs SQL text and parameter values for queries associated with input controls.
Cascading input control parameter resolution	FilterCore	Logs activity associated with cascading input controls. Query-driven input controls can cascade when a query has a parameter whose value comes from another input control. When the parameter value is changed, the query is automatically rerun, possibly changing the list of values for its input control.
Cascading input control query result caching	TokenControlLogic	Logs use of the cache for results of cascading input control queries.
Hibernate SQL	SQL	Logs SQL run by the Hibernate layer to access the JasperReports Server repository database. This logger generates a large volume of logging that could affect performance.
Ad Hoc data policy logging	CommonDomain-DataStrategy SubFilterInputControl-Generator Others	Logs various activities of the Ad Hoc data policy implementations, which use SQL queries or in-memory operations to get datasets for Ad Hoc views.
SQL generated for Domain queries	JdbcBaseDataSet	Logs SQL queries generated from queries using a Domain.

Logger Name	Identifier in Log	Description
Connection handling for Domains	DataSourceResolverImpl	Logs use of JDBC connections used by Domains to run SQL queries.
Expression to JSON converter	ExpressionJSON Converter	Logs information about the conversion between DomEL and JSON, which is used by Ad Hoc filters.
Domain-based security tests	Seman-ticLayerSecurityResolver Impl	Logs activity related to Domain column- and row-level security.
Cascading input control resolution for Domains	DomainFilterResolver	Logs the same activity as the FilterCore logger (Cascading input control parameter resolution) above, but adds information specific to Domain queries.
Ad Hoc cache activity	CachedData	Logs information about the life cycle of datasets that are cached in memory when Ad Hoc views are accessed.
Timing for SQL queries run for reports	JsCon-trolledJdbcQueryExecuter	Logs the time it takes a query run by the SQL query executer to return data to a report.
Ad Hoc WorkingDataSet	WorkingDataSet	Logs activity for the WorkingDataSet, used by the Ad Hoc Editor to perform in-memory dataset transformations of query results.
General controller	AdhocAjaxController	Logs activity of the Ad Hoc Editor.
Crosstab controller	AdhocCrosstabAjaxController	Logs additional activity of the Ad Hoc Editor specific to crosstab reports.
Groovy code generation for memory datasets	GroovyGenerator	Logs Groovy classes generated from DomEL expressions used by the Ad Hoc Editor for filters and calculated fields.
Ad Hoc AJAX requests	adhocAjaxRequests	Logs information about AJAX requests made by Ad Hoc Editor and dashboard designer, including report parameters and response times. Enable this setting when you want to understand the Ad Hoc Editor and dashboard designer or if you’ve encountered an error or slow response times.

Logger Name	Identifier in Log	Description
Ad Hoc cache activity	com.jaspersoft.commons. datarator.CachedData	Tracks the life cycle of datasets managed by the Ad Hoc cache as they transition between states. This log output includes information from the Ad Hoc cache in a format that lends itself to troubleshooting. Use this setting to understand how query response times contribute to the performance and responsiveness of the Ad Hoc Editor. Because it doesn't log the queries themselves, use it in conjunction with the SQL Query Executer log setting.

You can add other loggers to the Log Settings page if you know their classnames.

To add a logger to the page from the web interface:

1. Log in as system administrator (`superuser` by default).
2. Select **Manage > Server Settings** and choose **Log Settings** in the left-hand panel.
3. Scroll to the bottom of the page.
4. Enter the logger's classname in the text field. See the other properties on the page for guidance, for example:

   ```
   com.jaspersoft.ji.adhoc.action.AdhocCrosstabAjaxController
   ```
5. Use the drop-down to set the logging level.

The logger setting is persistent even when the server is restarted. However, the logger setting may not appear on the Log Settings page again. For information about adding loggers to this page permanently, see **"Adding a Logger to the Log Settings Page" on page 193**.

8.6.2 Log Configuration Files

You can edit the log configuration file to set loggers, logging levels, and log output, but you must restart the server for your changes to take effect.

However, if you have made modifications to the Log Settings UI, those settings are persistent in the repository, are *not* written to the configuration files, and take precedence over the configuration files. However, each setting is independent, so a value that is not modified in the Log Settings UI is taken from the corresponding file. For more information, see **"Configuration Settings in the User Interface" on page 168**.

Logger names are defined in the Java source. Loggers can have any name, but the Jaspersoft convention is to give them their full class names. In the log4j properties file, the classname must be preceded by `log4j.logger`. For example, the classname `org.acegisecurity.intercept` is represented in the log4j.poperties file as `log4j.logger.org.acegisecurity. intercept`. If you want to add a new logger, find its classname in the source.

8.6.2.1 Configuring Logging Options

Depending on your whether you are configuring server logging or logging during import and export, edit a different file.

Functionality to Log	File Location
Import/Export	<js-install>\buildomatic\conf_source\iePro
JasperReports Server	WEB-INF\log4j.properties in the JasperReports Server installation

If the logger is defined in the configuration file but is commented out, simply remove the comment character (#) to add the logger. Otherwise, add the logger's classname and set it to the desired logging level.

The form of a logger definition should be:

```
log4j.logger.<logger-classname> = <log-level>, <output-type>
```

where:

- `<logger-classname>` is the name of the class you want to monitor.
- `<log-level>` is `ERROR`, `WARN`, `INFO`, or `DEBUG`
- `<output-type>` is a standard output type, such as `stdout`. For example:

```
log4j.logger.org.springframework.webflow=DEBUG, stdout, fileout
```

Restart the server for your changes to take effect.

8.6.2.2 Adding a Logger to the Log Settings Page

If you know of a log4j logger that JasperReports Server uses, you can add it to the Log Settings page available to the superuser. To add a logger, edit a configuration file.

Because editing text files can be error-prone, Jaspersoft recommends that you add loggers from the web interface by entering them into the text field on the Log Settings page. Only edit the configuration file if you need to permanently add the logger.

To edit the list of loggers to be displayed on the page:

1. Edit the logger_descriptions_pro.properties file found under WEB-INF/bundles in your JasperReports Server installation.
2. Add a new line and specify the logger's classname and a brief description of it.

   Entries should be in the form `<logger-classname> = <description>`.

   See the other properties in the file for guidance, for example:

   ```
   com.jaspersoft.ji.adhoc.action.AdhocCrosstabAjaxController = Crosstab controller
   ```
3. Restart the server for your changes to take effect.

The logger_descriptions_pro.properties file controls the labels for the English locale. You can specify labels for other locales by editing the logger description property file for that locale. For example, to add the label in French, add an entry to the logger_descriptions_pro_fr.properties file. For more information on supporting other languages, refer to **"Localization" on page 249**.

8.7 Configuring Amazon Web Services

If you access data stored in Amazon Web Services (AWS) data sources, the following settings control how JasperReports Server interacts with your Amazon environment:

- The AWS settings page enables you to change Security Group settings without restarting the server.
- The AWS configuration file allows you to change the JDBC driver used with AWS data sources.

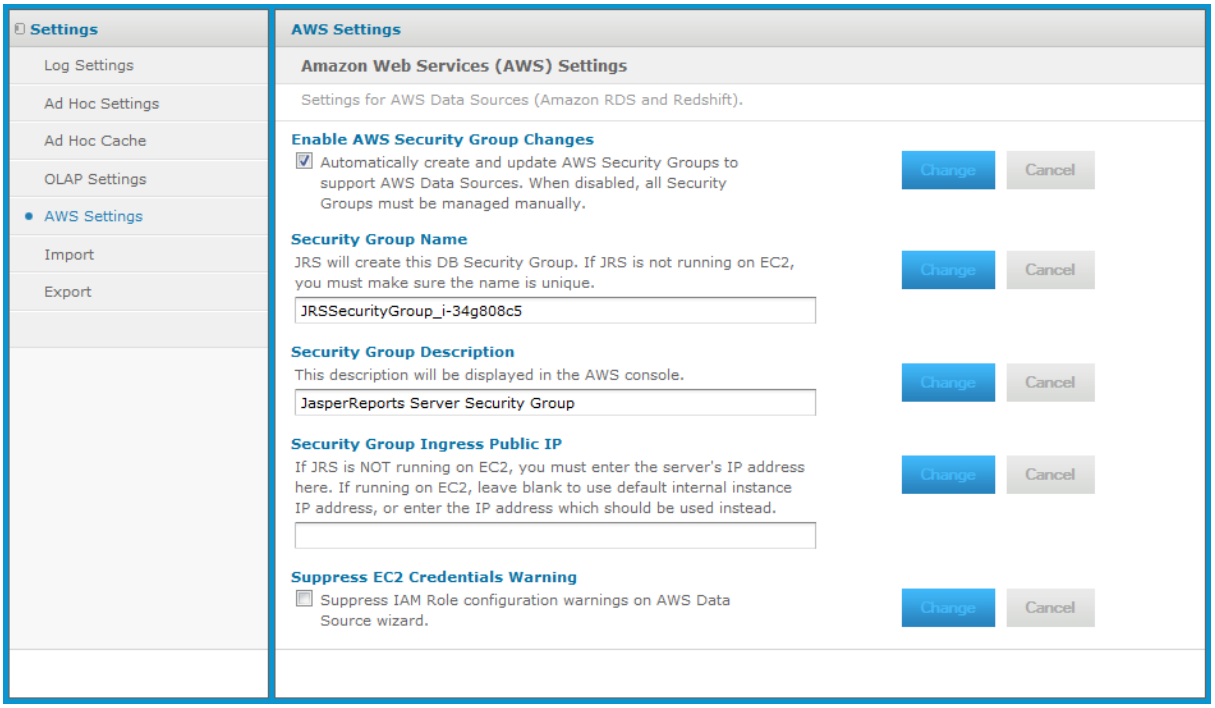
For more information about AWS data sources, see **4.1, "Data Sources," on page 65**.

To change AWS Security Group settings:

1. Log in as system administrator (`superuser` by default).
2. Click **Manage > Server Settings**.

   The **Log Settings** page appears.
3. Click **AWS Settings** in the left-hand menu.

   The AWS Settings panel appears:



Amazon Web Services (AWS) Settings

Settings for AWS Data Sources (Amazon RDS and Redshift).

Enable AWS Security Group Changes

☑ Automatically create and update AWS Security Groups to support AWS Data Sources. When disabled, all Security Groups must be managed manually.

Security Group Name

JRS will create this DB Security Group. If JRS is not running on EC2, you must make sure the name is unique.

JRSSecurityGroup_i-34g808c5

Security Group Description

This description will be displayed in the AWS console.

JasperReports Server Security Group

Security Group Ingress Public IP

If JRS is NOT running on EC2, you must enter the server's IP address here. If running on EC2, leave blank to use default internal instance IP address, or enter the IP address which should be used instead.

Suppress EC2 Credentials Warning

□ Suppress IAM Role configuration warnings on AWS Data Source wizard.

Figure 8-8 AWS Settings Page

4. Modify the following settings:

> We set up one AWS DB Security Group (using IP address) in each RDS region, per JasperReports Server instance. The security group allows connections from the specific JasperReports Server instance to the specified AWS database instance.

- **Enable AWS Security Group Changes**: This checkbox is generally left checked. When checked the JasperReports Server will use the instance credentials which it assumes from the IAM role to grant itself access to RDS and Redshift data services. For example, you stop your EC2 instance with JasperReports

Server on Friday. You restart it on Monday, and the instance gets a new IP address. JasperReports Server then re-grants itself access to RDS. If you want to manage the security groups manually, un-check this box.

- **Security Group Name**: When JasperReports Server creates security groups to support AWS data sources on this instance, it will use this name as the basis of the security group name. When the JasperReports Server instance is running on EC2, the EC2 instance ID will be appended. When running outside of EC2, you must make sure that name is unique between JasperReports Server instances (*i.e.* each one should have its own name), so that the IP addresses are properly granted access to the appropriate database instances.
- **Security Group Description**: This text will be used for the description field next to security group or groups in the AWS console.
- **Security Group Ingress Public IP:** Most users on EC2 should leave the this field empty. JasperReports Server determines the IP address automatically. If you are running JasperReports Server outside of EC2, then you must determine your IP address manually and enter it in this field. It is also possible with complex EC2 topology involving Virtual Private Clouds (VPCs) that you need to provide your IP address manually.
- **Suppress EC2 Credentials Warning**: If your JasperReports Server instance was created with no IAM role, when you go to the data source wizard to add a data source with EC2 credentials there will be a warning message saying there is no proper role set. Checking this box suppresses the warning and disables the option.

5. Click **Change** after each modification. The changes are effective immediately on the server.

To change the JDBC driver used with AWS data sources:

1. Open the file .../WEB-INF/applicationContext-webapp.xml for editing.
2. Locate the `jdbcConnectionMap`bean and the key of your AWS database type within it. Modify this key to specify a different JDBC driver. For example, the default driver for MySQL databases is set to the MariaDB driver:

```
<entry key="mysql">
<util:map>
    ...
    <entry key="jdbcUrl" value="jdbc:mysql://$[dbHost]:$[dbPort]/$[dbName]"/>
    <entry key="jdbcDriverClass" value="org.mariadb.jdbc.Driver"/>
    ...
</util:map>
```

3. Save the file and restart JasperReports Server.

8.8 Configuring Domains

For advanced uses of Domains, there are some configurations you may consider:

- **Disabling the Domain Validation Check**
- **Optimizing Snowflake Schema Joins**
- **Configuring Domain Dependency Behavior**

When you use Domains with certain specific database constructs, you may need to configure JasperReports Server:

- **Enabling Oracle Synonyms**
- **Enabling CLOB Fields**

- **Enabling Proprietary Types**
- **Extending JDBC Type Mapping**
- **Accessing Materialized Views**

8.8.1 Disabling the Domain Validation Check

By default, JasperReports Server validates a Domain against its data source to ensure that the Domain design maps properly to the underlying tables. This validation occurs when a Domain design file is uploaded to the server. If your data source is very large and complex, this validation can be time consuming. If the validation takes too long, you can disable it. In this case, JasperReports Server assumes the Domain design is valid, and simply uploads it without the check. You can disable the validation by editing the following configuration file:

Configuring Domain Validation Check		
Configuration File		
.../WEB-INF/applicationContext-semanticLayer.xml		
Property	**Bean**	**Description**
`skipDomainDatabase` `Validation`	`slConfig`	By default, this property is set to `FALSE`; in this case, JasperReports Server validates Domain designs against their data sources. Set it to `TRUE` to disable this validation check.

If the tables and fields referenced in the Domain design don't exist in the data source when `skipDomainDatabaseValidation` is set to TRUE, the Domain wizard won't detect the problem, but the Choose Data wizard returns errors when your end users work use the Domain.

8.8.2 Optimizing Snowflake Schema Joins

When creating a Domain on top of a snowflake schema, the default joins generated when using the Domain in the Ad Hoc editor may take a long time and include dimensions that are not used in the report. For example, a schema with over a hundred dimension tables mostly connected to a subset of 5-10 fact tables may cause such behavior. The following setting can be enabled to optimize the joins generated for such a snowflake database schema. The default setting has better performance in the more common cases with less tables.

Configuring Domain Join Optimization
Configuration File
.../WEB-INF/applicationContext-semanticLayer.xml

Configuring Domain Join Optimization		
Property	**Bean**	**Description**
specialOptimizationOn	graph Operations	The default setting of `false` handles typical cases of Domains based on 10-100 tables. For snowflake schemas that typically have 100 or more tables, or for database topologies that cause slow join performance in Ad Hoc views, set this property to `true` to optimize the joins in the Ad Hoc editor.

8.8.3 Configuring Domain Dependency Behavior

When modifying a Domain that is already in use by Ad Hoc views, JasperReports Server checks to see if any of these dependent views are affected. For example, if an Ad Hoc view uses a field, it should not be deleted from the Domain. However, if that field is not in use by any dependent view, it can be removed from the Domain, and from the list of fields in every view.

For dependency purposes, a field is "in use" by an Ad Hoc view if that field appears in the display manager (in any row, column, or group), if it is used in any filter, or if it is used in any calculated field formula, whether the calculated field is in use or not.

When modifying fields in a Domain, JasperReports Server always checks all views that depend on the Domain and always notifies the user of any fields in use. There are two settings to configure the Domain dependency behavior after the check:

- `defaultDomainDependentsBlockAndUpdate` - This setting turns on or off the behavior that ensures Ad Hoc views remain consistent with their Domains. When on, it ensure consistency by either blocking Domain changes that affect fields in use by any dependencies, or by updating the dependencies when there are no fields in use. When updating a dependency, it removes the field from the list of available fields (left-hand panel in the Ad Hoc editor). When off, it allows changes to Domains that will cause errors in any dependent view. If a field is in use by a view, and this setting is off and allows the Domain to delete that field, the view will cause an exception when opened. If a field is not in use by a view, and this setting is off, the field is not removed from the list of available fields. If a deleted field appears in the list of available fields, the view can still be opened, but any action on that field will cause an error.

  The only scenario for turning off this setting is when a field is deleted from the data source, and the Domain cannot be modified because the field is being used by some dependencies. You then need to manually edit the dependencies so they do not cause errors.
- `defaultAddToDomainDependents` - This setting determines whether a field being added to a Domain is automatically added to each dependent Ad Hoc view. When on, any new field added to a Domain is added to the list of available fields in every dependent view. When this setting or the pervious setting is off, dependent views are not updated with new Domain fields.

Turning Domain Dependency Checks On or Off
Configuration File
.../WEB-INF/applicationContext.xml

Turning Domain Dependency Checks On or Off		
Property	**Bean**	**Description**
defaultDomainDependentsBlockAndUpdate	configurationBean	The default setting of true means that Domain modification will be blocked if any Ad Hoc view uses the modified fields. If no Ad Hoc view uses the modified fields, the Domain modification proceeds, and all Ad Hoc views are updated with the change. When set to false, Domain modifications are not be blocked when the field is in use, and dependent views are not updated when fields are not in use. Any Ad Hoc view may become unusable if it references a field that is deleted from a Domain while this setting is false.

Configuring Domain Dependency Additions		
Configuration File		
.../WEB-INF/applicationContext.xml		
Property	**Bean**	**Description**
defaultAddToDomainDependents	configurationBean	When defaultDomainDependentsBlockAndUpdate is set to true AND this setting is true (the default), any field being added to a Domain is added to each dependent Ad Hoc view. It might not be possible to add a field to an Ad Hoc view if the field being added does not belong to the data island being used in the Ad Hoc view. When defaultDomainDependentsBlockAndUpdate is set to false OR this setting is false, dependent Ad Hoc views are not updated with fields that are added to a Domain. The new fields will not be available when a user opens a dependent Ad Hoc view.

8.8.4 Enabling Oracle Synonyms

By default, Domains cannot access synonyms in an Oracle database. Set the following property to enable them. If you access your Oracle database through JNDI, you also need to configure the JNDI connection.

Be aware that the Oracle metadata service works significantly slower when synonyms are in scope.

Enabling Oracle Synonyms		
Configuration File		
.../WEB-INF/applicationContext-semanticLayer.xml		
Property	**Bean**	**Description**
includeSynonymsForOracle	jdbcMetaConfiguration	Set the value to true: <value>true</value>
Configuration File		
...\META-INF\context.xml		
Property	**Bean**	**Description**
accessToUnderlyingConnectionAllowed	<Resourcename="jdbc/oracle"...	If you use JNDI, add the following property: accessToUnderlyingConnectionAllowed="true"

8.8.5 Enabling CLOB Fields

Support for CLOB (Character Large Object) fields is dependent on your database and must be enabled manually. If you want to access CLOB fields in JasperReports Server, you must set the following options according to your database.

The Oracle JDBC driver implementation uses the `CLOB` JDBC type for CLOB fields.

CLOB Support for Oracle		
Configuration File		
.../WEB-INF/applicationContext-semanticLayer.xml		
Property	**Bean**	**Description**
jdbc2JavaTypeMapping	jdbcMetaConfiguration	This property contains a map of database field types to Java types. Find the line for CLOB that is commented out: <!--entry key="CLOB" value=""/--> Modify it as follows: <entry key="CLOB" value="java.lang.String"/>

The MySQL JDBC driver implementation uses either the `CLOB` JDBC type, the `LONGVARBINARY` JDBC type, or both to represent CLOB fields, depending on their length.

CLOB Support for MySQL		
Configuration File		
.../WEB-INF/applicationContext-semanticLayer.xml		
Property	**Bean**	**Description**

`jdbc2JavaType Mapping`	`jdbcMeta Configuration`	This property contains a map of database field types to Java types. Find the following lines:
		`<!--entry key="CLOB" value=""/-->`
		`<!--entry key="LONGVARBINARY" value=""/-->`
		And modify them as follows:
		`<entry key="CLOB" value="java.lang.String"/>`
		`<entry key="LONGVARBINARY" value="java.lang.String"/>`

8.8.6 Enabling Proprietary Types

JasperReports Server provides a JDBC-to-Java type mapping for all standard JDBC column types for use in Domains. However, some databases have proprietary types, such as NVARCHAR2 in Oracle. You can map these types with a special configuration.

As a prerequisite, the proprietary type must be logically equivalent to one of following Java classes:

`java.lang.Boolean`
`java.lang.Byte`
`java.lang.Character`
`java.lang.Double`
`java.lang.Float`
`java.lang.Integer`
`java.lang.Long`
`java.lang.Short`
`java.lang.String`
`java.math.BigDecimal`
`java.sql.Date`
`java.sql.Time`
`java.sql.Timestamp`
`java.util.Date`

There are two ways to create a mapping for a proprietary type, as shown in the following table:

- Modify the generic mapping for NUMERIC types. By default, any numeric type that doesn't match one of the other types is mapped to `BigDecimal`.
- Create a secondary mapping under the special OTHER key, where the secondary key can be your custom type name.

Proprietary Database Type Mapping
Configuration File
.../WEB-INF/applicationContext-semanticLayer.xml

Proprietary Database Type Mapping		
Properties	**Bean**	**Description**

`jdbc2Java TypeMapping`	`jdbcMeta Configuration`	• To modify the generic mapping, edit this line:
		`<entry key="NUMERIC" value="java.math.BigDecimal"/>`
		• Add any secondary key to the OTHER key, following this example:
		`<entry key="OTHER">`
		`    <map>`
		`        <entry key="NVARCHAR2" value="java.lang.String"/>`
		`    </map>`
		`</entry>`
		• Java 1.6 supports java.sql.Types.NVARCHAR, therefore you should add it as a generic mapping, not under OTHER:
		`<entry key="NVARCHAR" value="java.lang.String"/>`

8.8.7 Extending JDBC Type Mapping

Some database types are not even mapped to a JDBC type. In particular, Oracle uses the TIMESTAMP WITH TIME ZONE and TIMESTAMP WITH LOCAL TIME ZONE that must be mapped in order to appear in JasperReports Server. If there are other types in your database, you can override or extend the JDBC type mapping with the following configuration:

Extending JDBC Type Mapping		
Configuration File		
.../WEB-INF/applicationContext-semanticLayer.xml		
Property	**Bean**	**Description**

`codeToJdbcType Mapping`	`jdbcMeta Configuration`	This property contains a map of database type codes to JDBC types. By default the codes for Oracle TIMESTAMP types are mapped:
		`<entry key="-101" value="TIMESTAMP"/>`
		`<entry key="-102" value="TIMESTAMP"/>`
		Add or replace these entries to map additional types from your database.

8.8.8 Accessing Materialized Views

Domains access tables and views by default, but some databases support other structures such as materialized views. These alternate table structures do not show up by default, but you can often configure Domains to display and access them.

If the JDBC driver for your database assigns a standard table type identifier to the materialized view, you can access it in Domains, Ad Hoc views, and reports. To find the table type, use a JDBC client such as the SQuirreL tool to view your database schema. In SQuirreL, use the “Objects” tab to browse the tables and views organized by table type. Look for your materialized view and note it's table type.

The table type values are defined in the DatabaseMetaData.html.getTables() documentation. When you know the string corresponding to your table type, add it to the following configuration value:

Accessing Materialized Views		
Configuration File		
.../WEB-INF/applicationContext-semanticLayer.xml		
Property	**Bean**	**Description**
`tableTypes`	`jdbcMetaConfiguration`	Uncomment the JDBC table type corresponding to the materialized view or other table structure in your databases, for example: `<value>LOCAL TEMPORARY</value>`

8.9 Configuring JasperReports Library

JasperReports Server’s reporting features are built on the JasperReports Library, which is embedded in the server. Many of the options you can configure to change the server’s functionality are actually JasperReports Library options. The configuration options can control many aspects of JasperReports Server behavior, from the way reports are exported into different file formats, to the default font to use.

These options can be set at different levels of granularity: Global (applies to all reports generated by the server), Report (defined in the JRXML and applies to a specific report), and Element (defined in the JRXML and applies to specific elements of the report). Global properties are defined in the .../WEB-INF/classes/jasperreports.properties file.

For more information about JasperReports Library configuration, see http://jasperreports.sourceforge.net/config.reference.html.

The following sections highlight a few of the available options:

- **Extending JasperReports Library**
- **Changing the Crosstab Limit**
- **Setting a Global Chart Theme**
- **Disabling Interactivity in the Report Viewer**
- **Enabling the XHTML or HTML Exporters**
- **Enabling Flash or HTML5 for Pro Charts**
- **Configuring a JavaScript Engine for Graphical Report Rendering**

8.9.1 Extending JasperReports Library

You can extend JasperReports Library by implementing the public interfaces it exposes.

Such an implementation is usually stored in a JAR (Java Archive) file that contains a file called jasperreports_extension.properties, specifies a factory class. The specified class used to instantiate an extension registry. The extension registry specifies one or more extension objects, each of which corresponds to a JasperReports Library extension point represented by a Java interface.

Place this JAR on the JasperReports Library classpath, and your extension is automatically available.

For more information, refer to *JasperReports Library Ultimate Guide*.

8.9.2 Changing the Crosstab Limit

If you use crosstab reports, you may experience Out of Memory errors if the reports are very large or complex. You can configure JasperReports Server to return a message instead of memory errors when users run such crosstabs. To do so, enable the `net.sf.jasperreports.crosstab.bucket.measure.limit` property and set its maximum value. To do so, edit the following configuration file:

Crosstab Report Configuration Option	
Configuration File	
.../WEB-INF/classes/jasperreports.properties	
Property	**Description**

`net.sf.jasperreports.`
`crosstab.bucket.`
`measure.limit`
	This value represents the maximum number of cells multiplied by the number of measures in the crosstab. The default value is `100000`.
	Enter large values to allow your users to create larger, more complicated crosstabs; enter small values to restrict them.
	If you experience OutOfMemoryExceptions after changing this value, try setting it to a smaller number, or configure your JVM to allow more memory to be used.

8.9.3 Setting a Global Chart Theme

Chart themes control the look and feel of the charts generated by JasperReports Server. Chart themes can be applied at the level of either the server or the individual report:

- To apply a theme at the report level, select it when designing the report in Jaspersoft iReport Designer. Note that you can also apply a theme to individual chart elements, as well. Note that a chart theme can be included in a report unit as a resource; in this case, the theme is only available to charts in that report unit.
- To apply a theme at the server level, copy the chart theme JAR to the correct location and edit its configuration file.

A chart theme is a JAR file that defines the look and feel of a chart. Once you have created the chart theme JAR file, copy it to the WEB-INF\lib directory. Chart themes in this location are available to any chart in the instance of the server; they may also be set as the global chart theme.

To set a theme as the default chart theme, edit the following configuration file:

Global Report Theme	
Configuration File	
.../WEB-INF/classes/jasperreports.properties	
Property	**Description**
`net.sf.jasperreports.chart.ChartTheme`	The name of a chart theme that is in the .../WEB-INF/lib directory.

Jaspersoft recommends that you create your chart themes in Jaspersoft iReport Designer. Click **File** > **New** > **Chart Theme**, then use Jaspersoft iReport Designer to archive the new chart theme as a JAR.

Chart themes do not apply to Ad Hoc chart views.

8.9.4 Disabling Interactivity in the Report Viewer

Be default, the report viewer's interactivity is enabled: reports with interactive elements (such as the table component) are interactive when they are run in the web server and displayed in the viewer. If you don't want your reports to be interactive, you can disable interactivity across the entire server by editing a configuration file.

Interactivity in the Report Viewer	
Configuration File	
.../WEB-INF/classes/jasperreports.properties	
Property	**Description**
`net.sf.jasperreports.components.table.interactive`	By default, this property is set to `true`; in this case, interactivity is enabled in the report viewer. Set it to `false` to disable interactivity.

Changing this setting in this configuration file changes the behavior for the entire server. You can also configure this behavior at the report, table, or column level by edging the report's JRXML properties.

8.9.5 Enabling the XHTML or HTML Exporters

By default, JasperReports Server exports HTML format using an HTML-based exporter. Unlike the default exporters from previous versions of the server (`html` and `xhtml`), the new HTML exporter (`html2`) is more forgiving when exporting reports that have overlapping elements while still preventing text from being cut off due to font metrics issues.

This setting affects all cases when HTML is exported, including when reports are exported from the report viewer and when they are scheduled to produce HTML output.

To use an older HTML exporter in JasperReports Server, edit the following configuration file:

<table>
<tr><th colspan="2">HTML Exporters</th></tr>
<tr><th colspan="2">Configuration File</th></tr>
<tr><td colspan="2">.../WEB-INF/classes/jasperreports.properties</td></tr>
<tr><th>Property</th><th>Description</th></tr>
<tr><td>com.jaspersoft.jasperreports.
export.html.type</td><td>Determines which of the HTML exporters is used. Valid values are:
• html2 is the default HTML exporter. It handles overlapping report elements more gracefully than the other exporters.
• xhtml was the default HTML exporter in versions from 4.5 to 5.0. Jaspersoft continues to support this exporter. It handles overlapping report elements more gracefully that the html exporter. However, it is subject to font metric mismatches between client browsers, which can result in text being cut off.
• html was the default HTML exporter in versions of JasperReports Server prior to 4.2. Jaspersoft continues to support this exporter. It doesn’t handle overlapping elements as gracefully as the other exporters.</td></tr>
</table>

Note that the properties are mutually exclusive; you can only have one uncommented at a time.

As of JasperReports Server version 5.5, if your reports include interactive elements such as the table component (which supports sorting and filtering in the HTML viewer), you must use the `html2` exporter in order to enable the interactive features; the `html` and `xhtml` exporters don’t support them.

8.9.6 Enabling Flash or HTML5 for Pro Charts

By default, JasperReports Server renders Pro Charts (those based on Fusion Charts) using Adobe Flash. If Flash isn’t found in the client environment, the server renders the chart using HTML5, instead. For example, Pro Charts displayed on devices that run Apple’s iOS operating system are rendered using HTML5 because Flash isn’t available. Note that not all browsers support HTML5.

Note that Pro Charts are only available in the JasperReports Server professional edition.

You can configure the server to default to HTML5 when rendering Pro Charts. In this case, if your browser doesn’t support HTML5, the chart isn’t rendered.

To render Pro Charts using HTML5, edit the following configuration file:

Pro Charts Renderer	
Configuration File	
.../WEB-INF/classes/jasperreports.properties	
Property	**Description**
`com.jaspersoft.jasperreports.` `fusion.charts.render.type`	Determines which of the following renderers is used: • `flash` is the default renderer for Pro Charts. If Flash isn't available, the server tries to render the chart in HTML5. • `html5` is the newest renderer for Pro Charts. Use it if you can't support Flash.

Note that this property only applies to reports that rely on Pro Charts and only affects the HTML preview and export.

Typically, this property is set at the server level; to override the server-level setting for a specific Pro Chart report, you must set this property at the report level, and also specify a second property as shown:

```
net.sf.jasperreports.print.transfer.fusion=com.jaspersoft.jasperreports.fusion
```

This allows the reporting engine (JasperReports Library) to recognize the Fusion settings. If this property isn't set, the `com.jaspersoft.jasperreports.fusion.charts.render.type` property is ignored at the report level.

8.9.7 Configuring a JavaScript Engine for Graphical Report Rendering

Depending on the circumstances, a given graphical element (such as a chart, a map, or a widget) in a report can be rendered in two ways:

- When it is run directly in the web UI, the browser itself renders the chart.
- When it is scheduled to run later or runs in the background, an internal engine renders the chart.

By default, JasperReports Server's internal JavaScript engine is Rhino, which is an excellent solution for most cases; most JasperReports Server users can accept this default. However, under certain circumstances, you may want to use a different engine. Investigate using a different engine if you encounter any of the following when running chart-based reports in the background or when they are scheduled:

- Poor performance when generating complex charts or charts that contain large volumes of data.
- Out of memory messages.
- Incorrect scaling when certain Pro Chart reports are printed.
- Results that don't match those generated when the report is run directly in the web UI. For example, text elements may be incorrectly sized or placed.

In such cases, Jaspersoft recommends that you use PhantomJS as the engine to execute JavaScript when generating graphical reports that are run in the background or are scheduled. PhantomJS is a headless WebKit with JavaScript API. To use PhantomJS, you must download and install the correct version for your environment. Download PhantomJS and install it on the computer hosting JasperReports Server. At a high level, installing PhantomJS includes expanding an archive. For installation instructions, refer to the documentation provided with PhantomJS.

Once PhantomJS is installed, you must point JasperReports Server to its location. You can configure several options independently: HighCharts generation, Pro Charts generation, Pro Widgets generation, and Pro Maps generation.

These are a server-wide settings. In a given server, all charts of the same type (HighCharts or Fusion (Charts Pro, Maps Pro, or Widgets Pro)) must use the same JavaScript engine.

You cannot use PhantomJS to render JFreeCharts. Such reports are always generated by Rhino when run in the background or scheduled.

To configure JasperReports Server to use PhantomJS for HighCharts, edit the following properties:

JavaScript Engine Configuration for HighCharts	
Configuration File	
.../WEB-INF/classes/jasperreports.properties	
Property	**Description**
`com.jaspersoft.jasperreports.highcharts.phantomjs.executable.path`	This property points to the engine the server should use to generate HighCharts-based charts in reports that are run in the background or have been scheduled. For example, if you are using Windows and you expanded the PhantomJS 1.8.1 ZIP file into the root of your C: drive: `com.jaspersoft.jasperreports.highcharts.phantomjs.executable.path=C:\\phantomjs-1.8.1-windows\\phantomjs.exe`
`com.jaspersoft.jasperreports.highcharts.phantomjs.tempdir.path`	The temporary directory where PhantomJS stores its output. By default, JasperReports Server expects this output in the location defined by Java's `java.io.tmpdir` system property.
`com.jaspersoft.jasperreports.highcharts.phantomjs.executable.timeout`	The maximum number of milliseconds to wait for output from PhantomJS. After that amount of time, the chart times out. The default is 3000.

To configure JasperReports Server to use PhantomJS for Pro Charts (Fusion), edit the following properties:

JavaScript Engine Configuration for Pro Charts (Fusion)
Configuration File
.../WEB-INF/classes/jasperreports.properties

JavaScript Engine Configuration for Pro Charts (Fusion)	
Property	**Description**
`com.jaspersoft.jasperreports.fusion.phantomjs.executable.path`	This property points to the engine the server should use to generate Pro Charts (based on Fusion) in reports that are run in the background or have been scheduled. For example, if you are using Windows and you expanded the PhantomJS 1.8.1 ZIP file into the root of your C: drive: `com.jaspersoft.jasperreports.fusion.phantomjs.executable.path=C:\\phantomjs-1.8.1-windows\\phantomjs.exe`
`com.jaspersoft.jasperreports.fusion.phantomjs.tempdir.path`	The temporary directory where PhantomJS stores its output. By default, JasperReports Server expects this output in the location defined by Java's `java.io.tmpdir` system property.
`com.jaspersoft.jasperreports.fusion.phantomjs.executable.timeout`	The maximum number of milliseconds to wait for output from PhantomJS. After that amount of time, the chart times out. The default is 3000.

By default, when Fusion-based reports are viewed in the web UI, they are generated as Flash elements. You can configure the web UI to generate your reports using HTML5 instead. For details, see **"Enabling Flash or HTML5 for Pro Charts" on page 205**.

8.10 Configuring Input Control Behavior

When defining text input controls, the default server behavior allows empty strings, even if you have configured a regular expression and made the input control mandatory. Use this setting to enforce the regular expression even on empty strings, thus forcing the user to provide a conforming value for the input control.

Input Control Behavior	
Configuration File	
.../WEB-INF/applicationContext-cascade.xml	
Bean	**Description**
`applyRegexpToEmptyString`	The default value of `false` gives the traditional behavior: even if a regular expression is defined, it is not applied to empty strings. If you want to strictly enforce the regular expression, even on empty input strings, set this property to `true`.

8.11 Configuring the Scheduler

The scheduler runs reports in the background according to a user-defined schedule (also called a job). You can configure the following aspects of the scheduler:

- **Configuring Scheduler Misfire Policy**
- **Configuring Scheduler Failure Notifications**
- **Restricting File System Output**
- **Removing Report Scheduling Interval Options**
- **Adding a Holiday Exclusion Calendar**

8.11.1 Configuring Scheduler Misfire Policy

A scheduler misfire occurs when the scheduler cannot run a report at the designated time, for example because JasperReports Server is offline, its database is offline, or the number of threads is limited. In this case, you can configure the behavior of the scheduler to retry the report or skip this scheduled run.

You can set a different misfire policy for each kind of job schedule: single job, repeating job, and calendar job. Misfire policies are defined in the Quartz Scheduler documentation and other online resources:

http://quartz-scheduler.org/documentation/quartz-2.x/tutorials/tutorial-lesson-05

http://quartz-scheduler.org/documentation/quartz-2.x/tutorials/tutorial-lesson-06

http://nurkiewicz.blogspot.com/2012/04/quartz-scheduler-misfire-instructions.html

Configuring Scheduler Misfire Policy	
Configuration File	
.../WEB-INF/js.quartz.properties	
Property	**Description**
`report.quartz.misfirepolicy.singlesimplejob`	Sets the misfire policy for single jobs to one of the following: • SMART_POLICY • MISFIRE_INSTRUCTION_FIRE_NOW • MISFIRE_INSTRUCTION_IGNORE_MISFIRE_POLICY

Configuring Scheduler Misfire Policy	
`report.quartz.misfirepolicy.repeatingsimplejob`	Sets the misfire policy for repeating jobs to one of the following values: • SMART_POLICY • MISFIRE_INSTRUCTION_FIRE_NOW • MISFIRE_INSTRUCTION_IGNORE_MISFIRE_POLICY • MISFIRE_INSTRUCTION_RESCHEDULE_NEXT_WITH_EXISTING_COUNT • MISFIRE_INSTRUCTION_RESCHEDULE_NOW_WITH_EXISTING_REPEAT_COUNT • MISFIRE_INSTRUCTION_RESCHEDULE_NOW_WITH_REMAINING_REPEAT_COUNT
`report.quartz.misfirepolicy.calendarjob`	Sets the misfire policy for jobs with calendar recursion to one of the following values: • SMART_POLICY • MISFIRE_INSTRUCTION_IGNORE_MISFIRE_POLICY • MISFIRE_INSTRUCTION_FIRE_ONCE_NOW • MISFIRE_INSTRUCTION_DO_NOTHING

8.11.2 Configuring Scheduler Failure Notifications

By default, if a scheduled report runs but causes an error, the scheduler sends an email to the schedule owner and to all JasperReports Server administrators in the same organization. This is in addition to any failure notification addresses specified on the **Notifications** tab of the scheduler wizard. In order to receive these scheduler failure alerts, administrators must have a valid email defined in their user accounts.

You can also configure the scheduler to send failure notifications to different users based on roles, or turn off failure notifications.

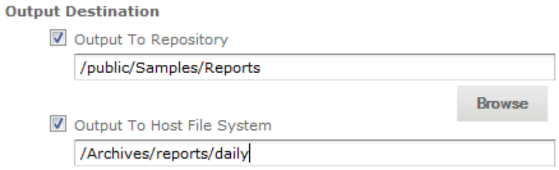
Configuring Scheduler Failure Notifications		
Configuration File		
.../WEB-INF/applicationContext-report-scheduling.xml		
Entry Key	**Bean**	**Description**
`administrator Role`	`quartz Scheduler`	This setting determines the role to which the scheduler failure notifications will be sent. All users in the organization with this role and a valid email address defined in their user profile will receive the email notification. By default, this setting is `ROLE_ADMINISTRATOR`.

Configuring Scheduler Failure Notifications		
`disableSendingAlertToAdmin`	`quartzScheduler`	Determines whether failure notifications are sent to the role in the previous setting. By default, this setting is `false`, meaning that notifications are sent. Set this value to `true` to disable scheduler failure notifications being sent to administrators (or the role defined above).
`disableSendingAlertToOwner`	`quartzScheduler`	Determines whether failure notifications are sent to the schedule owner. By default, this setting is `false`, meaning that notifications are sent. Set this value to `true` to disable scheduler failure notifications being sent to the schedule owner.

8.11.3 Restricting File System Output

The scheduler outputs reports through several channels. Most reports are emailed, but reports can also be written to FTP folders. You can also configure the scheduler to write reports to the server's local file system. This option is disabled by default for security reasons.

If you turn on scheduler file system output, make sure you have configured user and folder access rights to make sure that malicious files cannot be written to your file system. The process that writes the files is the same user that runs the application server that hosts JasperReports Server.

Scheduler File System Output	
Configuration File	
.../WEB-INF/applicationContext.xml	
Property to Update	**Description**
`enableSaveToHostFS`	Set the value from `"false"` (the default) to `"true"`. When true, the user interface for the scheduler displays active fields that allow the schedule creator to specify a folder in the server's file system. The scheduler will write files to this location every time it runs the schedule for this report.  Output Destination ☑ Output To Repository /public/Samples/Reports Browse ☑ Output To Host File System /Archives/reports/daily This property also determines the scheduler's overall access to the file system. When true, any schedule configured with a file system folder will write to the file system. When false, no scheduled reports will write output to the file system (FTP and email output are not affected). However, any file system output specified in a schedule remains defined and will again trigger file system output when this property is true again.

8.11.4 Removing Report Scheduling Interval Options

When users schedule reports, they can specify that the report run periodically at regular intervals. For simple recurrence, the default interval can be expressed in days, hours, or minutes. If it is necessary to prevent users from scheduling frequent reports, you can limit the intervals to days or hours by editing the following configuration file:

Scheduling Interval Options	
Configuration File	
.../WEB-INF/flows/reportJobBeans.xml	
Section to Update	**Description**
`recurrenceIntervalUnits`	Comment out the intervals you want to disable.

To remove a temporal interval, enclose the corresponding bean in comment characters. For example, to keep users from scheduling reports at minute intervals, comment out the bean containing the INTERVAL_MINUTE field:

```
<!--
<bean class="com.jaspersoft.jasperserver.war.dto.ByteEnum">
    <property name="code">
        <util:constant static-field="com.jaspersoft.jasperserver.api.engine.scheduling.
            domain.ReportJobSimpleTrigger.INTERVAL_MINUTE"/>
    </property>
    <property name="labelMessage">
        <value>job.interval.unit.minute.label</value>
    </property>
</bean>
-->
```

8.11.5 Adding a Holiday Exclusion Calendar

The scheduler support exclusion calendar that specify days or times when no report should be run, even if the schedule is triggered then. For example, you might not want a report to run on a bank holiday when the financial data would be meaningless.

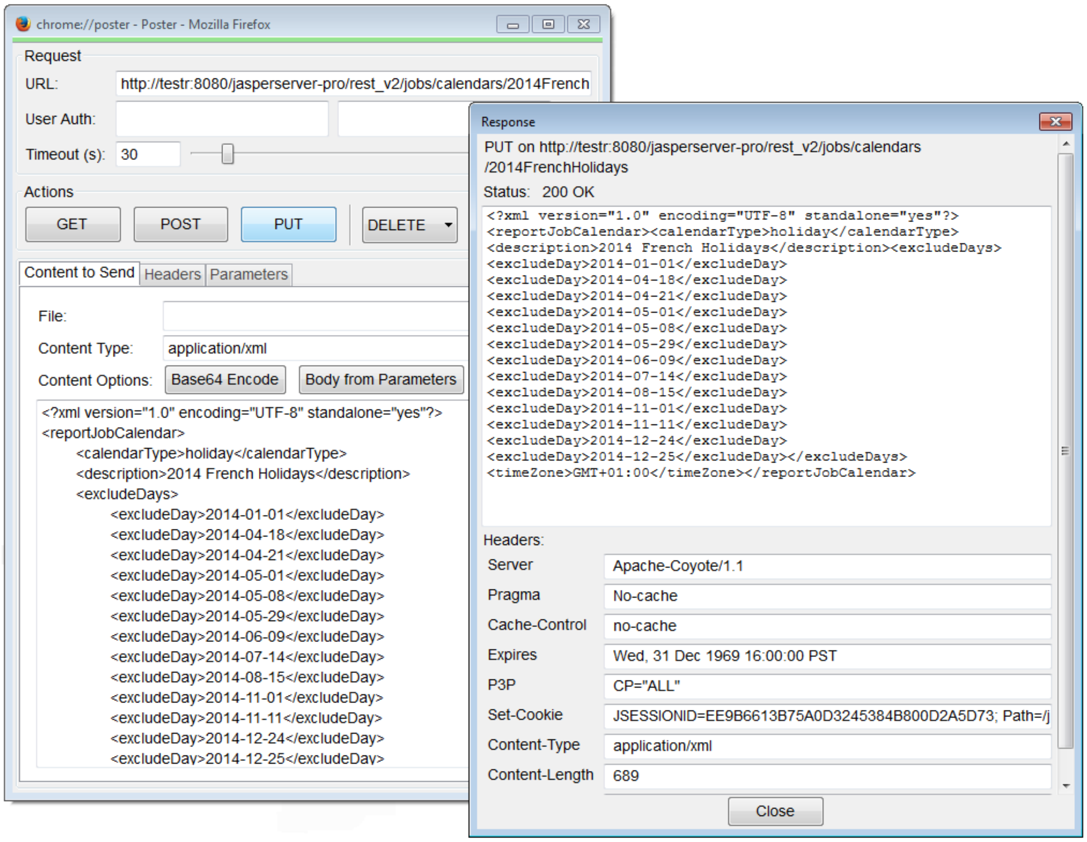
The scheduler maintains a list of named calendars, and the user interface allows the schedule creator to select a calendar whose dates will be excluded from the schedule.

Currently, the only method to define a holiday calendar is through the REST API. You can use any browser plug-in that acts as a REST client and can send PUT requests to JasperReports Server. Using such a plug-in, compose and send the following REST request (header and body) to your server:

```
PUT http://<host>:<port>/jasperserver[-pro]/rest_v2/jobs/calendars/2014FrenchHolidays
Content-Type: application/xml
```

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<reportJobCalendar>
    <calendarType>holiday</calendarType>
    <description>2014 French Holidays</description>
    <excludeDays>
        <excludeDay>2014-01-01</excludeDay>
               <excludeDay>2014-04-18</excludeDay>
        <excludeDay>2014-04-21</excludeDay>
        <excludeDay>2014-05-01</excludeDay>
        <excludeDay>2014-05-08</excludeDay>
        <excludeDay>2014-05-29</excludeDay>
        <excludeDay>2014-06-09</excludeDay>
        <excludeDay>2014-07-14</excludeDay>
        <excludeDay>2014-08-15</excludeDay>
        <excludeDay>2014-11-01</excludeDay>
        <excludeDay>2014-11-11</excludeDay>
        <excludeDay>2014-12-24</excludeDay>
        <excludeDay>2014-12-25</excludeDay>
    </excludeDays>
    <timeZone>GMT+01:00</timeZone>
</reportJobCalendar>
```

For example, using the Poster plug-in for Firefox, you can submit this request as shown in the following figure. The figure also shows the successful reply from the server.



URL: http://testr:8080/jasperserver-pro/rest_v2/jobs/calendars/2014French

User Auth:

Timeout (s): 30

File:

Content Type: application/xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<reportJobCalendar>
    <calendarType>holiday</calendarType>
    <description>2014 French Holidays</description>
    <excludeDays>
        <excludeDay>2014-01-01</excludeDay>
        <excludeDay>2014-04-18</excludeDay>
        <excludeDay>2014-04-21</excludeDay>
        <excludeDay>2014-05-01</excludeDay>
        <excludeDay>2014-05-08</excludeDay>
        <excludeDay>2014-05-29</excludeDay>
        <excludeDay>2014-06-09</excludeDay>
        <excludeDay>2014-07-14</excludeDay>
        <excludeDay>2014-08-15</excludeDay>
        <excludeDay>2014-11-01</excludeDay>
        <excludeDay>2014-11-11</excludeDay>
        <excludeDay>2014-12-24</excludeDay>
        <excludeDay>2014-12-25</excludeDay>
```

PUT on http://testr:8080/jasperserver-pro/rest_v2/jobs/calendars /2014FrenchHolidays

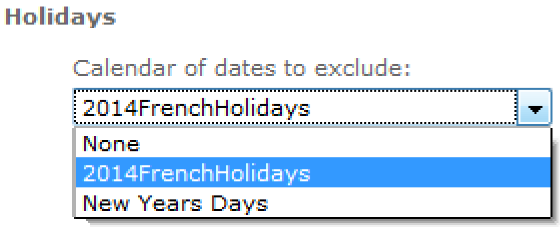
Status: 200 OK

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<reportJobCalendar><calendarType>holiday</calendarType>
<description>2014 French Holidays</description><excludeDays>
<excludeDay>2014-01-01</excludeDay>
<excludeDay>2014-04-18</excludeDay>
<excludeDay>2014-04-21</excludeDay>
<excludeDay>2014-05-01</excludeDay>
<excludeDay>2014-05-08</excludeDay>
<excludeDay>2014-05-29</excludeDay>
<excludeDay>2014-06-09</excludeDay>
<excludeDay>2014-07-14</excludeDay>
<excludeDay>2014-08-15</excludeDay>
<excludeDay>2014-11-01</excludeDay>
<excludeDay>2014-11-11</excludeDay>
<excludeDay>2014-12-24</excludeDay>
<excludeDay>2014-12-25</excludeDay></excludeDays>
<timeZone>GMT+01:00</timeZone></reportJobCalendar>
```

Server	Apache-Coyote/1.1
Pragma	No-cache
Cache-Control	no-cache
Expires	Wed, 31 Dec 1969 16:00:00 PST
P3P	CP="ALL"
Set-Cookie	JSESSIONID=EE9B6613B75A0D3245384B800D2A5D73; Path=/j
Content-Type	application/xml
Content-Length	689

Figure 8-9 Creating a Holiday Calendar with REST Web Services

Then you should see your new calendar in the list of calendar in the Schedule tab.



Holidays

Calendar of dates to exclude: 2014FrenchHolidays

Figure 8-10 Selecting a Custom Holiday Calendar in the Scheduler

The REST API supports other types of calendars, however, the user interface only lists the calendars of type `holiday`. Using the REST API, however, you can create and manage any number of calendars and update any schedule to use them. For more information, see the *JasperReports Server Web Services Guide*.

8.12 Configuring the Heartbeat

During installation (or the first time an administrator logs in), you are prompted once to participate in Jaspersoft's Heartbeat program, which reports technical information to Jaspersoft about your implementation, such as the operating system, JVM, application server, database (type and version), data source types, and JasperReports Server edition and version number.

If you change your mind, you can change the heartbeat behavior by editing the following configuration file:

Heartbeat Options	
Configuration File	
.../WEB-INF/js.config.properties	
Property	**Description**
`heartbeat.enabled=true`	When this property is set to `true`, JasperReports Server reports information about your environment to Jaspersoft once a week. When it is set to `false`, information is not sent.
`heartbeat.askForPermission.enabled`	Determines whether the administrator is prompted (the next time he logs into the web UI) about whether to allow heartbeat data to be sent. Typically, there is never cause to edit this property directly.
`heartbeat.permissionGranted.enabled`	Indicates whether a user has granted the server permission to send Heartbeat data. Setting this property to `false` prevents data from being sent.

All of these settings are properties that are substituted into the `heartbeatBean` in the .../WEB-INF/applicationContext-heartbeat.xml file.

8.13 Configuring the Online Help

JasperReports Server professional edition includes an online help system that describes the web interface. If your users don't have Internet connectivity, or if you don't want to provide access to this system, you can configure the server to hide the help links completely.

<table>
<tr><th colspan="3">Online Help Configuration Options</th></tr>
<tr><th colspan="3">Configuration File</th></tr>
<tr><td colspan="3">.../WEB-INF/applicationContext-webHelp.xml</td></tr>
<tr><th>Property</th><th>Bean</th><th>Description</th></tr>
<tr><td>showHelp</td><td>webHelp</td><td>Determines whether the help links are displayed in the JasperReports Server web UI. Valid values are true and false.
The **Help** link appears at the top right corner of the web UI's pages.</td></tr>
<tr><td>hostURL</td><td>webHelp</td><td>Indicates the name of the computer hosting the web server where the help is running. The value depends on the version of JasperReports Server. Do not change this value.</td></tr>
<tr><td>pagePrefix</td><td>webHelp</td><td>Defines the default page name to pass to the web server hosting the help system. The only valid value is Default_CSH.htm for this property.</td></tr>
<tr><td>helpContextMap</td><td>webHelp</td><td>Maps contexts in the application to topic identifiers in the help system. Many pages in the web application are configured for context-sensitivity. When a user clicks **Help** on such a page, JasperReports Server loads a specific topic in the help system. The topic that appears is determined by a map in the applicationContext-webHelp.xml file. The only valid values are the defaults.</td></tr>
</table>

CHAPTER 9 SERVER DIAGNOSTICS

This section describes functionality that can be restricted by the software license for JasperReports Server. If you don't see some of the options described in this section, your license may prohibit you from using them. To find out what you're licensed to use, or to upgrade your license, contact Jaspersoft.

JasperReports Server provides comprehensive diagnostics so that administrators can monitor the health and performance of the running server. In version 5.0, the server augments the audit logging with monitoring data that is easier to report against. Version 5.0 also introduces diagnostics that provide real-time information about the running server, such as memory usage. All of these tools can help you troubleshoot issues and analyze performance.

- Auditing stores key events that are of interest to system administrators, such as login/logout time, user, report generated, report details, and object sizes. The audited events can be saved and moved to an archive automatically after a specified number of days.
- Monitoring is based on audit events and provides a multi-dimensional Domain to create Ad Hoc views. This helps you generate reports that contain key metrics such as which reports use the most resources. This allow you to find places to optimize your data sources and your reports.
- Diagnostics provide run-time data that gives the overall health of your server instance. For example, it includes values such as logged in users, currently running reports, scheduled reports, and memory usage and performance in the Ad Hoc cache. The diagnostic data is exposed in a custom data source and can be easily viewed in a report or integrated with industry standard management consoles.

This chapter contains the following sections:

- **Events Being Audited and Monitored**
- **Configuring Auditing and Monitoring**
- **Using the Audit Data**
- **Using the Monitoring Data**
- **Importing and Exporting Event Data**
- **Real-Time Diagnostics**
- **Exposing Diagnostics Through Jaspersoft's JMX Agent**
- **Using the Diagnostic Data In Reports**
- **Excluding Diagnostic Attributes**

9.1 Events Being Audited and Monitored

In broad terms, an audit event is any atomic operation that can be recorded by the audit system. Event properties and attributes are features of the event; they can be defined internally or in custom code. Auditing and monitoring rely on the same record of events, so the audit events are also available in monitoring data sources, Domains, and reports.

The following table lists the defined audit events and the information that is collected about them. For every recorded event, JasperReports Server logs the time it occurred and the user who initiated it. See the configuration file applicationContext-audit.xml for complete specification of the events.

Event	Information Collected
Log in or log out	Time and user ID (recorded for every event)
Log in as	User logged in as
Run report or run a subreport within any other report	• Report referenced • Data source referenced • Report parameters and values • Report queries (such as SQL, Domain, HQL, generated SQL) • Execution start, end • Query execution time (in milliseconds) • Report rendering time (in milliseconds) • Caching parameters • Errors that occurred
Report schedule created, deleted, or updated	• Report referenced • Scheduling parameters and values
Scheduled report run	• Report output • Report delivery parameters (such as email) • Same parameters as when report is run
Creating report in Ad Hoc Editor	• Field added as a column • Field added as a group
Resource accessed for any reason (such as view, used in report, etc.)	• Resource referenced • Resource type
Resource added or updated	• Resource referenced • Resource type
Resource or folder deleted	Resource or folder referenced
Permissions added, updated, or deleted	• Resource or folder referenced • Previous permissions (before update)

Event	Information Collected
User added, updated, or deleted, also user password change	• User ID • User name • Email • Enabled flag • External flag • Profile attributes
Role added, updated, or deleted	• Role ID • Role name • Role organization
Organization added, updated, or deleted	• Organization ID • Organization description

9.2 Configuring Auditing and Monitoring

The auditing and monitoring features rely on the same subsystem in JasperReports Server. The settings for configuring auditing and monitoring are both located in the WEB-INF/applicationContext-audit.xml file. The beans and properties of this file are used to enable auditing and monitoring, set the archive options, and select which events are logged.

9.2.1 Enabling Auditing and Monitoring

Because auditing and monitoring share the same subsystem, there is a master configuration setting to turn on the subsystem, and individual settings for auditing and monitoring. This allows you to turn on each feature independently, or turn off the whole subsystem to avoid any overhead from an unused feature.

By default, the auditing and monitoring subsystem is off.

Enabling Auditing and Monitoring Options	
Configuration File	
.../WEB-INF/js.config.properties	
Property	**Description**
`audit.enabled=false`	Set this property to `true` to enable the auditing and monitoring subsystem. Given the default value of the other settings, only auditing is turned on when this setting is first set to `true`.

<table>
<tr><th colspan="3">Enabling Auditing and Monitoring Options</th></tr>
<tr><td colspan="2"><code>monitoring.enabled=false</code></td><td>Once <code>audit.enabled=true</code>, set this property to <code>true</code> to enable monitoring. More precisely, this setting controls the logging of events in the tables used by the monitoring Domain.</td></tr>
<tr><td colspan="2"><code>audit.sizeof.enabled=false</code></td><td>By default, the large print objects in memory are not measured because that can impact performance. If you want to temporarily enable auditing for the memory usage of print objects in reports, set this value to <code>true</code>.</td></tr>
<tr><th colspan="3">Configuration File</th></tr>
<tr><td colspan="3">.../WEB-INF/applicationContext-audit.xml</td></tr>
<tr><th>Property</th><th>Bean</th><th>Description</th></tr>
<tr><td><code>isAuditPersistence Enabled</code></td><td><code>audit Service</code></td><td>Set this property to <code>false</code> to disable logging of events in the tables used by the audit Domain. This allows you to turn off auditing data while keeping monitoring data.
Avoid turning off both monitoring and audit persistence. Instead, turn off the entire subsystem with <code>audit.enabled=false</code>.</td></tr>
</table>

9.2.2 Auditing Archive Options

Archiving is a mechanism to move audit data to separate database tables. For example if you create reports for weekly or monthly server usage based on the audit Domain, you will never access audit logs older than a week or month. Because audit data can be quite large, the old data can increase the time needed to write new data and query data for your report. Archiving automatically moves audit data to separate database tables after a certain time. If you want to create reports on historical audit data, Jaspersoft also provides a Domain to access the archived audit logs. You can also configure the audit feature to delete old archive data if you no longer need it.

You should set the archiving interval to a level that balances your need to record and access audit data with your server's performance on large audit tables. Use the following configuration settings to change the archiving behavior.

Auditing Archive Options
Configuration File
.../WEB-INF/applicationContext-audit.xml

Auditing Archive Options		
Property	**Bean**	**Description**
maxAudit EventAge ToArchive	auditService	The number of days to keep audit data in the active database. The default is 30. Older data is moved to the archive.
maxAudit EventAge	auditService	The number of days to keep the data. Older data is deleted. The default is 0 (zero), meaning that old data is never deleted.
cronExpression	auditEvent ArchiverTrigger	Defines the frequency of the archiving job in cron syntax. The default, 0 0 5* * ?, is every day at 5a.m.
cronExpression	auditEvent PurgerTrigger	Defines the frequency of the audit delete (purge) job in cron syntax. The default, 0 0 3 * * ?, is every day at 3 a.m.

The cronExpression properties use a Quartz scheduler cron expression that specifies the repeating trigger as seconds, minutes, hour, day of month, month, day of week.

9.2.3 Disabling Events and Properties

By default, all events and properties are logged. To enable or disable logging of a given event or property, use the applicationContext-audit.xml configuration file. Events that are logged are used by both the audit and monitoring subsystems, therefore to disable an event makes it unavailable for both auditing and monitoring.

In the file, event types and their properties are listed under <util:map id="enabledEventsMapping">. The map has three parts:

- WEB_SERVICES – Event types related to accessing JasperReports Server through a web service.
- GUI – Event types for access through the user interface.
- INTERNAL – Event types used by the server itself, such as when running a scheduled report.

To disable an event, comment it out. For example:

```
<!-- <entry key="createFolder" value="folderName,folderLabel,folderDescription" /> --
>
```

To disable a property, use any of these measures:

- Delete the property. For example, remove folderDescription, resulting in:

```
<entry key="createFolder" value="folderName,folderLabel,exception" />
```

- Disable it with the | syntax. For example:

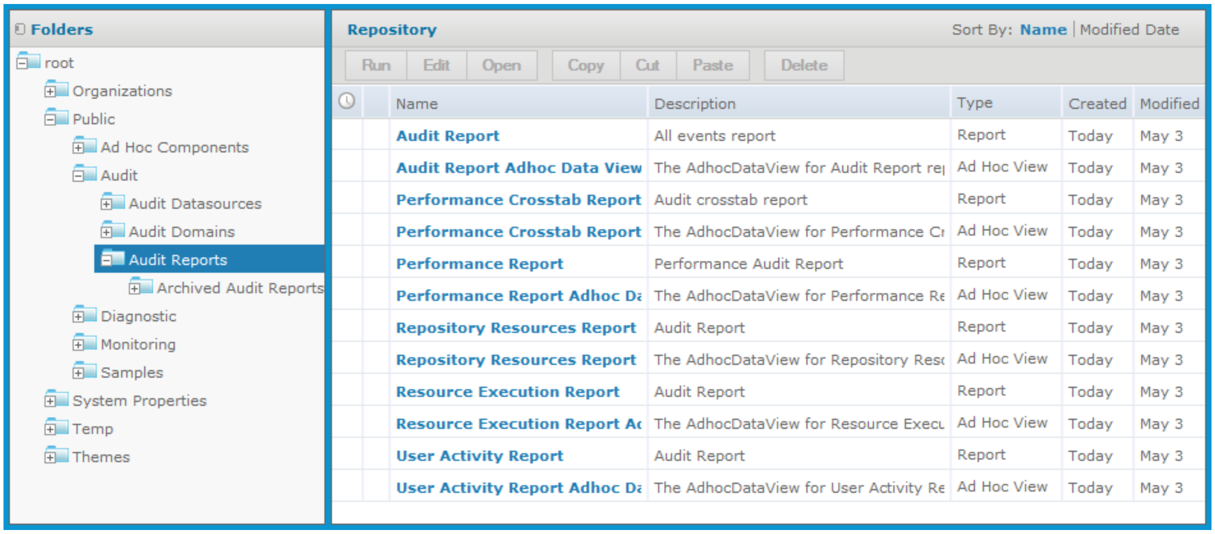
```
<entry key="createFolder" value="folderName,folderLabel,|folderDescription,exception"
/>
```

- Use the “all except” *| syntax to specify only the disabled property. All others are recorded. For example:

```
<entry key="createFolder" value="*|folderDescription" />
```

9.3 Using the Audit Data

JasperReports Server makes the audit data available to administrators through Domains and several prepared views and reports. These are located in the /Public/Audit folder of the repository.



- root
  - Organizations
  - Public
    - Ad Hoc Components
    - Audit
      - Audit Datasources
      - Audit Domains
      - Audit Reports
        - Archived Audit Reports
    - Diagnostic
    - Monitoring
    - Samples
  - System Properties
  - Temp
  - Themes

Name	Description	Type	Created	Modified
Audit Report	All events report	Report	Today	May 3
Audit Report Adhoc Data View	The AdhocDataView for Audit Report re|	Ad Hoc View	Today	May 3
Performance Crosstab Report	Audit crosstab report	Report	Today	May 3
Performance Crosstab Report	The AdhocDataView for Performance Cı	Ad Hoc View	Today	May 3
Performance Report	Performance Audit Report	Report	Today	May 3
Performance Report Adhoc Dz	The AdhocDataView for Performance Re	Ad Hoc View	Today	May 3
Repository Resources Report	Audit Report	Report	Today	May 3
Repository Resources Report	The AdhocDataView for Repository Reso	Ad Hoc View	Today	May 3
Resource Execution Report	Audit Report	Report	Today	May 3
Resource Execution Report Ac	The AdhocDataView for Resource Execu	Ad Hoc View	Today	May 3
User Activity Report	Audit Report	Report	Today	May 3
User Activity Report Adhoc Dz	The AdhocDataView for User Activity Re	Ad Hoc View	Today	May 3

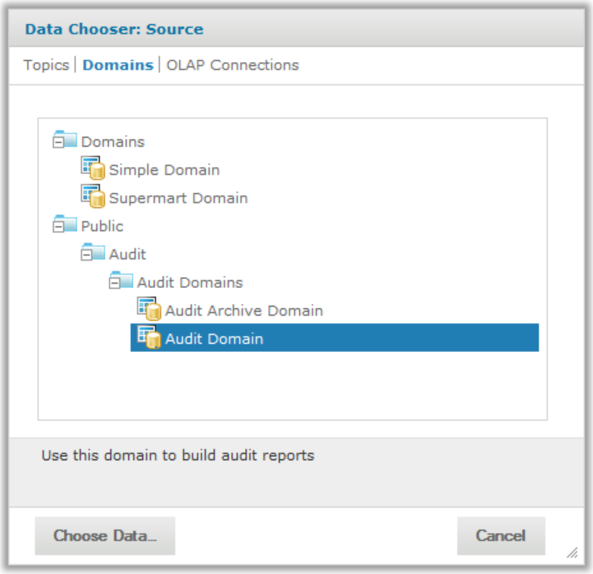
Figure 9-1 Audit Reports in the Repository

There are two Domains and two sets of reports created for accessing audit data:

- Audit Domain and Audit Reports – Use these to view the current audit data; they run against the active audit database.
- Audit Archive Domain and Archived Audit Reports – Use these to run reports on archived data; they run against the archive database.

The contents of both Domains and reports are identical—they differ only in the database tables that are accessed in each case.

To create an Ad Hoc View based on the audit Domains, select **Create > Ad Hoc View**, select the **Domains** tab in the Data Chooser, and expand the folders to select one of the audit Domains.



Use this domain to build audit reports

Figure 9-2 Selecting an Audit Domain to Create an Ad Hoc View

For instructions on using Domains in reports, see the Ad Hoc chapter in *JasperReports Server User Guide*. For documentation of Domains in general, see the Domains chapter in the same manual.

The following sections explain the contents of the Domains and the reports that are provided.

9.3.1 Domain Items

The Domains expose the fields of the audit logging tables stored in the server's internal database. As with all Domains, the database tables are joined, and the fields are presented as items that can be used in Ad Hoc views.

The following tables describe the items in both audit Domains (Audit Domain and Audit Archive Domain). These items correspond to the information that is recorded for each event. When creating a view based on either Domain, choose the items that correspond to the type of event you want to report on.

Domain items in the following table are used in general events as well as repository events:

Domain Item	Description
Date	Date event occurred.
Prop Long Value	`clob` value of event property, such as query.
Prop Type	Type of event property, such as destination folder, as per event map in configuration file.
Prop Value	`string` value of event property, such as folder name.
Time	Time event occurred.

Domain Item	Description
Event Type	Type of event, such as save resource, as per event map in configuration file.
Request Type	Repository request type of event.
Resource Type	Repository type of resource accessed in event.
Resource URI	URI of repository resource.

Domain items in the following table are recorded for user events:

Domain Item	Description
E-mail	E-mail address of event user (user at time of event).
Enabled	Whether event user is currently a user.
External	Whether event user was an external user.
Full Name	Full name of event user.
Password Changed	Whether event was a change of password
Organization	Organization of event user.
User Name	UserID of event user.

Domain items in the following table are recorded for role events:

Domain Item	Description
External	Whether role was defined in an external system.
Role Name	Name of the role in the event.
Organization	Organization of the role in the event.

Domain items in the following table are recorded when a report is generated:

Domain Item	Description
Date	Date the report is generated.
Time	Time the report is generated.
Resource URI	URI of repository resource accessed for report.
Resource Type	Repository type of resource accessed for report.

Domain Item	Description
Datasource URI	URI of data source accessed for report.
Query Execution Time	Time to execute the query in the database.
Report Rendering Time	Time to prepare query results for display.
Report Execution Time	Total time to execute the report (query execution + report rendering + overhead). Overhead includes tasks such as loading repository resources (report unit, data source, etc) and obtaining a DB connection from the data source.
Query	Specification of the report query.
User Name	UserID of event user.
Organization	Organization of event user.
Crosstab Group Field	Field name used in crosstab

9.3.2 Audit Reports and Ad Hoc Views

The audit reports and their views are blank by default, because auditing is disabled by default and no audit data exists. To view these reports, first enable auditing as described in section **"Configuring Auditing and Monitoring" on page 219**, then wait for user activity to generate events.

A number of Ad Hoc views based on the audit Domains are provided in the Public/Audit/Audit Reports folder. The same views and reports are also provided in the Archived Audit Reports subfolder. These reports are identical, except they use the Audit Archive Domain and run against the archived audit data. As with all audit material, these reports are visible only to administrators.

The reports are designed to cover common audit needs and can be used as-is. When auditing is enabled and audit events are being recorded, they will contain up-to-the-minute records of events on your server. You can run the reports or schedule them as needed.

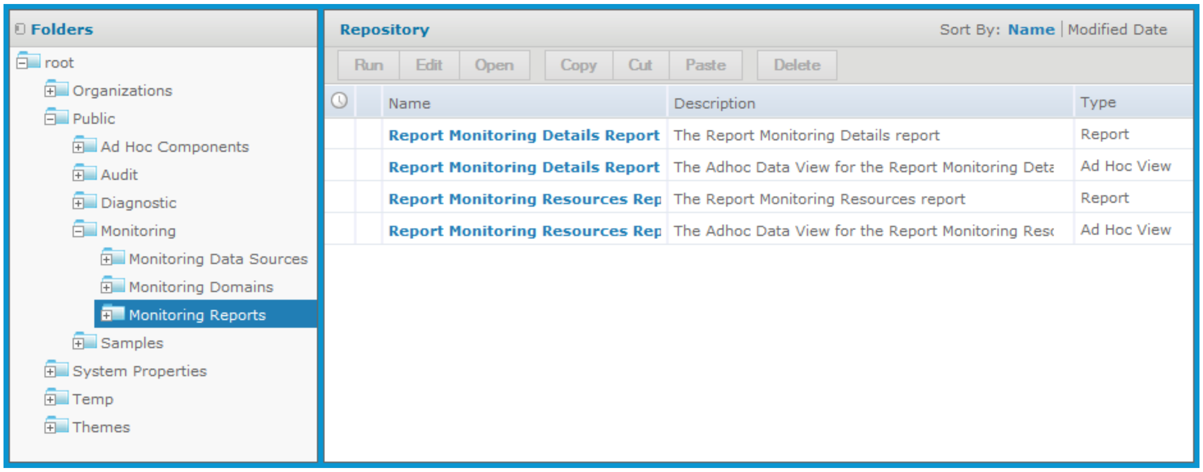
The Ad Hoc view used to create each report is included as well. You can open these in the Ad Hoc editor to explore the audit data in real-time. You can also modify these views in the Ad Hoc Editor to generate new reports to suit your auditing requirements.

The following views and reports are provided:

- Audit Report – Generic example of a an audit report showing commonly audited events.
- Performance Crosstab Report – A crosstab that shows average performance of reports that were run.
- Performance Report – Generates a list of reports that were run and sorted by run-time to identify slow reports.
- Repository Resources Report – Shows repository resources and their associated events.
- Resource Execution Report – Generates a list of reports that were run.
- User Activity Report – Generates a list of reports run by a specific user.

9.4 Using the Monitoring Data

JasperReports Server makes the monitoring data available to administrators through a Domain and several prepared views and reports. These are located in the /Public/Monitoring folder of the repository.



Name	Description	Type
Report Monitoring Details Report	The Report Monitoring Details report	Report
Report Monitoring Details Report	The Adhoc Data View for the Report Monitoring Deta	Ad Hoc View
Report Monitoring Resources Rep	The Report Monitoring Resources report	Report
Report Monitoring Resources Rep	The Adhoc Data View for the Report Monitoring Reso	Ad Hoc View

Figure 9-3 Monitoring Reports in the Repository

To create an Ad Hoc View based on the audit Domains, select **Create > Ad Hoc View**, select the **Domains** tab in the Data Chooser, and expand the folders to select the monitoring Domain. For instructions on using Domains in reports, see the Ad Hoc chapter in *JasperReports Server User Guide*. For documentation of Domains in general, see the Domains chapter in the same manual.

The following sections explain the contents of the Domains and the reports that are provided.

9.4.1 Domain Items

The monitoring Domain exposes the fields of the monitoring tables stored in the server's internal database. As with all Domains, the database tables are joined, and the fields are presented as items that can be used in Ad Hoc views.

In this release of JasperReports Server, the monitoring fields are limited to those that record report execution events:

Domain Item	Description
Day	Day of the month the report finished running.
Editing Action	The Ad Hoc editing step that the user just performed (null for report execution): • insertDimensionInAxisWithChild – A dimension was added. • addMeasure – A measure was added. • setProperty – A property was set. • moveDimension – A dimension was moved.

Domain Item	Description
Event Context	The context that triggered the report execution. Possible values are: • ui – The report ran interactively from the user interface. • web services – The report was run via web services. • internal – The report ran from an internal process, usually the scheduler.
Event Type	The type of report that was executed. Possible values are: • report execution – A report that ran from the repository. • ad hoc editing – A report that ran from an Ad Hoc view being edited.
Hour	Hour that the report finished running.
id	ID number of the monitoring event.
Minute	Minute that the report finished running.
Month	Month that report finished running.
Query Execution Time	The time spent executing the SQL query in the database.
Report Rendering Time	The time spent rendering the report after receiving the query results (dataset).
Report URI	Repository path of the report that was run.
Time Stamp	Full time and date that the report was finished running, including milliseconds.
Total Report Execution Time	The total time spent running the report. Typically this is a little more than the sum of the query execution and report rendering times, due to overhead. Overhead includes tasks such as loading repository resources (report unit, data source, etc) and obtaining a DB connection from the data source.
User Name	The user who ran the report.
User Organization	The organization containing the user who ran the report.
Year	Year that the report finished running.

9.4.2 Monitoring Views and Reports

The monitoring reports and their views are blank by default, because the audit subsystem that monitoring depends upon is disabled by default and no audit data exists. To view these reports, first enable auditing as described in section **“Configuring Auditing and Monitoring” on page 219**, then wait for user activity to generate events.

A number of Ad Hoc views based on the monitoring Domain are provided in the Public/Monitoring/Monitoring Reports folder.

The reports are designed to cover common monitoring needs and can be used as-is. When monitoring is enabled and audit events are being recorded, the reports will contain up-to-the-minute records of events on your server. You can run the reports or schedule them as needed.

The Ad Hoc view used to create each report is included as well. You can open these in the Ad Hoc editor to explore the monitoring data in real-time. You can also modify these views in the Ad Hoc Editor to generate new reports to suit your monitoring requirements.

The following views and reports are provided:

- Report Monitoring Resources Report – Gives a list of all reports that were run and shows their average and high-low runtimes.
- Report Monitoring Details Report – A crosstab that shows report runtimes on one axis and many dimensions such as a time hierarchy, user and organization, and event type on the other axis,.

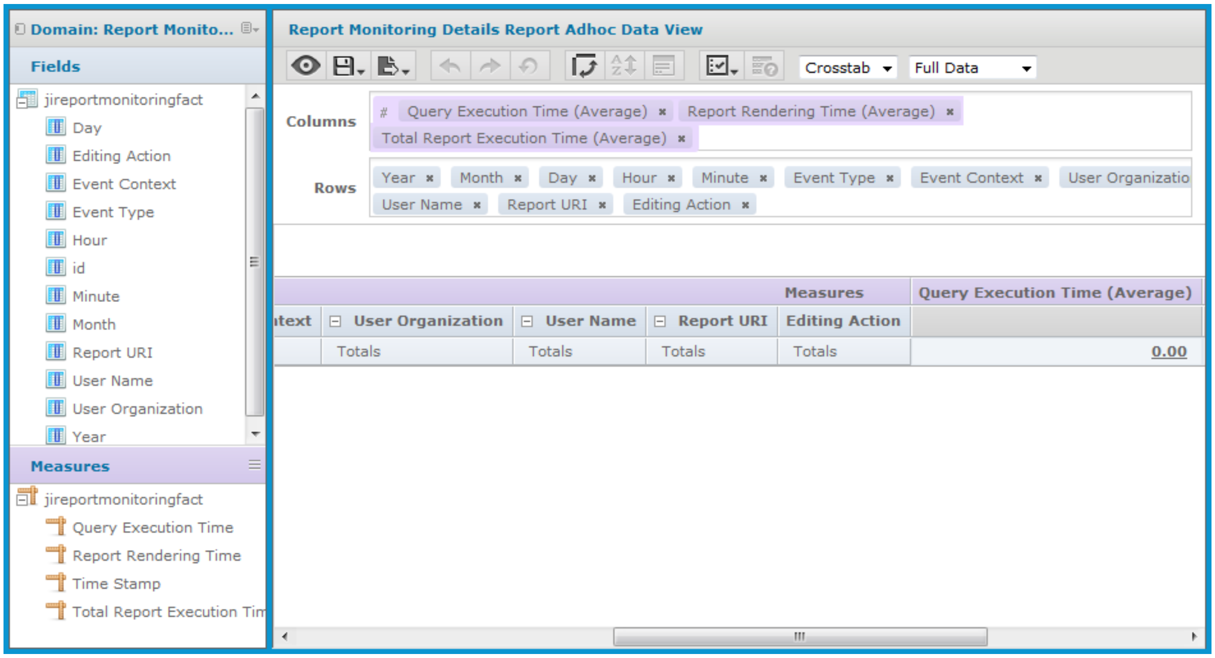


Figure 9-4 Monitoring Ad Hoc View with Multi-dimensional Analysis

9.5 Importing and Exporting Event Data

Audit and monitoring data can be imported and exported with the utilities described in the chapter **"Import and Export" on page 127**.

- To export audit data, use the `--include-audit-events` option in the export command.
- To export monitoring data user the `--include-monitoring-events` option in the export command.
- To import audit data, import the catalog containing audit data with the `--include-audit-events` option.
- To import monitoring data, import the catalog containing audit data with the `--include-monitoring-events` option.

Data in temp folders is not exported.

9.6 Real-Time Diagnostics

With JasperReports Server 5.0, Jaspersoft introduces full instrumentation of the server so that it can provide real-time diagnostic information such as memory usage, concurrent reports being run, cache statistics, and much more. Whereas auditing and monitoring provide a historical record of events on the server, diagnostics display the current status of the server and its Java Virtual Machine (JVM) environment.

For example, you can use the diagnostic information to adjust your JVM settings to optimize memory based on the size of typical datasets in your Ad Hoc cache. And because diagnostic data is available through a Topic, you can create Ad Hoc views that help you analyze your server performance and identify performance bottlenecks before they happen.

The diagnostic feature relies on the Java Management Extensions (JMX) industry standard to gather run-time data and expose it to other management interfaces. JasperReports Server implements several elements of the JMX architecture:

- New JMX managed beans that are used to gather and hold diagnostic data such as the number of concurrent reports.
- Its own JMX agent, like a server, that responds to JMX requests and exposes the information from the managed beans.
- Connections to existing JMX managed beans in other components such as Ehcache to include their diagnostic data.
- Connections to other JMX agents such as JVM agent to gather system diagnostics.

For more information about JMX, see http://docs.oracle.com/javase/tutorial/jmx/.

There are two ways to use diagnostic data from JasperReports Server:

- If you have an external management console that can connect to a JMX agent, you can use it to connect to the server's JMX agent. You will probably also want to connect to the JVM's JMX agent as well. You can then view the real-time diagnostic data from JasperReports Server integrated with the data from your other servers in your management console. Management consoles often offer further functionality such as thresholds and alarms that you can set on data from any JMX managed bean.
- Jaspersoft provides a custom data source within the server that collects the same information from the managed beans in the server and in the JVM. You can then create JasperReports that access this data source and present this diagnostic data in a report that suits your needs. Jaspersoft also provides a report and an Ad Hoc Topic to demonstrate this.

9.7 Exposing Diagnostics Through Jaspersoft's JMX Agent

By default, the diagnostic feature is configured to allow access to the diagnostic data through a remote management console that supports JMX. This allows you to integrate JasperReports Server diagnostics with your overall IT management strategy. Alternatively, the Java Development Kit provides the jConsole tool that uses JMX and can be used to monitor your server remotely. All of these management consoles access the JMX agent provided with JasperReports Server, and access is secured by the same users, passwords, and roles used by the server's web interface.

9.7.1 Connecting to the JMX Agent

To connect your management console to the JasperReports Server's JMX agent, initiate a new connection from your console and specify the following connection string:

```
service:jmx:rmi://localhost/jndi/rmi://<host>:<port>/<connectionName>
```

where:

- `<host>` is the computer where JasperReports Server is running
- `<port>` is the JMX port, by default `10990`
- `<connectionName>` is the name of the JMX agent, by default `jasperserver`

Therefore, the default connection string is:

```
service:jmx:rmi://localhost/jndi/rmi://<host>:10990/jasperserver
```

If you have a firewall implemented on the computer that hosts JasperReports Server, you will need to open the JMX port (10990 by default) before connecting.

When prompted to enter a username and password, you must give a user with the following roles:

Commercial editions:	ROLE_SUPERUSER, thus by default the `superuser` user
Community project:	ROLE_ADMINISTRATOR, thus by default the `jasperadmin` user

The following sections explain how to modify the default connection values for:

- The connection name
- The JMX port
- The required roles

9.7.2 Configuring the Port and Connection Name

The connection name is the name registered for the JMX agent with the remote method invocation (RMI) service. If you have more than one JasperReports Server instance in a single app server, you need to change the registered connection name for all but the first one.

There are times you may want to change the port from default (10990) to another port, for example, if another service is configured to use the default port. For example, change the port if you have JasperReports Server running in a second app server on the same computer.

To change the port or connection name, edit one of following files:

- In the WAR file distribution before installation: <js-install>/buildomatic/default_master.properties
- In the installed WAR file before starting the server: <js-war>/WEB-INF/js.diagnostic.properties

Find the following lines and edit the values to your desired port number and connection name:

```
diagnostic.jmx.port = 10990
diagnostic.jmx.name = jasperserver
```

9.7.3 Configuring Roles for JMX Connections

If you want to allow other users to establish the JMX connection from a remote management console, you must configure JasperReports Server to allow other roles:

- For commercial editions, edit the WEB-INF/applicationContext-Diagnostic-pro.xml file and modify the following setting:

```
<util:list id="diagnosticAllowedRolesPro">
    <value>ROLE_SUPERUSER</value>
</util:list>
```

- For community projects, edit the WEB-INF/applicationContext-Diagnostic.xml file and modify the following setting:

```
<util:list id="diagnosticAllowedRolesCe" value-type="java.lang.String">
    <value>ROLE_ADMINISTRATOR</value>
</util:list>
```

In both cases, you can change the existing role or add additional lines containing alternate `<value>ROLE_name</value>`.

9.7.4 Disabling Remote Connections to the JMX Agent

By default, remote connections to JMX Agent are enabled and configured as described in **9.7.1, "Connecting to the JMX Agent," on page 229**.

. To disable remote connections, edit the applicationContext-diagnostic.xml file and make the following changes:

- Comment out the entire `jMXAuthenticator` bean.
- Comment out the entire `jMXregistry` bean.
- Comment out the entire `jasperJMXServerConnector` bean.
- Comment out or remove the property `depends-on="jMXregistry"` in the `jasperJMXServer` bean.

To comment out a section of this XML file, surround it with `<!--` and `-->` tags.

9.7.5 Alternative Connection Through App Server JMX Service

Most app servers also have a JMX agent, and if they are configured properly, they can discover the JasperReports Server JMX agent and expose the diagnostic information. However, this connection has some significant security implications:

- When the app server discovers and connects to the JMX agent, it has full access to the diagnostic information.
- If the app server's JMX agent is configured for remote access, then the remote manager also has access to the JasperReports Server JMX agent--without needing to provide the JasperReports Server username and password. In other words, by trusting the app server to access the diagnostic information, you are also allowing anyone that the app server trusts to connect.
- The connection between the two JMX agents is reciprocal. If remote access is still enabled on the JasperReports Server JMX agent, a remote manager who connects to it also sees the contents of the app server JMX agent. In other words, the app server JMX agent is also trusting anyone who we trust to connect to our JMX agent (with our username and password).

To connect automatically to the app server's JMX agent, assuming one is available, edit the default_master.properties file before you deploy the JasperReports Server web app, and add the following line:

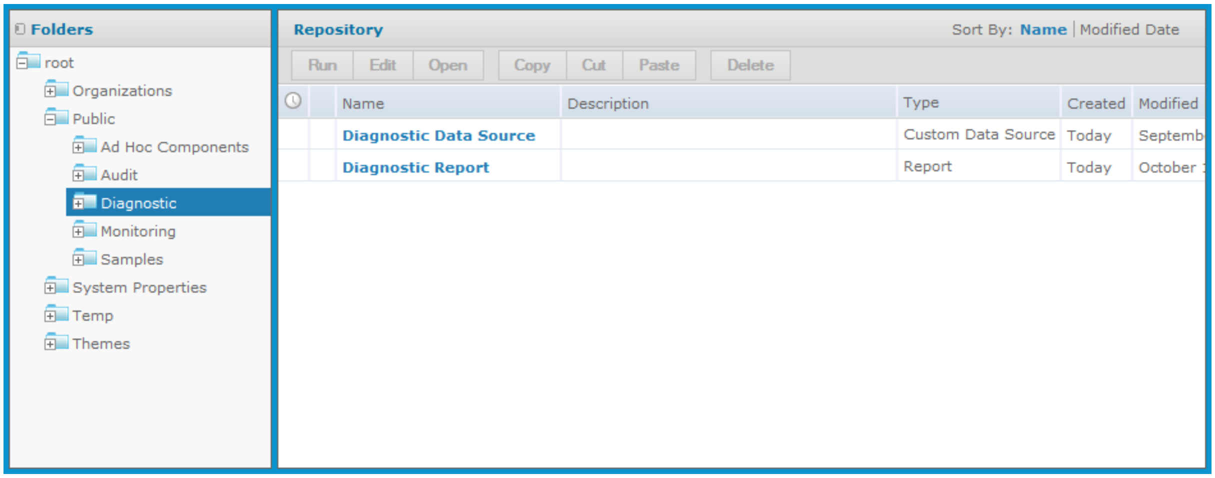
```
diagnostic.jmx.usePlatformServer = true
```

If the app server is Apache Tomcat for example, a local JMX connection named Catalina appears to anyone accessing the JasperReports Server JMX agent.

9.8 Using the Diagnostic Data In Reports

In addition to remote JMX connections, JasperReports Server makes the diagnostic data available to administrators for internal reports. The following resources are visible to the system admin (`superuser` by default) in the repository:

- /Public/Diagnostic/Diagnostic Data Source – A custom data source that returns all of the diagnostic fields.
- /Public/Diagnostic/Diagnostic Report – A report that displays nearly every single diagnostic field.
- /Public/Ad Hoc Components/Topics/Diagnostic Topic – A JRXML resource that can be used as a Topic to create an Ad Hoc view using diagnostic fields.

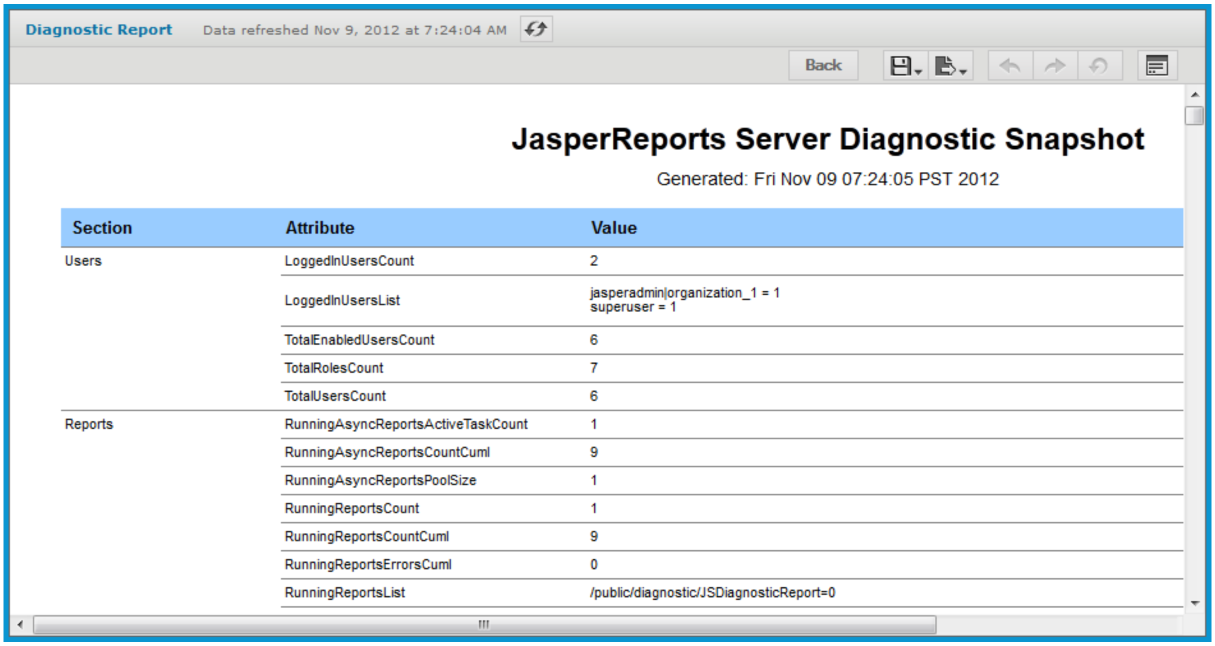


Name	Description	Type	Created	Modified
Diagnostic Data Source		Custom Data Source	Today	Septemb
Diagnostic Report		Report	Today	October :

Figure 9-5 Diagnostic Report in the Repository

The diagnostic topic and report are based on the diagnostic data source. This is a custom data source that encapsulates the JMX information and makes it available as a data source for reports. In addition, there is an Internal Diagnostic Data Source type that can be used to create a new data source. If you accidentally delete the diagnostic data source, select **Create > Data Source**, set the type to Internal Diagnostic Data Source, and set the name and location to re-create it.

The following figure shows the beginning of the diagnostic report. This report displays nearly every field that is available through JMX and the diagnostic subsystem. This report serves as a reference for the diagnostic data. The report is also very useful when configuring your server because it shows many server configuration settings as well as system information such as memory usage. You can use this information to fine tune the performance of your JasperReports Server instance.



JasperReports Server Diagnostic Snapshot

Generated: Fri Nov 09 07:24:05 PST 2012

Section	Attribute	Value
Users	LoggedInUsersCount	2
	LoggedInUsersList	jasperadmin|organization_1 = 1 superuser = 1
	TotalEnabledUsersCount	6
	TotalRolesCount	7
	TotalUsersCount	6
Reports	RunningAsyncReportsActiveTaskCount	1
	RunningAsyncReportsCountCuml	9
	RunningAsyncReportsPoolSize	1
	RunningReportsCount	1
	RunningReportsCountCuml	9
	RunningReportsErrorsCuml	0
	RunningReportsList	/public/diagnostic/JSDiagnosticReport=0

Figure 9-6 Contents of the Diagnostic Report

9.9 Excluding Diagnostic Attributes

The JasperReports Server diagnostic feature exposes a set of managed beans (MBeans), each with a number of JMX attributes. By default, all attributes of all MBeans are available. If you would like to limit what is exposed, you can exclude any of the attributes or entire beans through the following configuration file:

.../WEB-INF/applicationContext-diagnostic.xml

- To exclude an attribute, locate the MBean where it is defined and uncomment it from the `excludedDiagnosticAttributes` property. For example, if you want to hide sensitive information about your internal database, modify the `diagnosticRepositoryDatabaseInfoCe` MBean as follows:

```
<bean id="diagnosticRepositoryDatabaseInfoCe" class=
      "com.jaspersoft.jasperserver.api.logging.diagnostic.jmx.DiagnosticDynamicMBean">
    <property name="diagnosticServices">
        <set>
            <ref bean="repositoryDatabaseInfo"/>
        </set>
    </property>
    <property name="excludedDiagnosticAttributes">
        <set>
            <value>DatabaseProductName</value>
            <value>DatabaseProductVersion</value>
            <value>DriverName</value>
            <value>SQLKeywords</value>
            <value>URL</value>
            <value>UserName</value>
            <value>JDBCMajorVersion</value>
            <value>JDBCMinorVersion</value>
            <!--
            <value>MaxRowSize</value>
            <value>MaxStatementLength</value>
            <value>MaxConnections</value>
            <value>MaxCharLiteralLength</value>
            <value>MaxColumnsInTable</value>
            <value>MaxColumnsInSelect</value>
            <value>MaxColumnsInGroupBy</value>
            <value>MaxColumnNameLength</value>
            -->
        </set>
    </property>
</bean>
```

- To exclude an entire bean, comment it out or remove it from the list of beans in the diagnosticExportingMBeansMap. For example, instead of excluding selected attributes, you could remove the entire repository database MBean as follows:

```
<util:map id="diagnosticExportingMBeansMap" >
    <entry key="jasperserver:name=Users" value-ref="${bean.diagnosticUsers}"/>
    <entry key="jasperserver:name=Reports" value-ref="${bean.diagnosticReports}"/>
    <entry key="jasperserver:name=Scheduler" value-ref="${bean.diagnosticScheduler}"/>
    <entry key="jasperserver:name=Settings" value-ref="${bean.diagnosticSettings}"/>
    <entry key="jasperserver:name=Repository" value-ref="${bean.diagnosticRepository}"/>
    <entry key="jasperserver:name=About" value-ref="${bean.diagnosticJSAbout}"/>
    <entry key="jasperserver:name=HibernateStatics"
        value-ref="${bean.diagnosticHibernate}"/>
    <entry key="jasperserver:name=EhCache"
         value-ref="${bean.diagnosticEhCache}"/>
    <entry key="jasperserver:name=ExternalInfo"
         value-ref="${bean.diagnosticExternalInfo}"/>
    <!--
    <entry key="jasperserver:name=RepositoryDatabase"
         value-ref="${bean.diagnosticRepositoryDatabaseInfo}"/>
    -->
</util:map>
```

9.10 Disabling the Diagnostic Subsystem

By default the JMX diagnostic subsystem is always enabled, but external access is password-protected and requires opening the diagnostic port in your firewall as described in **Exposing Diagnostics Through Jaspersoft's JMX Agent**. If you wish to disable all external access, see **Disabling Remote Connections to the JMX Agent**.

Internally, the diagnostics subsystem is passive and has no performance impact until it is accessed in a report through the diagnostic data source. However, if you wish to disable the entire diagnostic subsystem, rename or remove the following files:

- applicationContext-diagnostic.xml
- applicationContext-diagnostic-pro.xml

In that case, the diagnostic data source, the sample report, and the sample Topic described in **"Using the Diagnostic Data In Reports" on page 232** will not function either. They can be deleted from the repository.

APPENDIX A TROUBLESHOOTING

This section describes functionality that can be restricted by the software license for JasperReports Server. If you don’t see some of the options described in this section, your license may prohibit you from using them. To find out what you're licensed to use, or to upgrade your license, contact Jaspersoft.

This appendix contains the following sections:

- **Number of Users Exceeded**
- **Running Out of Database Connections**
- **Fields Do Not Appear in Ad Hoc Editor**
- **Field Names Disappear in Ad Hoc Canvas**
- **Ad Hoc Filter With All Values Causing Error**
- **Ad Hoc Dimensions Too Large**
- **Custom URLs Not Loading in Dashboards**
- **Print View Not Displaying in Dashboards**
- **Scheduler Sending Multiple Emails**
- **Scheduler Running Deleted Jobs**
- **Charts Not Appearing in Excel Export**
- **Adding Data Sources**
- **Hadoop-Hive Reports Not Running**
- **Reverting to the Old Home Page**

A.1 Number of Users Exceeded

When there are more users defined in the server than your license allows, the login page displays a warning; users can still log in. After a 24-hour grace period, an email is sent to the administrator and users can no longer log in. Most server functionality is disabled. To re-enable server functionality:

- Contact Jaspersoft sales to purchase additional user licenses. When you install the new license, the server becomes fully functional for all users.
- Remove users until the number of user accounts on the server is in accord with your license. When server functionality is disabled, administrators can still log on and select **Manage > Users** to delete user accounts. For more information see **2.2, “Managing Users,” on page 29**.

A.2 Running Out of Database Connections

JasperReports Server manages a pool of connections for each JDBC data source. The default number of connections is 20, but if you run many reports concurrently against the same data source you may reach the connection limit and see degraded performance. In particular, using the web service APIs, REST clients can easily launch many report executions at the same time and reach the limit.

The connection pool size is limited to avoid having too much memory permanently allocated to connections. But if you need more concurrent connections on a regular basis, you can increase the limit with the following configuration:

Reducing the Size Limit for Ad Hoc Dimensions		
Configuration File		
.../WEB-INF/applicationContext.xml		
Property	**Bean**	**Description**
`<constructor-arg type="int" value="20"/>`	`dataSource ObjectPool Factory`	Change the default value to match your concurrent connections. Make sure you have enough memory to handle the connections and the concurrent report executions.

If you are using JNDI data sources, you can configure the number of connections in your application server. For more information, see the sections on JNDI service in **"Troubleshooting" on page 237**.

A.3 Fields Do Not Appear in Ad Hoc Editor

The Ad Hoc editor only supports certain data types. If a Topic contains a field with an unsupported type, the field does not appear when you open the Topic in the Ad Hoc editor. The following data types are supported in the Ad Hoc editor:

- java.lang.String
- java.lang.Byte
- java.lang.Short
- java.lang.Integer
- java.lang.Long
- java.lang.Float
- java.lang.Double
- java.lang.Number
- java.util.Date
- java.sql.Date
- java.sql.Time
- java.sql.Timestamp
- java.math.BigDecimal
- java.math.BigInteger
- java.lang.Boolean
- java.lang.Object

Unsupported data types may occur when editing Topics manually, and sometimes with data sources for big data, in particular MongoDB. The connector for MongoDB uses the data type of a given value in the last document containing that value, and errors in input files may cause unexpected types. For example, omitting the single quotes in the JSON format causes a string type to be interpreted as a numeric type.

If your Topic or Domain fields do not appear in the Ad Hoc editor, you can enable logging on the following class to see details of fields with unsupported data types:

com.jaspersoft.ji.adhoc.metadata.AdhocTopicMetadata

For information about enabling logging, see **"Configuring System Logs" on page 188**.

A.4 Field Names Disappear in Ad Hoc Canvas

Some fields with international characters in their display names disappear when the field is dragged into the canvas of the Ad Hoc Editor. This is caused by non-Unicode characters used in the field name in the JRXML underlying the selected Topic.

To make the international characters appear in Ad Hoc view field labels, use the resource bundle mechanism:

1. Create a resource bundle (*.properties) and associate each of your field label with a unique key. Use Unicode escape sequences such as `\u0153` for the œ character to insert international characters in your label values.
2. Use the $R syntax in the Topic to specify the appropriate key for the label of each desired field.
3. Upload the resource bundle as a resource of the Topic.

When you open the Topic in the Ad Hoc Editor, the labels are displayed correctly from the resource bundle.

This method has the advantage that you can create a resource bundle for each language that the Topic needs to support, and users see the labels for the locale they set in their browser.

For more information about localizing JasperReports Server, see **"Localization" on page 249**.

A.5 Ad Hoc Filter With All Values Causing Error

When using filters in the Ad Hoc editor, your browser sends lists of values to the server with a POST operation. If you filter a field with tens or hundreds of thousands of distinct values, and then select all values, your browser will send megabytes of data in the POST operation. Some application servers are configured to reject such large input by default.

For example, if you select 100 000 values in an Ad Hoc filter on a default installation on Tomcat, Tomcat will log an error and redirect the user to the JasperReports Server home page. The Tomcat error log may contain the following entry:

```
2013-09-30 15:12:33,847 ERROR errorPage_jsp,http-8080-6:559 - stack trace of
exception that redirected to errorPage.jsp
java.lang.NullPointerException
```

If you apply filters to fields with large numbers of distinct values, make sure your app server is configured to accept large input. The following table shows how to configure Apache Tomcat. For other app servers, refer to your app server's documentation about POST operations.

Configure Apache Tomcat to Accept Large Filter Values
Configuration File
<tomcat>/conf/server.xml

Configure Apache Tomcat to Accept Large Filter Values	
Property	**Description**

`<Connector port="8080" protocol="HTTP/1.1"`
`connectionTimeout="20000"`
`redirectPort="8443"`
`URIEncoding="UTF-8"`
`maxPostSize="0" />`
	Add the `maxPostSize` parameter to set the number of bytes accepted by the app server; `"0"` indicates there is no limit. For more information, see the Tomcat documentation.

A.6 Ad Hoc Dimensions Too Large

A column or row dimension in an Ad Hoc crosstab is the equivalent of a row group in an Ad Hoc table. The members of a dimension or group are the unique values used to aggregate the data. Some dimensions and groups can have hundreds or thousands of members. Even if the dimensions are collapsed, the internal engine must calculate and store the values for all dimension members and all cells.

Some datasets contain fields that make huge dimensions on the order of tens of thousands or hundreds of thousands of members. These fields are usually meant to be filtered, but if they are inserted into the crosstab before filtering or by accident, they will trigger a large database operation and a large processing load in the Ad Hoc editor. To limit this impact, you can configure a limit to the number of members in any dimension.

The internal process that calculates groups, dimension, and members is called the categorizer. Change the following setting to reduce this limit and avoid performance issues with large cardinality dimensions.

Reducing the Size Limit for Ad Hoc Dimensions		
Configuration File		
.../WEB-INF/applicationContext-catFactory.xml		
Property	**Bean**	**Description**
`maxMembers`	`baseCategorizer`	By default, the limit is set to 100,000 member per dimension. When the limit is reached, all other members are grouped in a member named "Other." Set this property to a lower value based on your typical data and reporting needs.

In addition, dimensions and groups may be nested on several levels, for example Country, Province, and City. If your row data has 100 countries, and each country has 10 provinces, and each province has 10 cities or towns, there will be 100 x 10 x 10 = 10,000 rows in your full crosstab. If you also have two column dimension, each with 10 members, there will be 100 columns in your crosstab and one million cells when all dimensions are fully expanded. This scenario has several implications:

- Nested dimensions and high cardinality dimensions quickly create huge crosstabs.
- Huge crosstabs have a performance impact and take a long time to display and update.
- Consider whether it's possible for users to actually read and interpret such a large crosstab.
- Avoid dimensions with more than 10 members and avoid nesting many levels on each axis.
- Use filters as input controls instead of hiding and expanding dimensions in the crosstab.

For example, it's unlikely that a user can read the expanded data for more than one country at a time. The large report in this example can be replaced with two reports, one that only has the country dimension and allows the user to compare aggregate values from all countries, and another that displays all provinces and cities for a single country selected by a drop-down filter list. Both reports will run much faster than the single large report, and the user will not be blocked waiting for the report to refresh.

A.7 Custom URLs Not Loading in Dashboards

Dashboards allow you to specify frames that contain web pages loaded from custom URLs specified when designing the dashboard. These URLs can even include parameters from input controls. However, if the URL takes too long to load, JasperReports Server will display an error message instead of the content.

If you expect the custom URL to take longer than 10 seconds, you can change the default timeout as follows:

Configuring the Dashboard URL Loading Timeout	
Configuration File	
.../scripts/dashboard.designer.js	
Property	**Description**
`CUSTOM_URL_IFRAME_TIMEOUT`	Time in milliseconds that the server will allow a custom URL to load in a dashboard before displaying an error. The setting takes effect immediately when the file is saved, there is no need to restart the server.

A.8 Print View Not Displaying in Dashboards

If you cannot display the Print view for a dashboard, there might be an issue with the size of the input control values. Input control values are passed as URL parameters on this page, and the application server can limit the length of the URL that includes the parameters.

To avoid this limit and allow large numbers of input control values in dashboard print view, edit the following configuration file, or the equivalent in your application server.

Configure Apache Tomcat to Accept Large Filter Values	
Configuration File	
<tomcat>/conf/server.xml	
Property	**Description**

`<Connector port="8080" protocol="HTTP/1.1"`
`connectionTimeout="20000"`
`redirectPort="8443"`
`URIEncoding="UTF-8"`
`maxPostSize="0"`
`maxHttpHeaderSize=65535 />`
	Add the `maxHttpHeaderSize` parameter to set the number of bytes accepted in the URL by the app server; `"65535"` is equivalent to 64 KB. For more information, see the Tomcat documentation.

A.9 Scheduler Sending Multiple Emails

In cases where you have a cluster of JasperReports Server instances accessing the same repository, the schedulers in each instance can sometimes conflict and send multiple emails. The behavior depends on the run-time of the reports that are scheduled, because a long report may cause the scheduler on another node to attempt to run the same report before the first node finishes.

To change this behavior, set the following parameter in <WAR-file>/WEB-INF/js.quartz.base.properties:

```
org.quartz.jobStore.clusterCheckinInterval = 900000
```

In case a job fails on the first node, the check-in interval is meant to ensure that the job runs on a second node after this delay. Because the schedulers do not communicate directly, the second scheduler cannot distinguish between a node that had a failure and a node that is still running a job. The default value corresponds to 15 minutes.

This parameter can be adjusted as follows:

- If you have scheduled reports that take a long time to run, longer than 15 minutes, you may see multiple emails. Increase this parameter to an interval longer than your longest report's expected run-time.
- On the other hand, if you have small reports that finish quickly, the default value means that any scheduler or node problem isn't detected by the other scheduler before 15 minutes. If you have time-critical reports scheduled, you can lower this parameter, but the value should still exceed your longest expected report run-time.

Restart all of your server instances after changing this parameter.

A.10 Scheduler Running Deleted Jobs

In some cases, old versions of JasperReports Server did not delete the scheduled jobs when deleting a report. These jobs cause errors when the scheduler tries to run them, but you can't remove the jobs through the user interface. The server no longer creates such "orphan" jobs, but they may appear again when you upgrade or import a catalog that contains them.

If you accidentally imported orphan jobs, make configuration change shown below and restart your server.

Automatically Deleting Orphan Jobs		
Configuration File		
.../WEB-INF/applicationContext-report-scheduling.xml		
Entry	**Bean**	**Description**
`autoDeleteBroken UriReportJob`	`quartz Scheduler`	If your repository has orphan jobs that cause errors, change this property from `false` (the default) to `true`. Orphan jobs are detected and deleted just before they run, so all orphan jobs will be deleted gradually over time.

A.11 Charts Not Appearing in Excel Export

When exporting a report to Excel, JasperReports Server usually removes images that decorate the report and that do not fit in the Excel data-centric layout. However, JasperReports Server also converts any charts to images and uses the special property `net.sf.jasperreports.export.xls.ignore.graphics` set to `false` to make the image appear. If your report does not set this property explicitly, the chart images do no appear in your reports when they are exported to Excel.

If you have a lot of reports with this issue, you can set the property on the server:

Charts Images in Excel Export	
Configuration File	
.../WEB-INF/classes/jasperreports.properties	
Property	**Description**
`net.sf.jasperreports.` `export.xls.ignore.graphics`	By default, this property is set to `true`; in this case, images and chart images from the report do not appear when exported to Excel. Set this property to `false` to make chart images appear in Excel exports.

A.12 Adding Data Sources

When adding a data source to JasperReports Server, there are several areas that can cause errors. Start by looking at the following general connectivity issues:

- Check that your database server is available and accepting TCP/IP connections from the host where JasperReports Server is installed.
- Check in your RDBMS that the username and password you are using are correct and have access to the selected database.
- Check for firewalls or network connectivity errors.

Many databases, including MySQL, also require the user grants to include the specific host from which connections are allowed. Otherwise, when testing the JDBC connection, a connection may not be allowed even though the username and password are correct. For more information, refer to the MySQL documentation for setting up users.

An easy way to test connectivity from the server to the database with a particular user is to use a tool such as SQuirreL or another DB query tool to connect to the database from the same host as your JasperReports Server instance.

Finally, you can enable additional logging to help you find the cause of the error. Set any or all of the following loggers in the server settings interface or in the .../WEB-INF/log4j.properties file:

- log4j.logger.com.jaspersoft.jasperserver.api.engine.jasperreports.service.impl.JdbcDataSourceService
- log4j.logger.com.jaspersoft.jasperserver.api.engine.jasperreports.service.impl.JndiJdbcDataSourceService
- log4j.logger.com.jaspersoft.jasperserver.war.action.ReportDataSourceAction
- log4j.logger.com.jaspersoft.commons.datarator.JdbcDataSet
- log4j.logger.com.jaspersoft.jasperserver.war.common.JasperServerUtil

- log4j.logger.com.jaspersoft.commons.semantic.dsimpl.JdbcDataSetFactory
- log4j.logger.com.jaspersoft.commons.semantic.metaapi.impl.jdbc.BaseJdbcMetaDataFactoryImpl
- log4j.logger.com.jaspersoft.jasperserver.war.validation.ReportDataSourceValidator

A.12.1 JDBC Drivers

As of JasperReports Server 5.1, JDBC driver management is automated and simplified. JasperReports Server ships with drivers for some databases, as listed in the dialog for creating data sources. If the JDBC driver for your database is not included, the system administrator can easily upload the driver and use it immediately in a data source.

For instructions on updating JDBC drivers without restarting the server, see **4.1, "Data Sources," on page 65** For instructions on adding JDBC drivers when using JBoss, see the next section.

A.12.2 JDBC Drivers on JBoss

For modularity reasons, the JBoss application server does not allow web applications such as JasperReports Server to change executable files, such as JDBC drivers, on the fly. In order for JDBC drivers to appear in the list of available drivers and be selectable, you must configure JBoss before you use the drivers to create a JDBC data source.

To add JDBC drivers on JBoss:

1. Download or copy the JDBC driver JAR file to the .../WEB-INF/lib/ directory.
2. Edit the jboss-deployment-structure.xml file as described in the following table:

Configuring JBoss for JDBC drivers	
Configuration File	
.../META-INF/jboss-deployment-structure.xml	
Property	**Description**
`resource-root path="<driver>.jar"`	Locate the resource root element for the JDBC driver you added and uncomment it. The name of the JAR file must match exactly the name of the JDBC driver that you upload. You can add a new resource root element if the JDBC driver of your choice is not given in the commented list.

3. Restart JBoss.

A.12.3 Database Permissions

When creating database users, you must ensure that they have the appropriate privileges to access data, as well as permission to connect from the server that JasperReports Server is running on.

- The database user that you specify in your data source definition should have the appropriate select permissions to query the tables within your database for the reports you want to generate.

- If you accept the defaults during installation of JasperReports Server on Linux from an RPM using apt-get, rpm, or yum, the bundled PostgreSQL only allows the user who owns PostgreSQL to connect. Enter the following commands to connect:

```
su - postgres
psql -U postgres
```

- Many databases, including MySQL, also require that the user permissions name the specific host from which connections are allowed. Otherwise, when testing the JDBC connection, a connection may not be allowed even though the user name and password are correct. For example, see the MySQL documentation for setting up users.

A fairly easy way to test permissions and connectivity is to use a tool such as SquirrelSQL or another DB query tool to connect to the database from the same host as JasperReports Server and to run typical queries against your database.

A.12.4 JDBC Database URLs

When you choose a JDBC driver, the data source creation wizard prompts you for the elements of the URL that are required for your database. In some cases, you may need to add certain arguments to the JDBC URL. Ensure that the database URL you entered when defining your JDBC data source is consistent with what is required for your specific database and database driver. The following table gives the default URLs and port numbers, as well as examples of optional arguments supported by the most common databases:

Database	**Default JDBC Database URL**
PostgreSQL	jdbc:postgresql://<host>:5432/<db-name>
MySQL and MariaDB	jdbc:mysql://<host>:3306/<db-name>?useUnicode=true&characterEncoding=UTF-8
Ingres	jdbc:ingres://<host>:II7/<db-name>;CURSOR=READONLY;auto=multi
Oracle	jdbc:oracle:thin:@<host>:1521:orcl
SQL Server	jdbc:sqlserver://<host>:1433;databaseName=<db-name>;SelectMethod=cursor
SQL Server jTDS driver	jdbc:jtds:sqlserver://<host>:1433/<db-name>
DB2	jdbc:db2://<host>:50000/<db-name>:driverType=4;currentSchema=<schema-name>;fullyMaterializeLobData=true;fullyMaterializeInputStreams=true;progressiveStreaming=2;progresssiveLocators=2
Vertica	jdbc:vertica://<host>:5433/<db-name>
Informix	jdbc:informix-sqli://<host>:1526/<db-name>:INFORMIXSERVER=<server-name>
Vertica	jdbc:sybase:Tds:<host>:5433?ServiceName=<service-name>

A.12.5 JNDI Services on Apache Tomcat

If you have trouble with a JNDI connection, you need to look at the JNDI definition for your database on your application server. This section gives common issues with JNDI definitions on Apache Tomcat connecting to MySQL. If you use a different application server or database server, refer to its documentation.

A JNDI connection on Tomcat is defined in two different files. Make sure both have the following information:

- <tomcat>/webapps/jasperserver[-pro]/META-INF/context.xml

```
<Resource name="jdbc/<db-name>" auth="Container" type="javax.sql.DataSource"
maxActive="100" maxIdle="30" maxWait="10000"
username="<db-user>" password="<db-user-password>"
driverClassName="org.postgresql.Driver"
validationQuery="SELECT 1" testOnBorrow="true"
url="jdbc:mysql://<host>:3306/<database>?autoReconnect=true&amp;autoReconnect
ForPools=true"/>
```

- <tomcat>/webapps/jasperserver-pro/WEB-INF/web.xml

```
<resource-ref>
<description>JNDI Example</description>
<res-ref-name>jdbc/<db-name></res-ref-name>
<res-type>javax.sql.DataSource</res-type>
<res-auth>Container</res-auth>
</resource-ref>
```

Also check the following points:

- Ensure the driver for your database connection is in the <tomcat>/lib folder.
- If you installed JasperServer from a WAR file, Tomcat may have created a separate copy of context.xml in <tomcat>/conf/Catalina/Localhost/jasperserver-pro.xml. See the corresponding section in the troubleshooting appendix of the *JasperReports Server Installation Guide*.
- See the Apache Tomcat documentation for JNDI datasources.

A.12.6 JNDI Services on JBoss

After defining JNDI Services on the JBoss application server, JasperReports Server does not automatically detect the new services. In order to use the new JNDI services as data sources in the server, follow these steps:

1. Define and deploy a JNDI data source in the JBoss administrator console.
2. Modify the file <jboss>/webapps/jasperserver-pro/WEB-INF/web.xml to include a data source reference to this new JNDI service.
3. Modify jboss-web.xml to include a reference to this data source.
4. Because the deployment configuration files such as web.xml were modified, redeploy the JasperReports Server application.

Now you can define JNDI data source in the repository, as described in **4.1, “Data Sources,” on page 65**.

A.12.7 JNDI Services on WebLogic

Follow these steps to configure JasperReports Server to use JNDI data sources with WebLogic:

1. Append the following definition to the `<reference-descriptor>` node of WEB-INF/weblogic.xml:

```
<resource-description>
    <res-ref-name>TestDatabase</res-ref-name>
    <jndi-name>jdbc/testDatabase</jndi-name>
</resource-description>
```

2. Append the following definition to WEB-INF/web.xml:

```
<resource-ref>
    <description>TestDatabase database</description>
    <res-ref-name>TestDatabase</res-ref-name>
    <res-type>javax.sql.DataSource</res-type>
    <res-auth>Container</res-auth>
</resource-ref>
```

3. In the WebLogic Admin Console, add a datasource with TestDatabase as the JNDI name.
4. Restart the jasperserver-pro instance using the WebLogic Admin Console.

A.12.8 Creating a Data Source on SQL Server Using Windows Authentication

If your database is Microsoft SQL Server and you use Windows Authentication (also called Integrated Security), use the following procedure to create a data source.

1. Go to the download page for Microsoft SQL Server JDBC Driver 3.0.

   Do not use version 4.0 of this driver because it will not work.
2. Download and run the self-extracting executable: 1033\sqljdbc_3.0.1301.101_enu.exe
3. Open the extracted folder sqljdbc_3.0\enu\auth, and then either the x64 or the x86 subfolder, depending on whether your version of Windows is 64-bit or 32-bit, respectively.
4. Copy the file sqljdbc_auth.dll to the folder that your app server automatically searches for DLLs.

   For Tomcat, this is the <tomcat>\bin folder.
5. Restart your app server.
6. Log into JasperReports Server as and administrator.
7. Select **Create > Data Source** from the main menu.
8. In the Type field, select **JDBC Data Source**.

   The page refreshes to show the fields necessary for a JDBC data source.
9. Enter a name and optional description for your data source.
10. From the dropdown field, select com.microsoft.sqlserver.jdbc.SQLServerDriver
11. Enter the database hostname and database name of your SQL Server instance.
12. In the URL field, add the following string to the end of the generated URL:

    ```
    ;integratedSecurity=true
    ```
13. In the User Name field, enter any non-blank string you want, for example “none.”
14. In the Password field, enter any non-blank string you want, for example “none.”
15. Set the Time Zone and Save Location fields if necessary.
16. Click **Test Connection** and verify that the connection works.
17. Click **Save** to save the data source in the repository.

A.13 Hadoop-Hive Reports Not Running

If you created a Hadoop-Hive data source prior in JasperReports Server 4.5 or earlier, it may not run when imported to a more recent version of the server, for example after an upgrade. The reason is because the name of the package of the Hadoop-Hive connector class has changed.

To update Hadoop-Hive data sources:

1. Create a new Hadoop-Hive data source using the same URL as the old Hadoop-Hive data source used by your reports. This new data source will use the correct package name internally.
2. Update your Hadoop-Hive-based reports to use the new data source.
3. Delete the old, imported data source.

A.14 Reverting to the Old Home Page

JasperReports Server 5.5 introduces a new home page with more functionality and access to more features in the server. If your installation or customizations require the old home page with the large buttons, you can specify that the server use the old home page.

1. Open the <js-webapp>/WEB-INF/flows/homeFlow.xml file.
2. Locate the following line:

   ```
   <view-state id="homeView" view="modules/home/home">
   ```

3. Replace the view value as shown in the following sample:

   ```
   <view-state id="homeView" view="modules/old_home/home">
   ```

4. Restart the server or redeploy the JasperReports Server web app.

APPENDIX B LOCALIZATION

By default, JasperReports Server is presented in the English language (US version), but it supports other languages, as well, with translations that include data formats and resource bundles. The supported languages are Brazilian Portuguese, Chinese (Simplified), French, German, Italian, Japanese, and Spanish. The translations are included in your JasperReports Server instance by default; to view the application in a specific locale, select it before logging in.

If you need to support a language other than the supported ones, you can localize JasperReports Server, including translating it into a different language by providing labels and messages in the preferred language. For other locales, you may also need to change the default locale and time zone. This chapter describes the procedures and a few examples.

For information about localizing Domains, Topics, and reports, refer to the *JasperReports Server User Guide*.

This chapter contains the following sections:

- **Configuring JasperReports Server for the Default Multi-byte Fonts**
- **UTF-8 Configuration**
- **Creating a Locale**
- **Configuring JasperReports Server to Offer a Locale**
- **Character Encoding and Fonts**

B.1 Configuring JasperReports Server for the Default Multi-byte Fonts

Although translation packs for Chinese and Japanese ship with JasperReports Server, the fonts that it uses by default do not support those languages. Therefore, if your organization requires those fonts, you need to configure JasperReports Server for them.

B.2 UTF-8 Configuration

JasperReports Server uses UTF-8 (8-bit Unicode Transformation Format) character encoding. If your database server or application server uses a different character encoding form, you may have to configure them to support UTF-8. This section provides information for configuring the character encoding for several application servers and database servers. If you use a different application server or database, and its default character encoding isn't UTF-8, you may need to make similar updates to support certain locales. For more information, refer to the documentation for your application server or database.

B.2.1 Tomcat

By default, Tomcat uses ISO-8859-1 (ISO Latin 1) character encoding for URIs, which is sufficient for Western European locales, but does not support many locales in other parts of the world.

If you plan to support locales that Latin 1 does not support, you must change Tomcat's URI encoding format.

If you chose the instance of Tomcat that is bundled with the installer, you do not need to make this change. The bundled Tomcat is pre-configured to support UTF-8. If you installed the WAR file distribution with your own instance of Tomcat and want to support UTF-8, perform the following procedure.

To configure Tomcat to support UTF-8:

1. Open the conf/server.xml file and locate the following code:

```
<!-- Define a non-SSL HTTP/1.1 Connector on port 8080 -->
<Connector>
    port="8080" maxHttpHeaderSize="8192"
    maxThreads="150" minSpareThreads="25" maxSpareThreads="75"
    enableLookups="false" redirectPort="8443" acceptCount="100"
    connectionTimeout="20000" disableUploadTimeout="true"
</Connector>
```

2. At the end of this section, insert the following line before the closing tag:

```
URIEncoding="UTF-8"
```

3. For example, after your changes, the section might read:

```
<!-- Define a non-SSL HTTP/1.1 Connector on port 8080 -->
    <Connector>
    port="8080" maxHttpHeaderSize="8192"
    maxThreads="150" minSpareThreads="25" maxSpareThreads="75"
    enableLookups="false" redirectPort="8443" acceptCount="100"
    connectionTimeout="20000" disableUploadTimeout="true"
    URIEncoding="UTF-8"
</Connector>
```

4. Save the file.
5. Restart Tomcat.

B.2.2 JBoss

Since JBoss uses Tomcat as its web connector, a configuration change like the one you made for Tomcat (**"Tomcat" on page 250**) also has to be made for JBoss. In this case, the server.xml file is located in the Tomcat deployment directory, typically server/default/deploy/jbossweb-tomcat55.sar. Make the same code changes, then restart JBoss.

B.2.3 PostgreSQL

JasperReports Server requires PostgresSQL to use UTF-8 character encoding for the database that stores its repository as well as for data sources. A simple way to meet the requirement is to create the database with a

UTF-8 character set. For example, enter the following command:

```
create database jasperserver encoding=’utf8’;
```

B.2.4 MySQL

By default, MySQL uses ISO-8859-1 (ISO Latin 1) character encoding. However, JasperReports Server requires MySQL to use UTF-8 character encoding for the database that stores its repository as well as for data sources. The simplest way to meet the requirement is to create the database with a UTF-8 character set. For example, enter the following command:

```
create database jasperserver character set utf8;
```

To support UTF-8, the MySQL JDBC driver also requires that the `useUnicode` and `characterEncoding` parameters be set as in this startup URL:

url="jdbc:mysql://localhost:3306/jasperserver?useUnicode=true&characterEncoding=UTF-8"

If the MySQL database is a JNDI data source managed by Tomcat, such as the JasperReports Server repository database, the parameters can be added to the JDBC URL in WEB-INF/context.xml. The following is a sample resource definition from that file:

```
<Resource name="jdbc/jasperserver" auth="Container" type="javax.sql.DataSource"
    maxActive="100" maxIdle="30" maxWait="10000"
    username="root" password="password" driverClassName="com.mysql.jdbc.Driver"
    url="jdbc:mysql://localhost/jasperserver?useUnicode=true&amp;characterEncoding=UTF-8" />
```

JBoss ignores the context.xml file, instead requiring an XML file to define JNDI data sources in the deployment directory, which is typically server/default/deploy. The following is an example of a resource definition in one of those XML files:

```
<local-tx-datasource>
    <jndi-name jdbc/jasperserver />
    <connection-url>
        jdbc:mysql://localhost/jasperserver?useUnicode=true&amp;characterEncoding=UTF-8
    </connection-url>
    <driver-class com.mysql.jdbc.Driver />
    <user-name jasperadmin />
    <password jasperadmin />
    <min-pool-size 5 />
    <max-pool-size 20 />
    <idle-timeout-minutes 0 />
    <metadata>
        <type-mapping mySQL />
    </metadata>
</local-tx-datasource>
```

If the database is a JDBC data source configured in the repository, change the JDBC URL by editing the data source in the JasperReports Server repository. The following is an example of the JDBC URL (note that the ampersand isn't escaped):

```
jdbc:mysql://localhost:3306/foodmart_ja?useUnicode=true&characterEncoding=UTF-8
```

B.2.5 Oracle

Oracle databases have both a default character set and a national character set that supports Unicode characters. Text types beginning with N (NCHAR, NVARCHAR2, and NCLOB) use the national character set. As of JasperServer 1.2, all the text data used by the JasperReports Server repository (when stored in Oracle) is stored in NVARCHAR2 columns, so that JasperReports Server metadata can use the full Unicode character set. For more information about Unicode text support, refer to the Oracle white paper (PDF).

To work properly with Unicode data, the Oracle JDBC driver requires you to set a Java system property by passing the following argument to the JVM:

```
-Doracle.jdbc.defaultNChar=true
```

In Tomcat, add the variable to JAVA_OPTS in bin/setclasspath.sh (Linux) or bin/setclasspath.bat (Windows):

1. Locate the following line in the script:

Linux	`# Set the default -Djava.endorsed.dirs argument`
Windows	`rem Set the default -Djava.endorsed.dirs argument`

2. Add the following line before it:

Linux	`JAVA_OPTS="$JAVA_OPTS "-Doracle.jdbc.defaultNChar=true`
Windows	`set JAVA_OPTS=%JAVA_OPTS% -Doracle.jdbc.defaultNChar=true`

Since JBoss also uses JAVA_OPTS to pass options to the JVM, you can add the same JAVA_OPTS line to bin/run.sh (Linux) and bin/run.bat (Windows). Add it before this line:

Linux	`# Setup the java endorsed dirs`
Windows	`rem Setup the java endorsed dirs`

B.3 Creating a Locale

Translation is only one aspect of localization. Creating a locale includes these tasks:

- Translating labels and messages.
- Changing date formats.
- Changing format masks.

The tasks in this section require you to edit these files:

File	Location	Purpose of Edits
*.properties files	WEB-INF\bundles	Translating labels and messages
jasperserver_config.properties	WEB-INF\bundles	Changing date formats
adhoc_masks	WEB-INF\bundles	Changing format masks

B.3.1 About Properties Files

JasperReports Server and Jaspersoft OLAP resource bundle files are found in the .../WEB-INF/bundles directory. The properties files contain all the labels and messages used in JasperReports Server and Jaspersoft OLAP.

A bundle includes a default locale (for example, jasperserver_messages.properties), which is written in U.S. English. Then it consists of all the properties files with the same base name, but different locale (such as jasperserver_messages_fr.properties). Each file translates all of the strings of the default file into the language given by the locale. The Java programming language has rules for specifiying locales and alternate locales and determining which locale in the bundle to use.

Default Resource Bundles in JasperReports Server	
File in .../WEB-INF/bundles	**Description**
AdHocFiltersBundle.properties	Labels and messages for the Ad Hoc Filters panel.
adhoc_masks.properties	Masks (data formats) for values appearing in the Ad Hoc Editor.
adhoc_messages.properties	Labels and messages for the Ad Hoc Editor.
calendar.properties	Labels and messages used by the pop-up calendar dialog.
CommonBundle.properties	Bundle for tests.
createsldatasource_messages .properties	Labels and messages for the Create Domain dialog.
domain_designer_messages .properties	Labels and messages for the Domain Designer UI.
HomeBundle.properties	Labels for the new home page introduced in version 5.5.
image_descriptions_messages .properties	Labels and messages for the AWS (Amazon Web Services) machine images.
jasperreports_highcharts_ messages.properties	Messages for charts in the report viewer.
jasperreports_messages .properties	Labels and messages for the report viewer.
jasperserver_config.properties	Configuration properties for dates and date-times.
jasperserver_messages.properties	Labels and messages used in the main JasperReports Server user interface.
jsexceptions_messages.properties	Messages used in errors and exceptions, both in the UI and in the log messages.
LicenseMessages.properties	Labels and messages used when validating licenses.
logger_descriptions.properties logger_descriptions_pro.properties	Internal log messages.
pro_nav_messages.properties	Labels and messages for the menu bar and old Home page.

Default Resource Bundles in JasperReports Server	
File in .../WEB-INF/bundles	**Description**
querybuilder_messages.properties	Labels and messages for the Choose Data dialog (for creating a Domain Topic before using Ad Hoc editor).
report_option_messages .properties	Labels and messages for the report options dialog.
ScalableInputControlsBundle .properties	Labels for lists of values in input controls.
scheduling_ws.properties	Validation messages for the report scheduler.
semanticLayer.properties	Labels and messages for the Domain designer and Ad Hoc data policies.

Default Resource Bundles in Jaspersoft OLAP	
File in .../WEB-INF/bundles	**Description**
ja_mondrian.properties	Labels and messages in the OLAP settings UI.
ja-pro_messages.properties	Labels and messages in the commercial edition OLAP viewer.
jpivot_messages.properties	Labels and messages in the community edition OLAP viewer.
mondrian_exception_messages .properties	MDX validation error messages specific to the internal analysis engine.

If you use the JasperReports Server portlet to display JasperReports Server content in a portal (such as Liferay), the deployed portlet includes properties files, as well:

File	Location	Description
jaspersoft_portlet_ message.properties	WEB-INF\bundles under the location where the portlet is deployed. For example: C:\liferay\webapps\<portlet_context_ name>\WEB-INF\bundles (where <portlet_ context_name> is the name specified when the JasperReports Server portlet was deployed).	Labels and messages that appear in the portlet, including the help text. Note that this does not include text in specific reports; to localize the report's content, you must upload its resource bundle to the repository.

Jaspersoft iReport Designer (iReport) and the iReport Plug-in for JasperReports Server (iReport plug-in) have their own resource bundles, including:

Component	File	Description
iReport	ireport.properties	Labels and messages used in Jaspersoft iReport Designer.
iReport plug-in	irplugin.properties	Labels and messages used in iReport Plug-in for JasperReports Server.

B.3.2 Creating a Resource Bundle

Create a resource bundle by making a copy of each *.properties file, using the following syntax for the copy's file name:

```
<default_file_name>_<locale>.properties
```

where

`<default_file_name>` is the name of the default version of the properties file, and

`<locale>` is a Java-compliant locale identifier.

For example, consider the core JasperReports Server resource bundle. For various locales, it might be named as follows:

File Type	File Name
Default resource bundle	jasperserver_messages.properties
English	jasperserver_messages_en.properties
French	jasperserver_messages_fr.properties
French in Switzerland	jasperserver_messages_fr_CH.properties

For a list of Java-compliant locales, please refer to the Java web site.

The resource bundles described in this document consist of locale-specific Java properties files. Java properties files use the ISO-8859-1 (Latin-1) encoding that is the same as ASCII for all English non-accented characters. For international characters that are not in ISO-8859-1, use Unicode escape sequences (for example `\u00e9` is é).

To create a new JasperReports Server resource bundle:

1. Copy each of the properties files (keeping them in the same directory as the originals) and rename them according to your locale.
2. Translate each *.properties file's labels and messages into the new language.

   Some of the strings in the properties files may not seem like English. These cases are typically date formats and format masks that may need to be edited for the new locale. For more information, refer to **"Changing Format Masks and Date Formats" on page 256**.
3. Save the files.

4. If the new locale requires specific character encoding or fonts, ensure that JasperReports Server and the third party software it relies on are configured to support them. For more information, refer to **"Character Encoding and Fonts" on page 260**.

This locale is not available in JasperReports Server until you follow the steps described in **"Specifying Additional Locales" on page 258**.

B.3.3 Changing Format Masks and Date Formats

Each locale may have its own format masks and rules for displaying dates and datetime values. This section describes the steps you must take to update these options for your new locale.

The data format masks described in this section are used in the Domains and in the Ad Hoc Editor; they appear in Ad Hoc views as well as JRXML reports based on Domains; they are not applicable to Jaspersoft OLAP.

B.3.3.1 Changing Date and Datetime Formats

System date and datetime formatting is controlled by four patterns that are specified in the jasperserver_config_<locale>.properties file associated with a particular locale.

For example in the English resource bundle, the four entries are:

```
date.format=dd-MM-yyyy
datetime.format=dd-MM-yyyy HH:mm
calendar.date.format=%d-%m-%Y
calendar.datetime.format=%d-%m-%Y %H:%M
```

The first two keys are used to parse and format dates and datetime values using an internal `java.util.DateFormat` object across the whole application. These patterns should be non-localized date patterns, in accordance with the Java Development Kit (JDK) syntax.

The other two keys are used by the calendar control, which formats the user-selected date and datetime values in accordance with its own pattern syntax.

To change the system date and datetime formatting for a new locale, edit the strings specified by these keys.

B.3.3.2 Changing Data Format Masks

The Ad Hoc Editor allows you to create custom reports based on a Topic or Domain. Such reports support localizable data format masks that determine how values appear. To make the data format masks vary by locale, you must create an adhoc_masks file for the new locale. To do so, copy the file adhoc_masks.properties to a new name that specifies the new locale and change the masks defined in the new file. For example, the French file would be named adhoc_masks_fr.properties.

Customize the available data format masks for dates, integers, and decimals by editing the existing masking entries or adding new ones. The default entries are given in the following table:

Data Format Mask Properties	Appearance in en_US Locale

`ADH_100_MASK_date_0 = short,hide`
`ADH_100_MASK_date_1 = long,hide`
`ADH_100_MASK_date_2 = short,medium`
`ADH_100_MASK_date_3 = medium,medium`
	3/31/09
	Mar 31, 2009
	March 31, 2009
	Mar 31, 2009 23:59:59

`ADH_100_MASK_int_0 = #,##0`
`ADH_100_MASK_int_1 = 0`
`ADH_100_MASK_int_2 = $#,##0;($#,##0)`
`ADH_100_MASK_int_3 = #,##0;(#,##0)`
	-1,234
	-1234
	($1,234)
	(1234)

`ADH_100_MASK_dec_0 = #,##0.00`
`ADH_100_MASK_dec_1 = 0`
`ADH_100_MASK_dec_2 = $#,##0.00;($#,##0.00)`
`ADH_100_MASK_dec_3 = $#,##0;($#,##0)`
	-1,234.56
	-1234
	($1,234.56)
	($1,234)

The data format masks for each type are numbered consecutively from zero; create new masks by adding new entries. The keys of the new entries must follow the convention established in the default entries. For example, a new decimal data format mask might have this ID:

```
ADH_100_MASK_dec_4
```

Date format masks are implemented using `java.text.SimpleDateFormat` and JasperReports extensions that provide access to predefined localized data format masks. New datetime masks must be specified in one of the following formats:

- A style for the date part of the value and a style for the time part (separated by comma) or a single style for both parts. A style is one of Short, Medium, Long, Full, Default (which correspond to `java.text.DateFormat` styles) and Hide.
- A pattern that can be supplied to `java.text.SimpleDateFormat`. In this case, internationalization support is limited.

Both integer and decimal data format masks are implemented with `java.text.DecimalFormat`, which localizes characters in the format specification. For example, consider the case of the digit grouping symbol (thousands separator): in French, it is a space; in U.S. English, it is a comma. `DecimalFormat` handles both cases: if the number pattern #,##0 is used, the number 6000 appears as 6 000 in the French locale and as 6,000 in the U.S. English locale.

For more information about Java's handling of decimal and date format masks, see:

- http://download.oracle.com/javase/6/docs/api/java/text/DecimalFormat.html
- http://download.oracle.com/javase/6/docs/api/java/text/DateFormat.html

By default, monetary values in Ad Hoc views are masked as USD (United States Dollars). Depending on your data, you may need to support a different currency, support more than one currency, or support currency conversion. These are three very different cases:

- Supporting a different currency than USD involves changing the monetary masks to use the correct symbol for your currency (for example, replace the `$` symbol in the `ADH_100_MASK_dec_2 and ADH_100_MASK_dec_3` masks). However, changing this symbol does not actually convert currencies in your reports.
- Supporting other currencies in addition to USD involves adding new masks. However, adding data formats does not actually convert currencies in your reports.
- Supporting currency conversion is more complicated; you must consider such issues as fluctuations in conversion rates. Oftentimes, a third-party service can be used to perform currency conversion

B.4 Configuring JasperReports Server to Offer a Locale

After creating a locale, you must configure JasperReports Server to offer it to your users, along with any new time zones.

The tasks in this section require you to edit these files:

File Name	Location	Purpose of Edits
applicationContext-security.xml	WEB-INF	Specifying additional locales
jasperserver-servlet.xml	WEB-INF	Specifying additional time zones

B.4.1 Specifying Additional Locales

By default, JasperReports Server appears in the locale selected in the end user’s browser. The Login page allows users to specify the locale they want to use. The list of locales from which they choose is defined in applicationContext-security.xml. Edit this file to add a new locale.

To add a new locale:

1. Edit the applicationContext-security.xml file and locate the bean named `userLocalesList`. For example:

```
<bean id="userLocalesList"
        class="com.jaspersoft.jasperserver.war.common.LocalesListImpl">
    <property name="locales">
        <list>
            <value type="java.util.Locale">en</value>
            <value type="java.util.Locale">fr</value>
            <value type="java.util.Locale">it</value>
            <value type="java.util.Locale">de</value>
            <value type="java.util.Locale">ro</value>
            <value type="java.util.Locale">ja</value>
            <value type="java.util.Locale">zh_TW</value>
        </list>
    </property>
</bean>
```

2. Add the new locale to the end of the list. For example, add the following line for Dutch (Java's nl_NL locale):

```
            <value type="java.util.Locale">nl_NL/value>
```

3. Save the file.
4. Restart JasperReports Server, and log into the web application to test your translation. Reviewing the translated strings in context can help you improve your word choices.

For a list of Java-compliant locales, please refer to the Java web site.

B.4.2 Specifying Additional Time Zones

By default, JasperReports Server assumes the user's time zone is the same as the time zone of the JasperReports Server host. However, the Login page allows users to choose a different time zone. The list from which they choose is defined in applicationContext.xml file.

To add a time zone:

1. Open the applicationContext.xml file and locate the `userTimeZonesList` bean. For example:

```
<bean id="userTimeZonesList"
        class="com.jaspersoft.jasperserver.war.common.JdkTimeZonesList">
    <property name="timeZonesIds">
        <list>
            <value>America/Los_Angeles</value>
            <value>America/Denver</value>
            <value>America/Chicago</value>
            <value>America/New_York</value>
            <value>Europe/London</value>
            <value>Europe/Berlin</value>
            <value>Europe/Bucharest</value>
        </list>
    </property>
</bean>
```

2. Add the new time zone to the bottom of the list. Specify each time zone as the standard Java time zone values so that JasperReports Server adjusts for daylight savings time when appropriate. For example, add the following line for Tokyo:

```
            <value>Asia/Tokyo</value>
```

3. Save the file.
4. Restart JasperReports Server.

For more information about Java-complaint time zones, please refer to the Java web site.

B.4.3 Setting a Default Time Zone

If you want JasperReports Server to use a time zone that is different from the host computer, you can set a specific time zone in Java. It becomes the default time zone for all users, but they may still select a different time zone when they log in.

To set a default time zone, set the user.timezone property in the JVM as shown in the tables below. Locate the file containing JVM settings for your platform and application server. The value for the property must be a Java-compliant time zone, for example, Europe/Bucharest.

You must restart your application server for this setting to take effect. The time zone is set for all applications in your application server, including JasperReports Server.

JVM Settings for Default Time Zone

Operating System	App Server	File	Setting
Windows	Tomcat	<apache-tomcat>\bin\setenv.bat	Add this line of code: `set JAVA_OPTS=%JAVA_OPTS% -Duser.timezone=<timezone>`
	JBoss	<jboss>\bin\run.bat	
Linux	Tomcat	<apache-tomcat>/bin/setenv.sh	Add this line of code: `export JAVA_OPTS="$JAVA_OPTS -Duser.timezone=<timezone>"`
	JBoss	<jboss>/bin/run.sh	
Both	GlassFish	<glassfish>/domains/domain1/config/domain.xml	Add this line of code to <jvm-options> section: `-Duser.timezone=<timezone>`

B.5 Character Encoding and Fonts

Depending on the third-party software you use and the locales you support, you may also have to configure JasperReports Server and its host. The steps described in this section are only necessary under certain circumstances, such as if you plan to use a character encoding form that UTF-8 cannot handle or if you need to change the font options for Jaspersoft OLAP charts.

The tasks in this section require you to edit these files:

File Name	Location	Purpose of Edits
applicationContext.xml	WEB-INF	Changing character encoding
jpivot_internal_messages.properties	WEB-INF/internal	Specifying chart fonts for Jaspersoft OLAP Community
Ja_pro_internal_messages.properties	WEB-INF/internal	Specifying chart fonts for Jaspersoft OLAP Professional and Enterprise
userConfig.xml	WEB-INF/jpivot/print	Embedding fonts in PDF

B.5.1 Changing Character Encoding

To use a character encoding form other than UTF-8, you must configure JasperReports Server, your application server, and your database server.

B.5.1.1 Configuring JasperReports Server

To configure JasperReports Server for a different encoding form, you must edit the applicationContext.xml file.

To specify a different encoding form:

1. Open the applicationContext.xml file and locate the following bean. It is configured for UTF-8:

```
<bean id="encodingProvider"
        class="com.jaspersoft.jasperserver.api.common.util.
        StaticCharacterEncodingProvider">
    <constructor-arg value="UTF-8" />
</bean>
```

2. Change “UTF-8” to the encoding type your database server and application server use. For example:

```
<bean id="encodingProvider"
        class="com.jaspersoft.jasperserver.api.common.util.
        StaticCharacterEncodingProvider">
    <constructor-arg value="UTF-16" />
</bean>
```

3. Save the file.
4. Restart JasperReports Server.

B.5.1.2 Configuring the Application Server and Database Server

If you want to use a character encoding other than UTF-8, you may need to configure the third party software that JasperReports Server relies on. For more information, refer to the documentation associated with your application server and database server. For Tomcat, you can specify a different character encoding by following steps similar to those described in **“Tomcat” on page 250** and **“UTF-8 Configuration” on page 249**.

This step is necessary only if you plan to support locales that requires a different character encoding, such as UTF-16. In addition to this change, your application server and database must be configured to use the character encoding you require. For more information, refer to the documentation associated with your third party software.

B.5.1.3 Configuration for Localized Analysis Schemas

If you plan to use localized OLAP views, you must take additional steps to configure JasperReports Server.

To configure JasperReports Server for localized OLAP views:

1. Every Unicode database that JasperReports Server interacts with (whether it is the repository database or a database accessed through a data source defined in JasperReports Server) must be created to support UTF-8. For example, to create the Foodmart database in PostgreSQL, you might give a command similar to the following:

```
create database foodmart_ja encoding=’utf8’;
```

2. The URL of any OLAP data source that JasperReports Server accesses must be properly configured in the /ji-pro/META-INF/context.xml file. For example, the URL definition for the Foodmart sample database might be similar to the following:

```
<Resource name="jdbc/MondrianFoodMart_ja"
    auth="Container" type="javax.sql.DataSource"
    maxActive="100" maxIdle="30" maxWait="10000"
    username="postgres" password="postgres" driverClassName="org.postgresql.Driver"
    url="jdbc:postgresql://localhost:5432/foodmart_ja" />
```

3. Encoding options must be added to the JDBC connection string for any data source that points to an OLAP database. For example, when creating a data source in JasperReports Server that points to an OLAP database, use the following connection string:

```
jdbc:postgresql://localhost:5432/foodmart_ja
```

B.5.2 Working with Fonts

While the fonts that JasperReports Server uses are generally dictated by the JRXML files that define your reports, some font configuration is required for special circumstances. For example, you can configure Jaspersoft OLAP to offer different options in the **Chart Default Font** field in the Chart Options dialog. But note that, in order to use a font, the font must be available to the host's operating system rather than to the application. This section describes steps you may need to take, depending on the functionality you use and the locales you support.

B.5.2.1 Enabling East Asian Fonts

The default JRE configuration does not support East Asian fonts. If your locale requires such a font, you need to configure your users' computers for the fonts and update the computers' JRE.

To configure a Microsoft Windows computer (XP and later) for East Asian fonts:

Details of this procedure vary, depending on your version of Windows.

1. In the Control Panel, click **Region and Language**.
2. In the Region and Language dialog, select the **Keyboards and Languages** tab.
3. On the tab, install the language(s) that you need.
4. If necessary, install the related keyboard modifications.
5. Close the control panel.
6. Locate the fontconfig.properties.src file in the C:\Program Files\<JRE_directory>\lib folder.
7. In the file, locate the following line:

   ```
   sequence.allfonts=alphabetic/default,dingbats,symbol
   ```

8. Change the line to include the East Asian fonts that you need, such as the following:

   ```
   sequence.allfonts=alphabetic/default,dingbats,symbol,korean,japanese,chinese-
   ms936,chinese-ms950
   ```

9. At the end of the file, check to be sure that the fonts you selected are listed, as in the following:

   ```
   filename.Gulim=gulim.TTC
   ```

   If the fonts are not listed, add them.
10. Save and close the file.
11. Rename the file to fontconfig.properties

B.5.2.2 Configuring OLAP Options for Chart Default Fonts

If you implement Jaspersoft OLAP and support a locale with special font requirements, you can configure Jaspersoft OLAP to offer different options in the **Chart Default Font** field in the Chart Options dialog of the OLAP view. This may be necessary if you implement locales that Latin 1 doesn't support.

An OLAP view's Chart Options dialog includes the **Chart Default Font** field, which allows users to select the font to use in charts. The default options are SansSerif, Serif, and MonoSpaced. JasperReports Server reads these values from a properties file and attempts to map them to fonts available in the server host's operating system. You can configure the server to offer different fonts if these fonts don't support the locales you implement.

To change the Chart Default Font field's options:

1. Save the jpivot_internal_messages.properties file with a new name that reflects the new locale. For example, for Japanese, the new file would be called jpivot_internal_messages_ja.properties.
2. Open the new file and locate the following keys:

```
JAJ_000_jsp.jpivot.chartpropertiesform.sansSerif=SansSerif
JAJ_000_jsp.jpivot.chartpropertiesform.serif=Serif
JAJ_000_jsp.jpivot.chartpropertiesform.monospaced=Monospaced
```

If you are using Jaspersoft OLAP Community Edition, the name of the file and the keys that you edit are different. For the Community Edition, open the jpivot_internal_message.properties file and edit these keys:

```
jsp.wcf.chart.sansserif=SansSerif
jsp.wcf.chart.serif=Serif
jsp.wcf.chart.monospaced=Monospaced
```

3. Change one or more of the strings to the name of a font available in the host's operating system. For example, if you wanted to change the SansSerif font to the SimHei font, edit the value specified by `jsp.wcf.chart.sansserif`. For example:

```
jsp.wcf.chart.sansserif=SimHei
```

4. Save the file.
5. Restart JasperReports Server.

B.5.2.3 Configuring Ad Hoc Charts for Asian Fonts

The default font for the legend of an Ad Hoc chart does not support some Asian characters, such as Japanese kana glyphs. Default fonts for Ad Hoc reports are defined in the following file:

Changing Ad Hoc Chart Legend Fonts
Configuration File
.../WEB-INF/adhoc/themes/default.new.jrxml

Changing Ad Hoc Chart Legend Fonts		
Property	**Value**	**Description**

`style name=`
`"ChartLegend"`
`fontName=`
	`"DejaVu Sans"`
	<default>
	`"SansSerif"`
		The default value, DejaVu Sans, does not include kana glyphs, and thus the legend contains blank symbols.
		If the server machine has system Japanese fonts available, setting the value to SansSerif should work in most Java font configurations.

After making changes to the default.new.jrxml file, you must rerun all Ad Hoc reports that contain Japanese characters for them to appear.

If Japanese fonts are not installed in the server machine, you can add it in the following manner:

1. Package a Japanese font as a font extension JAR.
2. Add the new JAR to the WEB-INF/lib folder of the JasperReports Server WAR file.
3. Edit the default.new.jrxml file as described above to specify the new font name.
4. Redeploy JasperReports Server or restart its app server.
5. Rerun the affected reports. Reports saved from Ad Hoc should now display correctly in the Report Viewer, but the corresponding view may not display chart legends correctly within the Ad Hoc editor.

B.5.2.4 Embedding Fonts in PDF Output

By default, JasperReports Server can create PDF (Portable Document Format) files with many different fonts. However, if you experience font problems in the PDF output of your reports, you may need to take the steps described in this section to make the fonts available to JasperReports Server's XSL Formatting Object (XSL-FO) processor.

You must have distribution rights to a font in order to embed it in a PDF file.

When users save reports in PDF format, JasperReports Server generates the PDF output using Apache FOP (Formatting Objects Processor). In order for FOP to render fonts properly, you must install the font itself (for example, a TTF file) on the server host, create a font metrics file (using Apache's `org.apache.fop.fonts.apps.TTFReader` utility), and update the userConfig.xml file to associate the font with its metrics. For more information, refer to the Apache FOP documentation.

You can embed any Unicode font using this procedure, though larger font files may have significantly larger memory footprints. In order to keep memory requirements small, Jaspersoft recommends that you use the smallest font file you can, such as SimHei to support Chinese, Japanese, and Korean.

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