

HP Select Audit Software

for the Windows® and HP-UX® operating systems

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Report Developer's Guide

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1 Overview

HP Select Audit software makes reporting easy for the developer and flexible for the end user. Select Audit provides tools for report developers with different levels of expertise, experience, and authorization. It also provides a web-based tool for end users to easily develop their own Ad Hoc reports.

Using a Select Audit report, an end user can easily connect to live data and display it in a web browser or Microsoft Excel, or print or save it in any of a number of formats. The end user can also change the report's data, layout, and appearance at runtime. No software other than the browser is required on the end user's machine.

The web-based Report server processes complex data queries and handles dynamic report formatting, security, and scheduling.

The files underlying each report are clear text and use an XML-based format, making it possible to connect your report to many types of data sources and application servers. These underlying files allow experts to make low-level changes to a report file using only a text editor.

Who is This Book For?

This book uses the following terms for the different types of people who use Select Audit:

- **Developers** create reports for others to use. Some developers are highly skilled and experienced in all aspects of report development, some specialize in either data or presentation, and some have only a high-level understanding of report development. Select Audit provides tools for all these kinds of developers.
- **Administrators** manage configuration, security, database access, and troubleshooting.
- **End Users** run web-based reports created by developers and managed by administrators, create their own Ad Hoc reports from scratch or based on reports created by developers, or use Microsoft Excel's graphing and charting capabilities to view reports.

This guide is addressed to developers. This is the first guide that developers should read.

What's in This Book?

The chapters in this book are given in [Table 1](#).



See the *HP Select Audit 1.1 Release Notes* ([SAudit_release_notes_1.1.html](#)) on the Select Audit installation CD for known installation issues at the time of this release.

Table 1 Chapter Summary

Chapter	Description
Chapter 1, Overview	This chapter describes this guide and its contents.
Chapter 2, Terms and Concepts	Defines the terms and concepts used in the Select Audit Report Designer.
Chapter 3, Parameters	Shows how to use Select Audit parameters.
Chapter 4, Guidelines for Developing Reports	Describes the typical report development cycle.
Chapter 5, Working with Non-SQL Data Sources	Gives pointers for using Select Audit with XML, EJB, or stored procedures as a data source.
Chapter 6, Select Audit APIs	Introduces the APIs included in Select Audit.
Chapter 7, Managing Images	Shows how to manage report images.
Chapter 8, Incorporating Reports into HTML	Shows the various ways to embed Select Audit reports in your application.
Chapter 9, Using JavaScript for HTML Output	Shows how to enhance your reports using JavaScript.
Chapter 10, Formatting PDF Output	This chapter provides technical information and stylistic guidelines for creating well-formatted PDF report output.
Chapter 11, Runtime RDL Processing	This chapter shows how RDL is processed at runtime.
Chapter 13, PopChart Support	Describes Select Audit's optional PopChart support.
Appendix A, Select Audit Variable Syntax	Describes the syntax of parameters, user variables, and query results in RDL.

The Select Audit Documentation Set

This manual refers to the following Select Audit documents. These documents are available on the Select Audit CD.

- *HP Select Audit 1.1 Administration Guide*, © Copyright 2006 - 2008 Hewlett-Packard Development Company, L.P. ([administration_guide.pdf](#)).
- *HP Select Audit 1.1 Installation Guide*, © Copyright 2006 - 2008 Hewlett-Packard Development Company, L.P. ([installation_guide.pdf](#)).
- *HP Select Audit 1.1 User's Guide*, © Copyright 2006 - 2008 Hewlett-Packard Development Company, L.P. ([user_guide.pdf](#)).

- *HP Select Audit 1.1 Sarbanes-Oxley Model Guide*, © Copyright 2006 - 2008 Hewlett-Packard Development Company, L.P. (sb_model_guide.pdf)
- *HP Select Audit 1.1 Concepts Guide*, © Copyright 2006 - 2008 Hewlett-Packard Development Company, L.P. (concepts_guide.pdf)
- *HP Select Audit 1.1 Report Center User's Guide*, © Copyright 2006 - 2008 Hewlett-Packard Development Company, L.P. (rpt_center_guide.pdf)
- *HP Select Audit 1.1 Report Designer's Guide*, © Copyright 2006 - 2008 Hewlett-Packard Development Company, L.P. (rpt_design_guide.pdf)
- *HP Select Audit 1.1 Report Developer's Guide*, © Copyright 2006 - 2008 Hewlett-Packard Development Company, L.P. (rpt_devel_guide.pdf)
- *HP Select Audit 1.1 LDAP Configuration Guide*, © Copyright 2006 - 2008 Hewlett-Packard Development Company, L.P. (ldap_provisioning.pdf)

Online help is available with the Audit Portal.

2 Terms and Concepts

This chapter introduces terms important to Select Audit reports. Most of these terms are standard English words but have specific meanings in the Select Audit context.

This chapter defines the following terms as used in Select Audit reports and related documentation:

- [RDL](#) on page 17
- [Component](#) on page 19
- [Control](#) on page 20
- [Parameter](#) on page 21
- [Profile](#) on page 21
- [Data Source](#) on page 21
- [Query](#) on page 22
- [Theme](#) on page 22
- [Catalog](#) on page 23
- [Library](#) on page 23
- [Report Creation Tools](#) on page 23
- [Ad Hoc Wizard](#) on page 24
- [Permissions, Directories, and ACLs](#) on page 25
- [Expression](#) on page 25
- [Uploading and Publishing](#) on page 26
- [Schedule](#) on page 26
- [Report APIs](#) on page 26
- [Report Variables](#) on page 27

RDL

The report file is the basis of an Select Audit report. The report file determines the report's content and layout. This file also contains other information, such as how the report handles sorting and pagination.

Select Audit report files use a format called RDL (pronounced "riddle"). Report files use the `.rdl` extension. RDL adheres to the XML standard.

The server program that renders RDL into an interactive report is called the Report server.

Like all XML-based languages, RDL is easily modifiable in any text editor. In fact, the Query Designer and Report Designer provide a text area for viewing and modifying the RDL file. You can write an RDL file from scratch, or you can create it using the client tool and modify it later if you choose. (See [Client Tools](#) on page 9 for more detail on the client tools.)

An end user can take an existing report (which may or may not contain layout information) and create layout for her own report using the Ad Hoc Wizard.

Structure

It is helpful to understand RDL's high-level structure to develop Select Audit reports. The following is a brief high-level description of RDL. If you use the client tool to create reports, you don't need an in-depth knowledge of the RDL language. However, it is advisable to learn at least the RDL blocks described in this section.

Top-level Tags

The highest-level blocks of RDL are listed in [Table 2](#).

Table 2 RDL Blocks

Block Name	Description
Properties	The property overrides for the RDL file.
Parameters	End-user-defined report elements.
Content	Data source, queries, returned columns.
Paginations	How the report breaks among pages.
Sortings	Sorting information for different columns.
Layout	Components such as table, headers and footers, colors.

The Query Designer primarily creates the `content` block and (if you create data-based parameters) part of the `parameters` block. The Report Designer creates the entire RDL file.

Properties

The `properties` block lists the property overrides for this RDL file. The settings specified in this section override the settings in the `defaultscope.xml` configuration file.

Parameters

The `parameters` block lists the report's parameters and their values. Parameters can be data-based (for modifying the report results), or layout-based (for modifying the report appearance). See [Parameter](#) on page 21 for more information on parameters.

Content

The `content` block consists of data blocks. Each data block contains one of the following blocks:

rdbms	A SQL <code>SELECT</code> or <code>CALL</code> statement run against a database that supports JDBC.
xmlsource	XML data read from a file, URL or the results of an XQuery.
ejb	An Enterprise Java Bean (EJB).
custom	A custom data source.

Each of these blocks contains a `return` block, which shows the columns returned from the data source. The component displays the data from these returned columns.

For more information on XML, EJB, and stored procedure data sources, see [Working with Non-SQL Data Sources](#) on page 41.

Paginations

The `paginations` block determines how the report should be broken into pages and how navigation among pages will work.

Sortings

The `sortings` block determines how return values in a `<XMLTag>data` block are to be sorted.

Layout

The `layout` block consists of `useComponent` and `controls` blocks. Each `useComponent` block uses an existing component (for example, `StandardTable`) and specifies exactly how this component is to be realized on the report. The `controls` block defines the controls in the report and how they work.



Components are defined in a JSP file on the server. These files have the extension `.jsp`. You can alter existing components or create new ones by modifying or creating a `.jsp` file. This process is not currently documented.

Component

Reports present data in standard formats, called *components*. The Report server provides several built-in components. You have great flexibility in configuring the appearance of these components.

The basis of each supplied component is a `.jsp` file. You can create a custom component by writing your own `.jsp` file or editing an existing one. This process is not documented in this release.

The supplied components in this release of Select Audit are listed below:

Table 3 Select Audit Supplied Components

Component	Description
StandardTable	A simple grid, one grid row per data row, and one grid column per data column. The table can also have a title, headers and footers for the columns, and a header and footer for the whole table.
StandardGroupTable	Like the StandardTable, but the rows can optionally be grouped, the groups can nest, and each group can have its own header and footer.
StandardCrossTab	A simple grid with grouping over both rows and columns. The column grouping typically uses time intervals.
StandardChart	A column, line, area, or bar chart. Many variants of column, line, area, and bar charts are provided.
StandardPieChart	A pie chart. Many variants of each chart type are provided.
StandardRecordGrid	A flexible table that allows you to specify the number of grid rows and columns for each header, footer, data column, data row, and cell. You can also specify exact grid row and column sizes for PDF output.
StandardBandedTable	Like the StandardRecordGrid, but the output can be grouped in bands with very flexible designs. The bands can nest. You can define headers and footers for each band.
StandardDashboard	A grid that contains other components. Use StandardDashboard to arrange the positioning of other components relative to one another.
StandardPopChart	Graphs and charts that use Corda's PopChart rendering tool. Note: This component is not available.



In the Report Designer, StandardBandedTable is used for all tables.

For a description of how to create components using the Report Designer, see the *HP Select Audit 1.1 Report Designer's Guide*.

Control

A **control** is an area in the browser window where the end user can specify a value or initiate an action. Examples of controls are radio buttons, text fields and submit buttons.

Parameter

In Select Audit, **parameters** are a type of **Report Variable** whose values can be set by the end user at runtime. Parameters are bound to controls on the report. For example, parameters can allow the end user to specify that she wants her report output to show only data from the Eastern region or to display only page 5 of the full output.

The **Client Tool** let you create and manage parameters. You can specify the parameter name, the kind of values it can take and how the values are presented, and optional default values. You can also save parameters to or fetch them from the **Catalog**.

For more detail on parameters, see [Parameters](#) on page 29. For a description of parameter syntax, see [Select Audit Variable Syntax](#) on page 107.

Profile

Typically, a particular end user uses the same sets of layout parameters each time she runs a report. For example, the manager of the Vancouver office may always choose only Western Canada sales data, and she may always prefer to see her report in earthtone colors. You, the developer, can create a control on the report that allows the end user to assign a name to the version of the report specifying, say, “Western Canada” as the `region` parameter and “Earthtone” as the `theme` parameter. (See [Theme](#) on page 22 for more information on themes.)

The name that the end user assigns to a set of parameters for a report is called a *profile*. When the end user opens a report in the Report Center (see [Library](#) on page 33), she can choose the profile for the report results.



The profile name is limited to letters, digits, and spaces.

Profile controls are optional. A report cannot contain more than one profile control.

Data Source

A data source can be one of the following:

- A relational database management system (RDBMS) that supports JDBC, accessed either by SQL statements or stored procedures.
- An XML file.
- An Enterprise Java Bean (EJB).
- A stored procedure.
- A custom source (a Java class implementing a particular interface).

For more details on using XML, EJB or stored procedure data sources, see [Working with Non-SQL Data Sources](#) on page 41.

In Select Audit’s Client Tool, you interact with the data source by specifying the connection name (the connection is defined in an administration file) and the “columns” returned by the data source.

Query

The term **query** is used to mean several different things in Select Audit:

- A SQL statement that returns values. This may be a `SELECT` statement or a stored procedure call. In RDL, this is an `SQL` block within a `data` block.
- A call to an XML data source that returns values. In RDL, this is an `xmlsource` block within a `data` block.
- A call to an Enterprise Java Bean that returns values. In RDL, this is an `ejb` block within a `data` block.
- An entire `<XMLTag>data` block in an RDL file (See [Data Blocks](#) on page 22).
- An entire RDL file that contains only data information. (The term **query** is used this way in the Catalog.)
- The “queries” saved by the Client Tool are `<XMLTag>data` blocks or complete RDL files containing a single `<XMLTag>data` block. The Client Tools always save a connection name and returned column list along with each “query”; they never save `sql`, `xmlsource` and `ejb` blocks without the rest of the `<XMLTag>data` block.

Select Audit’s documentation uses the following conventions to avoid confusion:

- SQL queries are referred to as **SQL statements**. (Although in standard database parlance queries are actually only one kind of SQL statement, SQL statements that are not queries are never used in Select Audit.)
- A SQL statement (or other source of return values), a connection name and the return values are collectively called a `<XMLTag>data` block.
- Catalog files of type “query” are called **query files**.

Data Blocks

The `content` block of the RDL file contains blocks called `data`. Each `<XMLTag>data` block for an RDBMS data source consists of the following:

- A connection name.
- A SQL statement that returns values.
- A list of returned columns.

Other data source types have similar `content` blocks.

Theme

In Select Audit, a theme is a set of CSS attributes associated with an element of a component. For example, for a standard table, the elements include title and the themes for a report title may include font family, font size and color.



In the Ad Hoc Wizard, themes are called “styles”.

The report developer can use both inline or external style sheets to design reports.

Catalog

The **Catalog** is one of the folders in the Library. It lets you save and re-use report elements. The Catalog elements are listed in [Table 4](#).

Table 4 Catalog Elements

Element	Description
Queries	A Catalog query file is an RDL file containing a content block that contains a single data block. If the data block uses parameter values, the Catalog query also contains a parameters section containing the parameters referred to in the data block.
Parameters	A Catalog parameter is an RDL file containing a parameters block that contains a single parameter block. If the Catalog parameter is based on a query, the Catalog parameter also contains one content block containing one data block.
Themes	A Catalog theme is an XML file describing multiple styles, grouping them, and naming the groups.
Permissions	A Catalog permission is an Access Control List (ACL) string stored in a text file. See ACLs on page 76 for details.

Using the Catalog, you can easily insert existing Catalog entries into your report and modify them slightly, if necessary. Once you create a query, parameter, theme or permission, you can save it in the Catalog for yourself or others to use later (if you have permission).

There is no standalone Catalog tool. The Ad Hoc Wizard has links to Catalog manager screens that let you retrieve elements from or save them to the Catalog.

Library

The Library is a virtual hierarchical file system that contains Catalog, Parameter and other files. It is a repository for files that many users of a particular Report server may find useful. The Library contains the Catalog as a subfolder. In addition to Catalog entries, the Library contains runnable reports and report output in any of several formats.

You interact with the Library using the Report Center, Select Audit's web-based Library management application. See the *HP Select Audit 1.1 Report Center User's Guide* for more information.

Report Creation Tools

Both developers and end users can create reports. Developers can define any part of the report. End users can start with a report prepared by a developer and create or re-create its layout.

Report-creation tools create an RDL file (see [RDL](#) on page 17). Each RDL file represents a single report. You have great flexibility in deciding when to create a report using the report-building tools and when to modify report files. You can create a report in three ways:

- Using the tools alone.
- Using the tools and then modifying the resulting report file.
- Writing an RDL file from scratch.

The developer tool for creating reports is called the **Report Designer**. The end-user tool for creating a report with a new layout is the **Ad Hoc Wizard**.

Report Designer

The Report Designer is a powerful tool for both beginners and experts to create complete reports. The Report Designer is a graphical Java-based tool that enables both novices and experts to create and modify all aspects of a report, including both content and layout, by creating and modifying RDL files.

For general information about the Report Designer, see the *HP Select Audit 1.1 Report Designer's Guide*.

RDL Generation Toolkit

The RDL Generation Toolkit is a Java API that lets you generate a RDL file programmatically, using neither the client tools nor hand-coding. See [RDL Generation Toolkit on page 32](#) for more information.

Ad Hoc Wizard

The Ad Hoc Wizard is used by end users to design the layout for their own reports. The Ad Hoc Wizard is a browser-based tool that is launched from the Report Center. It lets end users design layouts for their own reports. Any report in the Library with Ad Hoc permission can be used to launch the Ad Hoc Wizard.

The Ad Hoc Wizard allows end users to fashion the tabular or graphic layout they wish using the information that the developer put in a report. If the report contains parameters and the report developer wants the Ad Hoc Wizard to use different labels or parameter mappings for the report, you can do this using the Report Center.

Creating a New Report

By clicking the **Ad Hoc** button in the Report Center when a report is not selected, you can launch the Ad Hoc Wizard and create a new report from scratch.

Creating a Report From an Existing One

Any report in the Library with Ad Hoc permission can be used to launch the Ad Hoc Wizard. The Ad Hoc Wizard allows end users to design the tabular or graphic layout they wish using the information that you, the developer, put in a report. If the report contains parameters and you want the Ad Hoc Wizard to use different labels or parameter mappings for the report, you have the option of doing so using the Report Center. To quickly enable end users to create an Ad Hoc report when you have not yet uploaded the corresponding report to the Library, open the Query Designer, create a query and upload it to the Library. If the query is an SQL statement, you can cut and paste it into the Query Designer. Once the report is uploaded to the Library, use the Report Center to add **Ad Hoc** to the report's permission set.

For more information about the Ad Hoc Wizard, see the *HP Select Audit 1.1 Report Center User's Guide*.

Permissions, Directories, and ACLs

You can define which end users have access to which reports, queries, parameters, themes or even columns and rows of particular reports.

Catalog permissions files are ACL lists that are stored in text files.

A **directory** is a customer's list of users and groups. Often these lists are maintained remotely. LDAP is a commonly-used standard protocol for accessing remote directories.

Access Control Lists (ACLs) are formatted lists that determine which users and groups have access to which objects. ACL lists are used in the Catalog permissions files and inside RDL files (to control column permissions). For a description of ACL grammar, see [ACLs](#) on page 76.

Some Select Audit elements are secured using Select Audit, and some using the file system's native security. Parameter files are secured at the file system level, which means that you must use your operating system's security to control who can access these elements. Column-level security is defined within the RDL file, so it is also secured at the file system level. All Catalog items are secured by Select Audit, as is row-level security.

For details on the Select Audit security model, see [Security](#) on page 33.

Expression

The SQL database language includes functions (AVG, COUNT, MAX, MIN, and SUM) that allow queries to return calculated values and present them in the query results as a virtual or derived column.

You can create your own columns whose values are derived from functions that you create. These functions are called **expressions**. The set of operators available with Select Audit expressions is much richer than that provided by SQL.

For example, if your data source returns columns named `FIRST_NAME` and `LAST_NAME`, you may want to create a virtual column named `full_name`. To do that, use an expression like `FIRST_NAME + LAST_NAME`.

Uploading and Publishing

Moving reports and other files from your file system to the Library is called uploading. When you upload Catalog files, they are automatically validated and made available to Library users. Report files, on the other hand, are not validated on upload, and are invisible to other users until you publish them. Publishing validates the report file and makes it visible to users to whom you have given permission.

Use the Report Center to upload files to the Library, publish reports, and assign permissions. See the *HP Select Audit 1.1 Report Center User's Guide* for details.

Schedule

A Schedule determines the frequency with which the Report Center creates static report output. The Report Center lets you create report output automatically from published reports according to a schedule of your choosing. The report output can be in any of several formats: HTML, PDF (Adobe Acrobat), CSV, XML, and Microsoft Excel. Scheduling reports lets end users see reports containing recent data without the overhead of querying the data source or running the Report server.

For information on scheduling report output, see the *HP Select Audit 1.1 Report Center User's Guide*.

Report APIs

Select Audit provides application programming interfaces (APIs) to let expert developers create and manage reports. describes the APIs in this release.

Table 5 Report APIs

API	Description
HTTP "API"	Though not exactly an API, a sophisticated URL syntax lets you access reports and report output by specifying strings within the URL.
Extensibility API	The Java API for integrating Select Audit with custom or legacy environments.
SOAP API	The SOAP API allows you to programmatically interact with the Report server. (See Report Server on page 31 for more information.)

Report Variables

Select Audit provides variables that can be used within SQL code and elsewhere in the RDL file. Select Audit variables include:

- Parameter values
- user
- data
- cellname

For details on how parameter values and other variables are represented inside RDL files, see [Select Audit Variable Syntax](#) on page 107.

3 Parameters

Parameters make reports interactive by allowing end users to configure both the content and appearance of report output.

Parameters are variables that the report developer creates as part of the report. The values are set at runtime. The end user provides a value to the parameter by using a control on the report. Each parameter is “bound” to a control, meaning that what the end user does with the control determines the value assigned to the parameter.

Parameters can take two kinds of values: strings and lists. If the parameter value is a string, you provide a text field where the end user can enter the parameter’s value. If the parameter is a list, you can either create an explicit list of possible values to be displayed using a list-based control (for example, radio buttons), or you can use a `<XMLTag>data block’s` return values to populate the list.

You can provide default values for a parameter or you can require the end user to supply a value to the parameter.

Parameters can configure either data or layout. Data parameters affect the data in the report output. Layout parameters affect report appearance.

Data parameters restrict the amount and kind of data returned from the database. For example, you can create a parameter called `salesperson`, associate it with the `SALES_REP_LAST_NAME` column returned from the database, and bind it to a pick list control labeled “Salesperson:”. The end user selects a name from the list and only orders for that salesperson are shown in the report results.

Layout parameters let the end user configure a report’s appearance. For example, you can create a parameter called `tableTitle` and bind it to a text field control labeled “Title:”. The text that the end user types in this control appears as the title of the report output.

You can create parameters and bind them to controls by using the Ad Hoc Wizard or by hand-editing the RDL file. For a description of parameter syntax, see [Parameter Variables](#) on page 107.

Parameters and RDL

Parameters appear in several places in the RDL file. They are defined and configured in the `parameters` block. The `content` block can use parameters to let the end user control displayed data (for example, which orders to display), and the `layout` block can use parameters to let the end user control report appearance (for example, which header text to use).

This section lists the parts of the RDL file that you can parameterize.

Content Parameters

Parameters can appear in the following places within the `content` block:

- Anywhere within an SQL block.
- Anywhere within the URL in an `xmlsource` block.
- In an `ejb` block, in any value of an `arg`.



For EJBs, the parameter syntax is different from elsewhere in the `content` block.

For the syntax of parameters in the `content` block, see [Content Block Parameter Syntax](#) on page 107.

Layout Parameters

In the **layout** section, you can parameterize any literal string value of any of the `args` within the `useComponent` block.

For the syntax of parameters in the `layout` block, see [Layout Block Parameter Syntax](#) on page 108.

Tips for Using Parameters

When writing RDL, make sure to handle cases where the end user might assign multiple values to a single-value parameter or a null value to any parameter.

Since the **content** and **layout** sections use different parameter syntax, the way you handle these cases is different.

See [Example](#) on page 31 for an RDL file containing many instances of `content` and `layout` parameters.

Tips for the Content Section

The `content` block has its own parameter syntax. This richer syntax gives you a lot of flexibility when using parameters, especially for defining multi-value parameters. However, you must make sure that multiple values don't get assigned to a single-value parameter, and that parameters are assigned a value when necessary. See [Parameter Variables](#) on page 107 for details.

Making Sure the Parameter has a Value

Assign a default to the parameter to make sure that it has a value. You can do this using the Parameter Manager accessed through the Report Designer or you can do it directly in RDL by making sure that one of the values in the **parameter** section has `default` set to `true`, and that the value that has `default` set to `true` is not null.

For example, the following multi-value parameter is sure to have at least one value:

```
<rdl:parameter name="title" readonly="false" queryParam="false">  
  <rdl:value label="Title1" default="true">title1</rdl:value>
```

```

        <rdl:value label="Title2" default="false">title2</rdl:value>
    </rdl:parameter>

```

- ▶ The default value holds only the first time the report is run. If the end user selects a different value and then reruns the report, the default no longer applies.

If the list of possible values is generated by a query, or if the report is run using an API rather than by the end user (see [Chapter 6, Select Audit APIs](#)), then selecting a default value may not guarantee that the parameter has a value. For query-generated values, this is because the list of possible values for the parameter may no longer include the designated default value. For API-generated values, this is because the API may override the default value by explicitly specifying no value at all.

Making Sure the Parameter has Only One Value

You must make sure that single-value parameters are not assigned multiple values. To do this, bind the parameter to a single-value control type. The single-value control types are listed below:

- Text field
- Radio button
- Single-value list

- ▶ This technique may not work for API-generated values. If the API-specifies multiple values, the single value generated is a concatenation of all the specified values, rather than any one of the individual values.

Tips for the Layout Section

In the **layout** section, make sure that empty selections are not allowed. To do this, insert the value "", which creates a null string rather than a null value. For example:

```

<rdl:arg name="header">
<![CDATA[{{(param.pNoneCategoryProduct.label.equals("")) ? "" :
param.pNoneCategoryProduct.label}]]></rdl:arg>

```

Example

The following example shows some of the many ways that you can use parameters in an RDL file:

```

<?xml version="1.0"?>
<!DOCTYPE rdl:RDL SYSTEM "ReportDescriptionLanguage.dtd">
<rdl:RDL xmlns:rdl="http://www.panscopic.com/RDL" name="PanscopicScope">
<!--

```

This report provides an example of parameterizing the GROUP BY, HAVING, and ORDER BY clauses used for generating a table report. Additionally, this report also provides an example of using JavaScript to alter the layout of the report at runtime.

- 1) Add parameters pCountryCity and pNoneCategoryProduct whose values will be used in the GROUP BY and ORDER BY clauses. The parameters will be bound to controls in the layout section so that the user can select the columns by which they wish to group the report.
- 2) Add a parameter pSalesAmount whose value will be used in the HAVING clause.

The parameter will be bound to a control in the layout section so that the user can specify the conditional value to be tested against in an optional HAVING clause.

-->

```
<rdl:parameters>
  <rdl:parameter name="pSalesAmount" readonly="false"
    queryParam="false">
  </rdl:parameter>
  <rdl:parameter name="pCountryCity" readonly="false"
    queryParam="false">
    <rdl:value label="Country" default="true"> ORDERS.SHIP_COUNTRY
    </rdl:value>
    <rdl:value label="City" default="false">ORDERS.SHIP_CITY
    </rdl:value>
  </rdl:parameter>
  <rdl:parameter name="pNoneCategoryProduct" readonly="false"
    queryParam="false">
    <rdl:value label="Category" default="true">
    CATEGORIES.CATEGORY_NAME</rdl:value>
    <rdl:value label="Product" default="false">
    PRODUCTS.PRODUCT_NAME</rdl:value>
  </rdl:parameter>
</rdl:parameters>
```

```
<rdl:content>
  <rdl:data name="MainQuery" readonly="false">
    <rdl:mandatoryParameters/>
  <rdl:rdbms prefetch="false">
    <rdl:connection name="demo"/>
</rdl:content>
```

<!--

- 3) Use the parameters in the SQL statement. Using the parameter syntax add the values of the parameters to the SELECT, GROUP BY, and ORDER BY clauses. Also, using the parameter syntax add an optional HAVING clause. Note that the HAVING clause will not be added to the SQL statement if the value of pSalesAmount is empty. Since the value of pNoneCategoryProduct is potentially empty and we cannot dynamically change the number of return columns based on a parameter value we must add the parameterized value to the end of the SELECT clause and follow it with a "filler" column of "NULL" so that if the expression, {param.pNoneCategoryProduct ("", ",")}, evaluates to an empty string there will be at least four columns returned by our query and no runtime error will be generated.

-->

```
<rdl:sql>
```



```

        <![CDATA[
            SELECT      {param.pCountryCity("", "", "")}
                       EMPLOYEES.LAST_NAME,
                       SUM(ORDER_DETAILS.UNIT_PRICE
                           * ORDER_DETAILS.QUANTITY),
                       {param.pNoneCategoryProduct("", "", "")} NULL

            FROM        ORDERS, ORDER_DETAILS, CATEGORIES, PRODUCTS,
                       SUPPLIERS, EMPLOYEES

            WHERE       ORDERS.ORDER_ID = ORDER_DETAILS.ORDER_ID
                       AND
                       ORDERS.EMPLOYEE_ID = EMPLOYEES.EMPLOYEE_ID
                       AND
                       ORDER_DETAILS.PRODUCT_ID = PRODUCTS.PRODUCT_ID
                       AND
                       CATEGORIES.CATEGORY_ID = PRODUCTS.CATEGORY_ID
                       AND
                       PRODUCTS.SUPPLIER_ID = SUPPLIERS.SUPPLIER_ID

            GROUP BY   {param.pCountryCity("", "", "")}
                       {param.pNoneCategoryProduct("", "", "")}
                       EMPLOYEES.LAST_NAME

                       {param.pSalesAmount("HAVING SUM
                       (ORDER_DETAILS.UNIT_PRICE *
                       ORDER_DETAILS.QUANTITY) > ", "")}

            ORDER BY  {param.pCountryCity("", " ASC,")}
                       {param.pNoneCategoryProduct("", " ASC,")}
                       SUM(ORDER_DETAILS.UNIT_PRICE *
                       ORDER_DETAILS.QUANTITY) DESC
                       ]]>
        </rdl:sql>
    <!--
    4) Add return columns which represents the return values of the
       parameterized columns from the SELECT clause.
    -->
    <rdl:return>
        <rdl:column name="COUNTRY_CITY" type="string" index="1"/>
        <rdl:column name="EMPLOYEES_LAST_NAME" type="string"
            index="2"/>
        <rdl:column name="SUMORDER_DETAILS_UNIT_PRICE_MUL_ORDER_
            DETAILS_QUANTITY" type="integer" index="3"/>
        <rdl:column name="NONE_CATEGORY_PRODUCT" type="string"
            index="4"/>
    </rdl:return>
    </rdl:rdbms>
</rdl:data>
</rdl:content>

```

```

<rdl:paginations>
  <rdl:pagination data="MainQuery" type="vcr">
    <rdl:pageInterval>10</rdl:pageInterval>
    <rdl:nextPage><![CDATA[]]></rdl:nextPage>
    <rdl:prevPage><![CDATA[]]></rdl:prevPage>
    <rdl:firstPage><![CDATA[]]></rdl:firstPage>
    <rdl:lastPage><![CDATA[]]></rdl:lastPage>
  </rdl:pagination>
</rdl:paginations>

<rdl:sortings>
  <rdl:sorting data="MainQuery">
<rdl:sortOrder direction="ascending">EMPLOYEES_LAST_NAME</
rdl:sortOrder>
<rdl:sortOrder direction="descending"> SUMORDER_DETAILS_UNIT_PRICE_
MUL_ORDER_DETAILS_QUANTITY</rdl:sortOrder>
<rdl:sortOrder direction="descending">NONE_CATEGORY_PRODUCT</
rdl:sortOrder>
</rdl:sorting>
</rdl:sortings>

<rdl:layout>
<!--
5) Bind the parameters to controls so that the user can
interactively select grouping columns and optionally specify a
"having" value via the report's UI.
-->
<rdl:controls name="controls0" style="background:#ffffff;
font-family:Arial; font-size:9pt;">
  <rdl:pushButton type="submit" style="font-family:Arial;
font-size:9pt;">Submit</rdl:pushButton>
  <rdl:break/>
  <rdl:sectionBreak/>
  <rdl:listMenu size="1" style="width:80;font-family:Arial;
font-size:9pt;" multiple="false" parameter="pCountryCity"
labelStyle="font-family:Arial; font-size:9pt;">Group by
</rdl:listMenu>
  <rdl:listMenu size="1" style="width:80;font-family:Arial;
font-size:9pt;" multiple="false"
parameter="pNoneCategoryProduct" labelStyle="font-family:Arial;
font-size:9pt;" noSelection="(none)">then by</rdl:listMenu>
  <rdl:textField cols="6" wrap="default" lines="1"
style="text-align:right;font-family:Arial; font-size:9pt;"
password="false" parameter="pSalesAmount"
labelStyle="font-family:Arial; font-size:9pt;">having sales
amount greater than US$</rdl:textField>
</rdl:controls>

<rdl:useComponent name="StandardTable_1" type="StandardTable">

```

```

<!--
6) Add a column to the layout that displays the data values of the
COUNTRY_CITY return column. The data values will be from either
the ORDERS.SHIP_COUNTRY column or the ORDERS.SHIP_CITY column
depending on the user's selection in the report's UI. Note that
the header will correspond to the label of the selected
parameter value.
-->
<rdl:arg name="column">
  <rdl:arg name="header">{param.pCountryCity.label}</rdl:arg>
  <rdl:arg name="cell">{data.MainQuery.COUNTRY_CITY}</rdl:arg>
  <rdl:arg name="headerStyle">text-align: center;</rdl:arg>
</rdl:arg>
<!--
7) Add a column to the layout that displays the data values of the
NONE_CATEGORY_PRODUCT return column. Note the use of the
JavaScript three part conditional operator, "condition ? val1 :
val2", to "hide" the column when no selection, "(none)", is
specified for the parameter.
-->
<rdl:arg name="column">
  <rdl:arg name="columnStyle"><![CDATA[
    { (param.pNoneCategoryProduct.label.equals("") ?
      "width:0" : "") }]]></rdl:arg>
  <rdl:arg name="header"><![CDATA[
    { (param.pNoneCategoryProduct.label.equals("") ? "" :
      param.pNoneCategoryProduct.label) }]]></rdl:arg>
  <rdl:arg name="cell"><![CDATA[
    { (param.pNoneCategoryProduct.label.equals("") ? "" :
      data.MainQuery.NONE_CATEGORY_PRODUCT) }]]></rdl:arg>
  <rdl:arg name="headerStyle">text-align: center;</rdl:arg>
</rdl:arg>
<rdl:arg name="column">
  <rdl:arg name="sortable">EMPLOYEES_LAST_NAME</rdl:arg>
  <rdl:arg name="header">Sales Rep</rdl:arg>
  <rdl:arg name="cell">{data.MainQuery.EMPLOYEES_LAST_NAME}
</rdl:arg>
  <rdl:arg name="headerStyle">text-align: center;</rdl:arg>
</rdl:arg>
<rdl:arg name="column">
  <rdl:arg name="sortable">SUMORDER_DETAILS_UNIT_
PRICE_MUL_ORDER_DETAILS_QUANTITY</rdl:arg>
  <rdl:arg name="header">Sales Amount</rdl:arg>
  <rdl:arg name="cell">{data.MainQuery.SUMORDER_DETAILS_
UNIT_PRICE_MUL_ORDER_DETAILS_QUANTITY}</rdl:arg>
  <rdl:arg name="headerStyle">text-align: center;</rdl:arg>
</rdl:arg>
<rdl:arg name="dataSet">MainQuery</rdl:arg>

```

```

    <rdl:arg name="tableStyle">width:80%; border-color:#000066;
    border-style:solid; border-width:2; background:#FFFFFF;
    font-family:Arial; font-size:9pt; color:#000000;
    text-align:right;</rdl:arg>
    <rdl:arg name="tableBorder">1</rdl:arg>
<!--
    8) Both embedded HTML and JavaScript are used to generate the report
    title. Note the use of the embedded HTML tag, &lt;BR/&gt;, to
    break the title into two lines. Also, note again the use of the
    JavaScript three part conditional operator to dynamically build
    the report title at runtime.
-->

    <rdl:arg name="titleLabel"><![CDATA[Sales Amount Per Rep<BR/>
    {new String("Grouped by " + param.pCountryCity.label +
    (param.pNoneCategoryProduct.label.equals("") ? "" : (" and by
    " + param.pNoneCategoryProduct.label))}]]></rdl:arg>
    <rdl:arg name="showColumnHeaders">>true</rdl:arg>
    <rdl:arg name="titleStyle">text-align: center;
    background:#FFFFFF; font-family:Arial; font-size:14pt;
    font-weight: bold; color:#000066;</rdl:arg>
    <rdl:arg name="columnHeaderStyle">font-weight:bold;
    font-family:Arial</rdl:arg>
    <rdl:arg name="tableHeaderFooterStyle">text-align:center;
    font-family:Arial; font-size:10pt; font-weight:bold;
    font-style:normal; text-decoration:none; background:#CCCCCC;
    color:#000066;</rdl:arg>
    <rdl:arg name="rowStyle1">font-family:Arial; background:
    #dffffd;</rdl:arg>
    <rdl:arg name="rowStyle2">font-family:Arial; background:
    #d0d5e1;</rdl:arg>
    </rdl:useComponent>
  </rdl:layout>
</rdl:RDL>

```

4 Guidelines for Developing Reports

This chapter describes the steps you typically take to develop reports using the Report Designer and the Report Center. The principal steps in report development are as follows:

- [Building the Report Using the Report Designer](#) on page 37
- [Test-publishing Your Report](#) on page 38
- [Publishing Your Report](#) on page 39

Building the Report Using the Report Designer

Typically, you start building a report using the Report Designer by performing the following steps:

- 1 Connect to the server that contains your data sources.
- 2 Select the data source that will populate the report.
- 3 Create the SQL statement.
- 4 Decide the choices that the end user can make at runtime that affect the data in the component. For example, if the report will contain a table of orders, you might want to let the end user select to display only orders placed in certain countries and/or only orders above a certain amount. Create a parameter to represent each choice.
- 5 If the set of possible parameter values will not be known until runtime, create a separate query to generate the items to choose from. For example, if a parameter lets the end user limit the shown orders to those from certain countries, create a new query to generate the list of countries.
- 6 If you have created queries to produce parameter values, bind the queries to the parameters.
- 7 Add the parameter to the query that generates data for display using Report Designer's SQL editor.
- 8 Preview the report using the **Preview** tab.
- 9 Select the component (Table, CrossTab, or Chart) to present the data.
- 10 Use the wizard to create the component.
- 11 Rearrange and style the various parts of the component. (See the *HP Select Audit 1.1 Report Designer's Guide* for examples.)
- 12 Select the controls for the report. Bind the controls to parameters (some controls, for example the **Run** button, are not bound to parameters).
- 13 Run **Live Preview** to check whether the report runs as expected.
- 14 Save the RDL file.

Test-publishing Your Report

You must publish a report to run it in the Library. It is desirable to test your report in the Report server using the Report Center's Developers Center before publishing it.

For details on the Developers Center, see the *HP Select Audit 1.1 Report Center User's Guide*.

Using the Report Server's Developers Center to Test Publish a Report

- 1 You must do the following before you test publish a report:

- Set the `development server` property in the `scopeserver.xml` file to `true`.
- Copy the report to the following directory under the directory in your Select Audit installation:

```
WEBAPPS_HOME\scopeserver\WEB-INF\rdl
```

- ▶ You can create subdirectories of the `rdl` directory and copy the report into one of the subdirectories, if you wish.

- 2 Open the Developers Center. The URL of the Developers Center is:

```
http://<servername>/scopeserver/
```

where `<servername>` is the address of the Report server. The **Developers Center Test** screen opens.

- ▶ It's a good idea to save this page as a favorite or bookmark in your browser.

File Name	
BandedTableAndCrosstab.rdl	View RDL
ChartAndTable.rdl	View RDL
ComplexDashboard.rdl	View RDL
ConditionalFormatting.rdl	View RDL
ControlsPage.rdl	View RDL
DashboardControls.rdl	View RDL
GroupTableWithDrilldown.rdl	View RDL
ParameterizedCrosstab.rdl	View RDL
ParameterizedGroupBy.rdl	View RDL
ParameterizedTable.rdl	View RDL
ReadMe.html	View RDL
SampleInvoice.rdl	View RDL
TableWithConditionalFormattingAndJavascript.rdl	View RDL
TableWithSorting.rdl	View RDL
drilldowns/ComplexDashboardDrilldownTQ.rdl	View RDL
drilldowns/ComplexDashboardDrilldownTS.rdl	View RDL
drilldowns/ControlsPageDetails.rdl	View RDL
drilldowns/GroupTableDrilldown.rdl	View RDL
drilldowns/ParameterizedGroupByDrilldown.rdl	View RDL

The Test screen contains a number of samples, as well as a Test Run section.

- 3 Type your report's complete filename in the **Select a File** field and click **Run**. If the report is in a subdirectory of `rdl`, type it as a relative path, for example:

`my_sub_folder/myscope.rdl`

Publishing Your Report

Once you are satisfied with your report, publish it to the Library. For instructions, see the *HP Select Audit 1.1 Report Center User's Guide*.

5 Working with Non-SQL Data Sources

This chapter discusses how to work with XML, EJB and stored procedure data sources. (Even though stored procedures actually are SQL-based, they are discussed in this chapter because Select Audit handles them differently from SQL `SELECT` queries.)



You can also create a custom data source. See [Custom Data Source API](#) on page 60 for details.

This chapter frequently refers to the tags contained in the RDL `content` block.

Queries and Parameters

Data returned from any supported data source type can be treated similarly to the results of an SQL `SELECT` statement. The Select Audit parameter model also works with all supported data source types.

Non-SQL `SELECT` “Queries”

The definition of the values returned from a data source (the equivalent of a “query” in SQL) is defined in the various sub-blocks of the RDL file’s `content` block. XML “queries” are defined in the `xmlsource` block, EJB “queries” are defined in the `ejb` block, and stored procedure “queries” are defined in the `sql` block.

The Report server uses a list of data elements internally, each of which must contain the same number of fields. Data returned from all sources is mapped to this internal data structure. In the case of SQL data, the data elements are rows and the fields are the columns in each row. For XML data, each data element is a node in the XML DOM. For EJBs, each element is an instance of an EJB.

Parameters Not in SQL `SELECT` Statements

Select Audit parameters are variables with dynamic values. (See [Parameters](#) on page 29 for more information on Select Audit parameters.) Select Audit parameters are a powerful way to restrict the return set generated by any data source. They can be used as part of an XML URL, an EJB argument, or a stored procedure argument. The sections in this chapter explain how to use parameters with each supported data source type.

You can work with XML, EJB and stored procedure data sources using the Query Designer.

XML Data Sources

Select Audit accesses an XML source either through a URL or as the result of an XQuery. You retrieve XML from a URL by setting the `url` attribute of the `xmlsource` block. The specified URL must include the protocol. Be sure to use `file:` for reading XML from a local file. To specify XQuery content, nest an `xquery` block inside the `xmlsource`. When using an XQuery, the `url` attribute sets the default document to query against.

Select Audit Parameters and XML Data Sources

The `url` attribute of an XML source can be fully parameterized. The parameters can be used to pass information to the source of the XML or even to change the source of the data. You can parameterize the entire URL or just part of it, and you can put multiple parameters in the URL. You can a Select Audit parameter as the value of a URL parameter.

Select Audit parameter syntax in an URL is the same as in a SQL query. See [Content Block Parameter Syntax](#) on page 107 for details.

The following is an example of parameterized URL that changes the source of the XML data:

```
<rdl:xmlsource url="file://{param.region('samples/XML/', '', '')}">
...
</rdl:xmlsource>
```

If the value of the `region` parameter is `East`, the file `samples/XML/East` is used. Similarly, if the value is `West`, the file `samples/XML/West` is loaded.

If the same data had originated from a dynamic XML source, you might want to modify the request sent to the XML source. If the data in the previous example came from a servlet or web services invocation, the example be as follows:

```
<rdl:xmlsource url="http://myserver/
xmlProcessor?{param.region('region=', '', '')}">
...
</rdl:xmlsource>
```

In this example, if the `region` parameter is set to `East`, the actual URL used is:

```
http://myserver/xmlProcessor?region=East
```

If `region` is set to `West`, the URL is:

```
http://myserver/xmlProcessor?region=West
```

Select Audit Parameters and XQueries

Because XQueries are strongly typed, the syntax for parameterizing an XQuery is different from the syntax for parameterizing a URL or SQL query. An XQuery in an `xmlsource` block consists of a series of static text and parameterized text, all enclosed in an `xquery` block. Static text is enclosed in an `insertText` block, while parameterized text is enclosed in a `parameterizedCondition` block.

The following example shows the W3C's sample XQuery *Q1* inside an RDL file. (See <http://w3c.org/TR/xquery-use-cases/#xmp-queries-results-q1> for more information on the sample XQueries defined by the W3C.)

```

<rdl:xmlsource>
  <rdl:xquery>
    <rdl:insertText>
      <![CDATA[
        <bib>
          {
            for $b in doc("http://bstore1.example.com/bib.xml")/bib/book
            where $b/publisher = "Addison-Wesley" and $b/@year > 1991
            return
              <book year="{ $b/@year }">
                { $b/title }
              </book>
          }
        </bib>
      ]]>
    </rdl:insertText>
  </rdl:xquery>
  ...
</rdl:xmlsource>

```

A `parameterizedCondition` always contains one predicate block, which specifies which parameter the block depends on. If the parameter does not have a defined value, the entire block evaluates to an empty string; otherwise it evaluates to the optional leading static text, the parameterized expression, and the optional trailing static text. The predicate requires a parameter and a string that acts as a placeholder for the parameter value, and can contain the type of the parameter and a boolean operator to use if the parameter has more than one value. If no boolean operator is specified and the parameter has more than one value the query fails and an error is thrown.

The following extension to the previous example parameterizes the publisher:

```

<rdl:xmlsource>
  <rdl:xquery>
    <rdl:insertText>
      <![CDATA[
        <bib>
          {
            for $b in doc("http://bstore1.example.com/bib.xml")/bib/book
            where $b/@year > 1991
          }
      ]]>
    </rdl:insertText>
    <rdl:parameterizedCondition>
      <rdl:insertText> and ( <rdl:insertText>
        <rdl:predicate parameter="Publisher" bindingSymbol="###"
          booleanOp="or">
          $b/publisher='###'
        </rdl:predicate>
        <rdl:insertText> ) </rdl:insertText>
      </rdl:parameterizedCondition>
    <rdl:insertText>
      <![CDATA[

```

```

        $b/publisher = "Addison-Wesley" and
        return
            <book year="{ $b/@year }">
                { $b/title }
            </book>
        }
    </bib>
]]>
</rdl:insertText>
</rdl:xquery>
...
</rdl:xmlsource>

```

If the `Publisher` parameter does not have any values, every book published since 1991 is returned, regardless of the publisher. If `Publisher` is set to “Addison-Wesley” the data returned matches the first example, and if `Publisher` is set to “Addison-Wesley” and “Morgan Kaufmann Publishers” all books published since 1991 by either publisher are returned.

In addition, if you are using Select Audit driver for the Saxon XQuery engine available from Saxonica (<http://www.saxonica.com>), you can specify a custom URI resolver to use when loading data into the XQuery engine.

Designating Rows and Columns from an XML Data Source

Select Audit treats XML data as a sequence of nodes, with the specific fields to report on for each node specified relative to each node. The full DOM is available when specifying the fields to use.

Specifying the XML data to include in a report is a two-step process. First you identify the set of nodes to include in the report and then you specify the data fields for each node. In both cases, Select Audit uses XPath (<http://www.w3.org/TR/xpath>) to identify both the node set and the data fields.

Select Audit uses the Java API for XML Processing (JAXP) to perform all operations on the XML data and follows the JAXP specification when determining which transformer to use.

Use the `selectPath` attribute of the `return` block to specify an XPath expression that identifies the nodes to include in the report. To identify the information you want to include for each node, use the `fieldPath` attribute of nested column tags.



The context for the XPath used in the `fieldPath` attribute is the current node, not the entire document. You should always specify `fieldPath` expressions relative to a node and begin each with `./`.

If your XML data source returns data containing explicit namespaces, you must tell Select Audit the prefixes that are being used in the returned data. Do this using the namespace elements nested inside the `return` block.

Examples

The examples in this section all use the following XML data:

```
<?xml version="1.0" encoding="UTF-8"?>
<Regions>
  <Region name="East">
    <City name="New York">
      <Population>8000000</Population>
    </City>
    <City name="Boston">
      <Population>600000</Population>
    </City>
    <City name="Philadelphia">
      <Population>1500000</Population>
    </City>
    <City name="Chicago">
      <Population>2900000</Population>
    </City>
  </Region>
  <Region name="West">
    <City name="Dallas">
      <Population>1200000</Population>
    </City>
    <City name="San Francisco">
      <Population>800000</Population>
    </City>
    <City name="Seattle">
      <Population>600000</Population>
    </City>
    <City name="San Diego">
      <Population>1300000</Population>
    </City>
  </Region>
</Regions>
```

The following RDL code returns a simple table of all the cities, the regions they are in and their populations. The code selects all the City nodes and includes a reference to the Region ancestor as one of the data fields:

```
<rdl:return selectNode="/Regions/Region/City">
  <rdl:column name="Region" type="string" fieldPath="ancestor::Region/
  @name"/>
  <rdl:column name="City" type="string" fieldPath="./@name"/>
  <rdl:column name="Population" type="int" fieldPath="./Population"/>
</rdl:return>
```

The resulting data set is:

East	New York	8000000
East	Boston	600000

East	Philadelphia	1500000
East	Chicago	2900000
West	Dallas	1200000
West	San Francisco	800000
West	Seattle	600000
West	San Diego	1300000

The next example uses XPath predicates to further filter the data set. This example extends the previous one to find only the cities that start with the string “San”.

```
<rdl:return selectNode="/Regions/Region/City[starts-with(@name,
'San')]">
  <rdl:column name="Region" type="string" fieldPath="ancestor::Region/
  @name"/>
  <rdl:column name="City" type="string" fieldPath="./@name"/>
  <rdl:column name="Population" type="int" fieldPath="./Population"/>
</rdl:return>
```

The results are:

West	San Francisco	800000
West	San Diego	1300000

The final example shows how to take advantage of all the XPath and XSLT functions. This example counts the number of cities in a Region and sums up the total population for the cities using functions to aggregate the information and format the output:

```
<rdl:return selectNode="/Regions/Region">
  <rdl:column name="Region" type="string" fieldPath="./@name"/>
  <rdl:column name="NumCities" type="string"
    fieldPath="count(descendant::City)"/>
  <rdl:column name="Population" type="string"
    fieldPath="format-number(sum(child::City/Population), '#,##0')"/>
</rdl:return>
```

The output is:

East	4	13,000,000
West	4	3,900,000

EJB Data Sources

The `ejb` tag takes three arguments: `connection`, `service` and `method`.

The `connection` attribute specifies the EJB’s JNDI connection. This attribute specifies the logical name of the connection as defined in the `scopeserver.xml` file.

The `service` attribute is the logical name under which the EJB server advertises itself on the JNDI naming service.

The `method` attribute is the name of the method to invoke on the object. The method returns either a single bean or a collection of beans. Single beans are useful for record- or invoice-type reports. Collections are useful for showing tabular or chart data.

The specified method can be any method on the Home interface. It may or may not be a finder method. You can also use a series of methods, separated by a slash (/), where the first method is on the Home interface and subsequent methods are on the object returned by the previous method.

The return objects can be Entity beans, Session beans, or Java beans (serializable state objects). Each returned bean is mapped as a row in Select Audit. If the EJB “query” returns a single object rather than a collection, the results contain only one row. A collection of 12 beans results in 12 rows of data.

The `return` block within the `ejb` block contains the “columns” to return. Each of the return objects becomes a row of data and the public access methods become the “columns”. The `property` attribute of each column refers to methods on the bean, typically “getters” or “setters”. For example, if a column name is `lastName`, the column’s property is typically the `getLastName` method on the bean.



The method specified with the `method` attribute is not on the same object as the access method. The former is on the Home interface and the latter is on a returned bean.

The `arg` blocks within the `ejb` block is how the Select Audit parameter model is realized on an EJB. The `value` attribute of each `arg` is typically a Select Audit parameter. The parameter is sent to the EJB as an argument to a bean method.

Setting Up a JNDI Connection

To use an EJB data source, make sure that a JNDI connection is defined in the `scopeserver.xml` file. The JNDI connection definition depends on the application server. This section shows sample JNDI connection definitions for different application servers.

For example, using the supplied Tomcat application server framework, the following `JNDIConnection` block in `scopeserver.xml` might define the `jndi-demo` connection used in the examples that follow:

```
<JNDIConnection>
  <name>jndi-demo</name>
  <Properties>
    <Property name="java.naming.factory.initial">
      org.openejb.client.JNDIContext
    </Property>
    <Property name="java.naming.provider.url">
      127.0.0.1:4201
    </Property>
    <Property name="java.naming.security.principal">
      myuser
    </Property>
    <Property name="java.naming.security.credentials">
      mypass
    </Property>
  </Properties>
</JNDIConnection>
```

WebLogic Example

The following example shows a sample JNDI connection definition using BEA WebLogic:

```
<JNDIConnection>
  <name>jndi-weblogic</name>
  <Properties>
    <Property name="java.naming.factory.initial">
      weblogic.jndi.WLInitialContextFactory</Property>
    <Property name="java.naming.provider.url">t3://localhost:7001
    </Property>
    <Property name="java.naming.security.principal">user</Property>
    <Property name="java.naming.security.credentials">password
    </Property>
  </Properties>
</JNDIConnection>
```



The port number is configurable, so check your server configuration.

Example Java Files

The following examples show how to create reports using an entity EJB data source that uses the connection defined above.

The following file, `EmployeeHome.java`, gets the beans and advertises the methods that the `rdl:ejb` method attribute can specify:

```
package testapp;

import java.rmi.*;
import javax.ejb.*;
import java.util.Collection;

public interface EmployeeHome extends EJBHome {

    public java.util.Collection findEmployees() throws
        javax.ejb.FinderException, java.rmi.RemoteException;
    public java.util.Collection findEmployeesBySize(int size) throws
        javax.ejb.FinderException, java.rmi.RemoteException;
}

```

The following file, `Employee.java`, specifies the methods available using the `rdl:column` properties attribute:

```
package testapp;

import java.rmi.RemoteException;

public interface Employee extends javax.ejb.EJBObject {
    public String getFirstName() throws RemoteException;
    public String getLastName() throws RemoteException;
    public String getDepartment() throws RemoteException;
}

```



```

        public String getPhoneNumber() throws RemoteException;
    }

```

Basic EJB Example

The following content block of an RDL file retrieves information on all employees from the EJB described in the Java files mentioned above:

```

<rdl:content>
  <rdl:data name="sampledata">
    <rdl:ejb connection="jndi-demo"
      beanclass=""
      factoryclass=""
      method="findEmployees"
      service="EmployeeHome">
      <rdl:return>
        <rdl:column name="firstName" type="string"
          property="getFirstName"/>
        <rdl:column name="lastName" type="string"
          property="getFirstName"/>
        <rdl:column name="name" type="string"
          value="firstName + ' ' + lastName"/>
        <rdl:column name="dept" type="string"
          property="getDepartment"/>
        <rdl:column name="phoneNum" type="string"
          property="getPhoneNumber"/>
      </rdl:return>
    </rdl:ejb>
  </rdl:data>
</rdl:content>

```

Parameterized EJB Example

The following content block of an RDL file passes a parameter value to an EJB method to filter employees by the size of their department:

```

<rdl:content>
  <rdl:data name="sampledata">
    <rdl:ejb connection="jndi-demo"
      beanclass=""
      factoryclass=""
      method="findEmployeesBySize"
      service="EmployeeHome">
      <rdl:arg name="size" type="int" value="{param.size}" />
    <rdl:return>
      <rdl:column name="firstName" type="string"
        property="getFirstName"/>
      <rdl:column name="lastName" type="string"
        property="getFirstName"/>
    </rdl:return>
  </rdl:data>
</rdl:content>

```

```

        <rdl:column name="name" type="string"
            value="firstName + ' ' + lastName"/>
        <rdl:column name="dept" type="string"
            property="getDepartment"/>
        <rdl:column name="phoneNum" type="string"
            property="getPhoneNumber"/>
    </rdl:return>
</rdl:ejb>
</rdl:data>
</rdl:content>

```

Stored Procedure Data Sources

Stored procedure calls, like SQL `SELECT` statements, are placed in `sql` blocks. Standard JDBC syntax is used:

```
{call stored_procedure_name ([optional_argument_list])}
```

Example Stored Procedure Arguments

The following is a typical `sql` block containing a stored procedure that does not take any arguments:

```
<rdl:sql><![CDATA[call OrdersByQuarter()]]></rdl:sql>
```

The following examples use a stored procedure that takes an argument specifying the starting year for the report. You can bind the argument to either a fixed value or to a Select Audit parameter.

The following example shows a fixed-value argument:

```
<rdl:sql><![CDATA[call OrdersByQuarter(1998)]]></rdl:sql>
```

The following example shows the argument bound to a Select Audit parameter:

```
<rdl:sql><![CDATA[call OrdersByQuarter({param.startDate("", "")} )]]>
</rdl:sql>
```

Handling Return Values

For all supported databases except Oracle, the values returned by the stored procedure are automatically available to be assigned to columns in the `return` block.

Return Values from Oracle Stored Procedures

Oracle stored procedures cannot directly return results. To return results, an Oracle stored procedure must have an argument of Oracle data type `REFCURSOR`. The stored procedure must load this argument with the results.

Select Audit automatically creates a `REFCURSOR`, passes it to the stored procedure and extracts the results when the stored procedure returns. All you need to do is indicate which argument represents the `REFCURSOR` by marking it with the “?” character.

In following example, the value of the Select Audit parameter `region` is passed in as the stored procedure's `reg` argument, and a REF CURSOR is automatically created and passed in as the second argument.

To call the following Oracle stored procedure:

```
PROCEDURE CustomersForRegion(reg IN VARCHAR2, curs IN OUT refcursor)
IS
BEGIN
open curs for select company_name, address, city, region, country,
postal_code
FROM customers
WHERE country = reg
ORDER BY company_name;
END CustomersForRegion;
```

set the second (REF CURSOR) argument to "?", as follows:

```
<rdl:sql><![CDATA[call CustomersForRegion({param.region}, ?)]]>
</rdl:sql>
```


6 Select Audit APIs

Select Audit offers several APIs that integrate Select Audit with your system, and extend and enhance the Report server. Each of the APIs serves a different purpose and offers a different level of control.

API Overview

The Select Audit APIs are listed below:

- HTTP API
- SOAP API
- Java Client SOAP API
- Extensibility API

There is also an App Server plugin which consists of a set of Java classes that you can use to easily run a report from a JSP or Java servlet application.

The following table shows the functionality provided by each API:

Table 6 API Functionality

	Report Execution	Session Management	Library Navigation	Directory Access	Server Extensions	Scheduling
HTTP	X					
SOAP	X	X	X	X		X
Java Client SOAP	X	X	X	X		X
Extensibility					X	
App Server plugin	X					

HTTP API

The HTTP API isn't a true API, but a way to drive the Report server using URLs. It consists of parameters that can be passed using a URL to run a specific report, save output to the Library, and so forth.

You can control much of how the Report server runs a report by using parameters passed as part of the URL. These parameters are collectively called the HTTP API. You can perform the following actions with the HTTP API:

- Specify report parameters.
- Configure how the report runs.
- Specify the output format.

URL Syntax for the HTTP API

The URL syntax for using HTTP API is:

```
http://<server>/scopeserver/ScopeServer?<URL_parameter_string>
```

where:

- <server> is the URL of your server
- <URL_parameter_string> is a sequence of parameter name/value pairs separated by ampersands (&).

Example HTTP Request

The following URL causes the App Server Plugin to request that the Report Generator execute the file `Leads.rdl` in the Library's Sales folder and display the results in XML format:

```
http://myappserver:8080/scopeserver/ScopeServer?_p_r=/Sales/Leads&_p_ch=xml
```

SOAP API

The SOAP API allows you to programmatically interact with the Report server. Currently, this API includes Library calls, Directory access, Session management and Report Execution sections

SOAP (Simple Object Access Protocol) is an XML-based messaging protocol designed to be language- and transport-neutral. SOAP is currently the most popular protocol for deploying a web service. Select Audit fully supports SOAP 1.1.

SOAP uses XML to send a message or make a remote procedure call across a network, such as the Internet. All the parameters in the XML body of the request, as well as information about the request itself, are contained in a special section of the XML data called the envelope. Because all the information is encoded in XML, you can access a SOAP server from any operating system that supports the underlying protocol used to send the message. Similarly, you can write the SOAP client in any programming language.

You can make Select Audit SOAP API calls from any language. Select Audit also provides a Java client implementation for applications written in Java.

The Select Audit SOAP implementation requires HTTP transport. Cookies maintain state between requests.

Setting Up the SOAP API

This section shows how to set up the SOAP API for Java and non-Java applications.

Java Applications

To call the Select Audit SOAP API from a Java application, include the `panscopicsoap.jar` file in your application's classpath and use the Java objects it contains to make all the calls. This is the Java Client SOAP API. See the Javadoc that comes with the Java SOAP client library for more information.

Non-Java Applications

To call the Select Audit SOAP API from a non-Java based application, use a SOAP library to format all the requests. You can write your own SOAP library if you choose to. Your SOAP library should have some way to call an arbitrary SOAP Action and specify the method, the namespace URI and all parameters.

All the methods in the SOAP API require that you log in first. The SOAP API is stateful and uses servlet-based sessions to maintain the login state. The first method you call must be `login`, which returns a cookie over the HTTP transport as well as a `session ID`. If your SOAP client library supports it, cache the cookie and send it back with each subsequent request. If your client does not support cookies and you cannot add support for them, you must add the `session ID` to each subsequent request. To do so, add:

```
 ;jsessionid=sessionid
```

to each URL before any parameters.

Since Select Audit uses servlet-maintained sessions, SOAP sessions time out. If your client code may have long delays between logging in and making an additional call, prepare to detect a timeout and log back in.

Types of Methods

The Select Audit SOAP API contains the following sets of methods:

- Session management
- Library
- Directory
- Report execution
- Schedule

Session Management

The Session Management methods of the SOAP API let you log into Select Audit and programmatically end a session. The Select Audit SOAP API is stateful and `login` must be the first call your code makes. If your code makes any other calls before `login`, an error results.

The `login` method uses the configured authentication model (and the configured Authentication Module if appropriate) to perform authentication. See [Authentication Models](#) on page 71 for more information about the available authentication models.

To end a session programmatically, call the `logout` method. This is useful to force Select Audit sessions to end when a session expires in another integrated application.

Library

The Library methods of the SOAP API enable you to do the following:

- Browse the contents of the Library (without using the Report Center).
- Get the metadata about objects in the Library.
- Upload, publish and unpublish reports.
- Generate a list of available reports.
- Add or delete objects from the Library.
- Integrate with an existing portal.

The Library methods include `search`, `getChildren`, `getObject`, `removeObject` and `addObject`.

Directory

The Directory methods of the SOAP API give you programmatic access to the user and group information available to Select Audit. These methods act as a gateway to the underlying configured directory provider. See [Authentication Providers](#) on page 72 for more information about directory providers. The Directory methods include `getUsers`, `getRoles`, `getSubRoles` and `getUsersInRole`.

Report Execution

The Report Execution section of the SOAP API enables you to programmatically run reports in either full page or part-of-page mode. The method `getScope` allows you to run any report in the Library, supply parameters to it, and get the resulting output, usually HTML. (You can specify another format as part of the request, if desired.) The most common use of the `getScope` method is to get the HTML output of a report and embed it in another page.

Schedule

The Schedule section of the SOAP API lets you manage schedules for reports.

Java Client SOAP API

The Select Audit Java Client SOAP API is a set of Java classes that perform SOAP communication with the Report server through a Java API.

The supplied `com.panscopic.soap.client.CommandLineInterface` example demonstrates a typical use of the Java Client SOAP API.

Extensibility API

The Extensibility API is a set of Java interfaces that extend and modify the Report server. The Select Audit Extensibility API extends Select Audit and integrates it with custom or legacy environments. Using the Extensibility API, you can integrate the Report server with a custom directory or authentication engine, or add a custom data source.

Each element of the Extensibility API consists of one or more Java interfaces that must be implemented as well as configuration information on how to use the extension. For complete information about the interfaces that must be implemented, see the Javadoc installed with the Select Audit API.

Using the Report Server API Examples

This section includes API examples as well as build, deployment and implementation instructions.

The following files are included:

- `src/`: Java source for all the examples.
- `javadoc/`: Javadoc for all the public APIs.
- `rdl/`: RDL files for use with the examples.
- `classes/`: Location of class files built from the Java examples.
- `javaApiSamples.jar`: JAR file created from the class files.
- `build.xml`: An Ant build file that allows you to compile, JAR and deploy the examples.

Building and Deploying the Examples

Adding custom extensions to the Report server entails the following steps:

- Compiling the Java code into class files.
- Building a JAR file.
- Copying the JAR to the directory where the Report server is deployed.

The API example directory (`REPORTSERVER_HOME/integration/java_api`) has an Ant build file to automate these steps. This build file requires that the `JAVA_HOME` environment variable points to a valid JDK 1.4 installation. The version of Ant included with the Report server uses a built-in JVM by default, but this JVM does not include the full JDK. To check your `JAVA_HOME`, run the following command:

- On Windows:

```
%JAVA_HOME%\bin\javac -help
```
- On UNIX:

```
$JAVA_HOME/bin/javac -help
```

You should get a help message if `JAVA_HOME` is set correctly. All the following steps assume that your current directory is `REPORTSERVER_HOME/integration/java_api`.

Set Up a Report Server Deployment

In order to deploy the JAR file with the examples, the Ant build file needs a path to a deployed Report server webapp, which is typically under `REPORTSERVER_HOME/deployedWebApps`. Create a file called `build.properties` with a line that sets the `targetWebApp` property, such as the following:

```
targetWebApp=c:/download/20060609-minizip/deployedWebApps/  
embeddedTomcatscopeserver-  
2006Jun09-120821/scopeserver
```

Build and Deploy Examples

Run the built-in Ant executable (this is in a cygwin shell):

```
$ ../../ant/bin/ant clean deploy  
Buildfile: build.xml  
clean:  
[delete] Deleting directory C:\download\20060609-  
minizip\integration\java_api\classes  
jar:  
[mkdir] Created dir:  
C:\download\20060609-minizip\integration\java_api\classes  
[javac] Compiling 2 source files to C:\download\20060609-  
minizip\integration\java_api\classes  
[jar] Building jar: C:\download\20060609-  
minizip\integration\java_api\javaApiSamples.jar  
deploy:  
[copy] Copying 1 file to C:\download\20060609-  
minizip\deployedWebApps\embeddedTomcat-scopeserver-2006Jun09-  
120821\scopeserver\WEB-INF\lib  
BUILD SUCCESSFUL  
Total time: 2 seconds
```

The webapp will need to be reloaded before you have access to the new JAR file.

Test Data Source Example with Supplied RDL Files

The `rdl` directory contains test RDL files for each of the examples. Select one of the RDL files to upload and run using the Report server.

Custom Data Source Examples

JoinDataSource

This data source will perform a Join between two other datasets specified in the content section. The Java source is in `src/com/acme/java_api_examples/JoinDataSource.java`, and a test RDL is in `rdl/JoinExample.rdl`. The data element which uses the data source is shown below:

```
<rdl:data name="MainQuery" readonly="false">
  <rdl:custom classname="com.acme.java_api_examples.JoinDataSource">
    <rdl:arg name="dataset1" value="products"/>
    <rdl:arg name="dataset2" value="suppliers"/>
    <rdl:arg name="joinColumn1" value="supplierId"/>
    <rdl:arg name="joinColumn2" value="supplierId"/>
    <rdl:return>
      <rdl:column name="products_ProductName" type="string" index="1"/>
      <rdl:column name="products_UnitsInStock" type="integer" index="2"/>
      <rdl:column name="suppliers_CompanyName" type="string" index="3"/>
      <rdl:column name="suppliers_ContactName" type="string" index="4"/>
      <rdl:column name="suppliers_City" type="string" index="5"/>
      <rdl:column name="suppliers_Country" type="string" index="6"/>
    </rdl:return>
  </rdl:custom>
  <rdl:mandatoryParameters/>
</rdl:data>
```

The four parameters specify dataset names and column names for the two datasets being joined. The column names are in the form `dataset_column`, where `dataset` is one of the source dataset names and `column` is a column in that dataset.

CSVDataSource

This data source will read a CSV file. Before using this, create a CSV file with at least four columns and change the test RDL to point to the CSV file. The Java source is in `src/com/acme/java_api_examples/CSVDataSource.java` and a test RDL is in `rdl/csvExample.rdl`. The data element which uses the data source is shown below:

```
<rdl:data name="MainQuery" readonly="false">
  <rdl:custom classname="com.acme.java_api_examples.CSVDataSource">
    <rdl:arg name="file" value="c:/download/ssmsg.csv"/>
    <rdl:return>
      <rdl:column name="name" type="string" index="0"/>
      <rdl:column name="status" type="string" index="1"/>
      <rdl:column name="code" type="string" index="2"/>
    </rdl:return>
  </rdl:custom>
  <rdl:mandatoryParameters/>
</rdl:data>
```

```

<rdl:column name="sourcePath" type="string" index="3"/>
</rdl:return>
</rdl:custom>
<rdl:mandatoryParameters/>
</rdl:data>

```

The file argument specifies the path to the file.

Custom Data Source API

The Report server can access many different kinds of data sources, including RDBMS, XML and EJB. You can also implement a custom data source.

A custom data source gives you complete control on how the data is presented to the Report server. For example, you can write a data source that performs a join between an Oracle server and a Sybase server, and appears to the Report server as a single database. As another example, you can write a custom data source that goes to a URL and “screen scrapes” the returned HTML to convert tabular data into a data stream.

The main goals of the data source API are to allow customers and PS to extend the Report server to accept data from new sources, and to transform data from existing data sources.

Description of Data Sources

A RDL file (report template) contains a content element which consists of one or more *data* elements, each of which represents a data source which maps to an implementation of the Java DataSource interface. When the report engine runs a report, different implementations are created by the report engine depending on the child element of the data element.

Content Element Example

The following is an example of a content element with a single SQL data source.

```

<rdl:content>
<rdl:data name="MainQuery" readonly="false">
<rdl:rdbms prefetch="false">
<rdl:connection name="demo"/>
<rdl:sql><![CDATA[SELECT PRODUCTS.PRODUCT_NAME,
PRODUCTS.UNITS_IN_STOCK,
SUPPLIERS.COMPANY_NAME, SUPPLIERS.CONTACT_NAME,
SUPPLIERS.CITY, SUPPLIERS.COUNTRY
FROM PRODUCTS, SUPPLIERS
WHERE PRODUCTS.SUPPLIER_ID = SUPPLIERS.SUPPLIER_ID
{param.Country ("AND SUPPLIERS.COUNTRY =", "'')}]]>
</rdl:sql>

```

```

<rdl:return>
<rdl:column name="ProductName" type="string" index="1"/>
<rdl:column name="UnitsInStock" type="integer" index="2"/>
<rdl:column name="CompanyName" type="string" index="3"/>
<rdl:column name="ContactName" type="string" index="4"/>
<rdl:column name="City" type="string" index="5"/>
<rdl:column name="Country" type="string" index="6"/>
</rdl:return>
</rdl:rdbms>
<rdl:mandatoryParameters/>
</rdl:data>
</rdl:content>

```

The columns of the data source are described by the column elements under the return element. The attributes of column tell the data source and the RDL file more information about the data source:

- **Name:** Used to identify the column to the rest of the RDL file. For this reason, it needs to conform to the syntax of JavaScript identifiers, which start with a “_” or letter and contain letters, numbers or “_”.
- **Type:** Identifies the type of data expected for column values.
- **Index:** An integer value used by the SQL data set, which retrieves result set values by index.
- **Value:** Used to specify a JavaScript expression which is evaluated to find the column’s value. All of these attributes can be used in custom data source implementations.

Overview of Data Source Processing Steps During Report Creation

Data Source implementations are created from the content element of the RDL file. For each Data Source:

If caching is active (default):

- `getCacheKey()` is called to get a key string which is used to look up previously fetched data.
- If the data is not found in the cache, `getDataSet()` is called to obtain the actual data.
- All the rows of the data set are retrieved, stored in the cache under the previously obtained key and are ready to be used in the layout phase below.

If caching is inactive (default):

- In the layout phase the layout element is evaluated to render the report.
- Tables, charts, crosstabs and other components iterate through the rows of the datasets obtained in the previous processing phase.
- Column values are accessed in various ways, including references to the column names or JavaScript expressions.

Implementation

Previous versions of the Report server required custom data source implementations to supply a full `DataSource` and `DataSet` implementation. In this release, a custom data source can be created by implementing the `CustomDataSourceHandler` interface, which has four methods:

- `init(CustomDataSource dataSource)` does any initialization, using the `CustomDataSource` parameter to access information that it needs to create the data set.
- `nextRow()` gets a new row of data.
- `getColumnValue(ColumnInfo column)` gets a value for the column, which is specified by the `ColumnInfo` object. This object allows access to all the attributes specified by the column element (`name`, `index`, `type` and `value`). It is up to the implementation to interpret these values to calculate the column value, but each attribute has syntax restrictions (see above). Value is the least restricted but it still has to conform to XML attribute value syntax.
- `getCacheKey(CustomDataSource dataSource)` returns a unique object (typically a string) that will allow the caching layer to look up the data set, for example, a data source that reads a CSV file would return the file name. This gets called before `init()`, so it needs to do its own calculation based on the arguments passed to it. If you return `null`, caching will be disabled for this dataset. This is appropriate if your implementation is using data from another data source, as in [JoinDataSource](#) on page 59.

The `CustomDataSource` passed to the `init()` method can be used to access information required to create the data set.

- `getArgs()` returns a map of all the argument names and values from `arg` elements.
- `getArg(String name)` returns the value of a specific argument.
- `getReturnInfo()` returns a `ReturnInfo` object which can be used to get information about the return columns declared in column elements.
- `getDataSet(String name)` looks up the data source with the given name from the list of data sources defined under the content element and returns the corresponding `BasicDataSet`.



`getDataSet()` cannot be called within the `getCacheKey()` implementation, because datasets have not yet been created from the data sources.



Most of the time, a `BasicDataSet` returned by `getDataSet()` can be cast to a `RandomAccessDataSet`, which has some extra methods allowing access to rows in any order. The [JoinDataSource](#) example uses this. The only time when casting cannot be done is when caching is disabled by setting `cacheTimeout="-1"` in the RDL or adding the parameter `"_p_cacheTimeout=-1"` in the HTTP request for the report.

Custom Directory API

The Report server uses a directory to maintain the following data:

- A list of users known to the system.
- A list of roles which users can assume.
- Named attribute values for each user and role.

The directory is used for the following tasks:

- Authenticating users when the Report server is configured to do authentication internally.
- Retrieving attribute values for the current user for use within reports.

The Report server has a Java directory interface called `DirectoryProvider`, with multiple built-in implementations that can store directory data in the following sources:

- An XML file in the Report server web application.
- A relational database.
- An LDAP directory.

The directory support is configured with the file `WEB-INF/conf/ directory.xml`. If the built-in `DirectoryProvider` implementations are not suitable, you can build your own implementation, taking one of these three approaches:

- Implement the `DirectoryProvider` interface directly.
- Implement the `ReadOnlyDirectoryHandler`, which is simpler than `DirectoryProvider` and doesn't rely on internal APIs.
- Implement the `WriteableDirectoryHandler`, which includes everything in `ReadOnlyDirectoryHandler`, along with methods for updating the directory. (The base system uses the directory in a read-only mode, but custom extensions may need to update the directory.)

This document focuses on the last two options, but there is an `XMLDirectoryProvider.java` in the example directory which implements `DirectoryProvider` directly. Other implementation decisions include the following:

- Whether to support nested roles (roles which contain other roles).
- Whether to read all directory data once on initialization or reread the directory data to look for changes.

Implementing the Directory Handler API

The examples directory contains the source for `XMLDirectoryHandler.java` which implements `WriteableDirectoryHandler` by reading and writing an XML file stored in the Report server web application. The following is the section of `directory.xml` that configures the example handler:

```
<DirectoryProvider
  class="com.panscopic.scopeserver.extensions.
  CustomDirectoryAdapterImpl" >
  <CustomDirectoryProvider
    handlerClass="com.acme.java_api_examples.XMLDirectoryHandler">
    <arg name="path" value="xmldirdata.xml"/>
  </CustomDirectoryProvider>
</DirectoryProvider>
```

The `DirectoryProvider` element specifies a special directory provider that acts as a wrapper for the `WriteableDirectoryHandler` implementation. When you implement a directory handler (either `WriteableDirectoryHandler` or `ReadOnlyDirectoryHandler`), set the `handlerClass` attribute to your implementation class and add any arguments needed to configure the handler.

At startup, the Report server calls the handler's `init()` function, passing a `CustomDirectoryAdapter`. This object has methods to read arguments specified in `directory.xml` under the `CustomDirectoryProvider` element and to read other files in the webapp directory.

The `init()` function of `XMLDirectoryHandler` reads an XML file named by the path argument and initializes its lists of users, roles and attributes based on the contents of the XML. Once these are initialized, it can provide answers to all the other methods in `WriteableDirectoryHandler`.

Configuring and Deploying the Example Directory Handler

The example directory has a `conf` directory containing the following files:

- `directory.xml` is the main directory configuration file.
- `xmldirdata.xml` is the file used by `XMLDirectoryHandler` to store directory data.
- `authentication.xml` is an authentication configuration file which configures the Report server to use the directory for authenticating user logins.

In order to install these files in the webapp, make sure that your `build.properties` file has been configured as in [Building and Deploying the Examples](#) on page 57, then run the following command and reload the webapp:

```
$ ../../ant/bin/ant deploy-dir-conf
```

Writing a Custom XQuery Data Source

Select Audit provides full support for XQuery data sources. One area where XQuery standardization lags behind SQL standardization is the lack of a standard interface to talk to a XQuery provider. Select Audit provides an interface to the Saxon XQuery engine, and you can also write an adaptor to talk to a different XQuery engine.

To add support for an additional XQuery engine, write an XQuery data source that implements the `com.panscopic.scopeserver.queryengine.XQueryConnection` interface. The only method that you must implement is `executeQuery()`; the other methods can be empty. You do not have to parameterize XQuery or parsing the results; Select Audit does all that for you.

Writing a Custom Authentication Module

A custom authentication module integrates Select Audit with an authentication source that does not already have an authentication module available. This could be a proprietary system or a SQL database that the generic `SQLAuthModule` cannot handle.

Before implementing a custom authentication module you should familiarize yourself with the JAAS authentication module by consulting Sun Microsystems' documentation, especially their *LoginModule Developer's Guide*, available from their web site. Note that the Select Audit authentication engine handles all Callback-related issues for you, so you do not have to implement `javax.security.auth.callback.CallbackHandler` yourself.

To implement a custom authentication module, write an implementation of the `javax.security.auth.spi.LoginModule` interface. Your object needs to provide only the default constructor, as all configuration information is passed to the `initialize` method on each attempt to authenticate.

For more information about authentication modules, see [Authentication Providers](#) on page 72.

App Server Plugin API

This section describes the App Server Plugin API, an extremely simple interface for interacting with the App Server Plugin. The Report server contains an embedded application server to handle HTTP requests for reports. However, you may want to integrate your company's existing application servers and web infrastructure with the Report server. Select Audit provides the App Server Plugin for this purpose.

The App Server Plugin lives in your own application server and forwards requests to a Report server. To the end user, reports appear just like other web pages served by your application server. The reports can include the complete page (reports) or may fill only part of the page (Scopelets). (HTML output from reports includes the `<head>` and `<body>` tags while output from Scopelets does not.) Additionally, the App Server Plugin lets you put multiple reports onto a single web page.

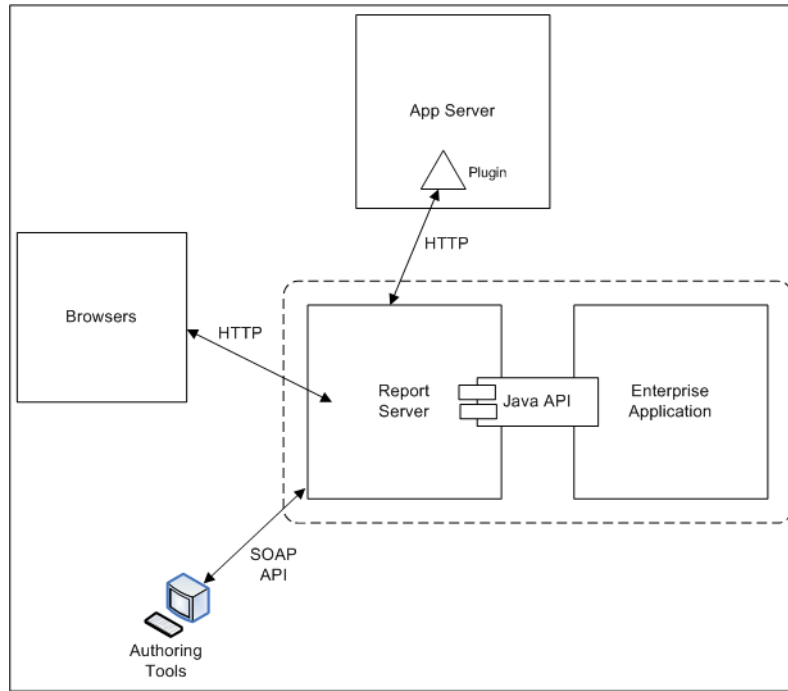
In addition to preserving your web site's look and feel, the App Server Plugin does the following:

- It provides additional security. Only the App Server Plugin needs to be exposed to the external network. The Report server and the backend databases can be protected behind a second firewall.
- It supports single sign-on. The App Server Plugin enables sharing of the currently-authenticated user. User information can be passed explicitly as an argument to the report object or implicitly from the HTTP request.
- It provides load balancing to enhance scalability. The App Server Plugin can be configured to use multiple Report servers.

App Server Plugin Architecture

Figure 1 shows how the App Server Plugin works with your system:

Figure 1 App Server Plugin



Typically, the end user's browser communicates with your application server, and the App Server Plugin embedded in your application server communicates with the Report servers.



All Report servers accessed through the App Server Plugin must have the same key value. The key value is set using the "license key" property of the `scopeserver.xml` file.

App Server Plugin API Methods

The App Server Plugin API fetches report output from the Report server. The methods belong to the `com.panscopic.plugin.Scope` object.

The API is extremely simple. It consists of two methods: `getScope` and `getScopelet`. `getScope` fetches report output to be shown on a full page and `getScopelet` fetches report output to be inserted into another page. The `getScope` method writes the output to the `HttpServletResponse` object, while the `getScopelet` method returns the output as a `String`.

Both methods require the name of the report to run and the `HttpServletRequest` object.

The App Server Plugin also supports running the report as a specified user. Both methods also have overloaded versions that take the user specified in the HTTP request header as an additional argument. The JSP/Servlet can use its own authentication mechanism and then pass that user to the App Server Plugin.

App Server Plugin Examples

Examples are provided to show how to use the App Server Plugin. These examples are typically in `WEBAPPS_HOME\plugin\examples`.

ReportServer.jsp	Illustrates part-page mode from a JSP file. This example runs <code>ProductsProfessionalStyle.rdl</code> in the <code>Library</code> <code>samples/Products</code> folder as user <code>RKing</code> .
PresidioServer.jsp	Same as <code>ReportServer.jsp</code> but in a full-page mode. The Report server generates the page elements as well.
ParameterizedReports.jsp	Same as <code>PresidioServer.jsp</code> but lets the user specify the report to run. If no value is specified, this example runs <code>ProductsProfessionalStyle.rdl</code> in the <code>Library</code> <code>samples/Products</code> folder.
CustomerServlet.java	Sample servlet that uses the App Server Plugin to include <code>ProductsProfessionalStyle.rdl</code> in the <code>Library</code> <code>samples/Products</code> directory in the Servlet output. The report is run as user <code>RKing</code> .
ReportServerServlet.java	Slight variation of the <code>CustomerServlet.java</code> example with the output generated in full page mode.

7 Managing Images

This chapter discusses image management in the Report server. Image management refers to generation, storage, retrieval, and cleanup of images in single and clustered server configurations.

Images can be incorporated into reports (see [Static Images](#) on page 9) or generated by reports (see [Dynamic Images Generated by Chart Components](#) on page 11).

Images can be included in reports in any of the following ways:

- Using the `rdl:image` tag.
- Using HTML tags whose `src` attributes refer to an image (such as `img` or `input`) in a JSP report component.
- Within chart background images, chart series fill images or the chart component itself.
- Image locations are specified as fully-qualified URLs in the `src` attribute of an `rdl:image` or HTML `` tag.

Images can be persisted in the Library or in a file system directory. See [Deploying Images](#) on page 11.

Images are served by a servlet. See [The Image Servlet](#) on page 12 for details.

Static and Dynamic Images

Select Audit can support either static or dynamic images. All image output, both static and dynamic, is accessed using either the `rdl:image` tag (for a supplied component) or the `` HTML tag (for a custom component).

Static Images

Images that are stored and fetched before the report is run are called **static** images. Static images are pre-generated and included in the report output. Examples are header and footer images, icons, and logos.

The static images themselves may be stored in the Library or in a specific location under the Report server home directory. The images can be of any type supported by the presenting application (typically a web browser).

Dynamic Images

Images that are generated by the report's charting components at runtime are called **dynamic** images. Dynamic images are saved to either a temporary file or to the Library. The acceptable types of dynamic images are: JPEG, GIF (licensing from Unisys is required) and PNG.

Image Usage

This section shows the RDL and component file syntax for managing different kinds of images.

Images in an RDL File

The following RDL code generates the text “Press Me!” next to an image taken from the file system on the server machine:

```
<rdl:image src="http://myserver/images/myimage.gif">Press Me!  
</rdl:image>
```

The following RDL code does the same thing from a generated image file in the Library:

```
<rdl:image src="http://scopeserv1:7001/scopeserver/servlet/  
imageservlet?action=get&store=library&loc=User+Scopes%2Fjeff%2  
Fchart-1443091197.jpg">Press Me!</rdl:image>
```

Images in a Component File

The following example includes an image from a known spot on the Report server in a component. The component refers to the images that use the HTML `src` tag attribute:

```

```

The following HTML example includes a Library image in a component:

```

```

Background Images for Charts

Chart components can refer to images for use within the chart. For example, the chart background can display an image using the following syntax:

```
<rdl:arg name="Chart.BackgroundImage">http://myserver/images/  
myimage.gif</rdl:arg>
```

Fill Images for Charts

Each chart series can use a fill image by using the following syntax:

```
<rdl:arg name="ChartData.ChartSeries1.FillImage">  
http://myserver/images/myimage.gif  
</rdl:arg>
```

Sorting Icon Images

You can specify the images to use for “up” and “down” sorting icons, if your report uses them. For example, the following RDL code selects an image for the “up” sorting icon:

```
<rdl:sorting data="data" upIcon="http://myserver/images/myimage.gif">
```

Dynamic Images Generated by Chart Components

Dynamic images of charts are generated when a charting component is included in a report.

```
<rdl:useComponent name="Chart_1" type="StandardPieChart">  
<rdl:arg name="chartargname">argvalue</rdl:arg>  
...  
</rdl:useComponent>
```

Deploying Images

Deploy images either to the Library or to a directory that is configurable in the Report server configuration file. Doing so enables multiple servers to share the images in a clustered environment. You can store static images directly under this configurable directory.



Only the “admin” user should be able to configure this directory.

Configuring the Image Directory

To configure the image servlet directory that stores images, set the `image path` property. If this property is not set or is set to the null string, the image directory is the `images` directory under the Report server `webapp` root. If this property is set to a value other than null, the specified path is an absolute path available in the server machine. This can be a local path or a network path.

Temporary Images Directory per Server Instance

The `images` directory also contains the `tmp` subdirectory, which contains directories for each Report server instance. For example, if the names of two Report servers in a clustered environment are `myserver` and `yourserver`, then the `tmp` directory under the `image` directory contains two directories called `myserver` and `yourserver`. Maintaining a different temporary directory for each Report server prevents UID conflicts among server instances.

Each of these server-specific directories stores the temporary images that are generated when a report is executed but not stored in the Library. The temporary image filenames follow the following naming convention:

```
chart-<uid>.<imagetype>
```

where `<uid>` is a unique ID generated in the server. The UID is unique to the server machine.

The Image Servlet

All images are served by an image servlet. The servlet's main URL is:

```
http://serverinstance:<portnumber>/scopeserver/servlet/imageservlet
```

The image servlet uses the following attributes:

Table 7 Image Servlet Attributes

Attribute name	Function	Valid values
action	Indicates what to do with the image.	get
loc	The URL of the image.	valid URL
store	Indicates where the image is.	library, file

You can serve the image to the browser using a different server instance than the one that generated the image. The temporary file is automatically deleted after it is served.

Image servlet serves URLs that access the following image types:

- Images in the Library
- Images in the Configurable Images directory
- Per-server temporary chart images

Images in the Library

The following URL accesses the image at `/User Reports/jdoe/myimage.gif` in the Library. It assumes the server is accessible through port 1234.

```
http://serverinstance:1234/scopeserver/servlet/  
imageservlet?action=get&store=library&loc=/User%20Reports/jdoe/  
myimage.gif
```

Images in the Configurable Images Directory

The following URL accesses the image file `myimage.gif` under the images directory:

```
http://serverinstance:1234/scopeserver/servlet/  
imageservlet?action=get&store=file&loc=myimage.gif
```

Per-server Temporary Chart Images

The following URL accesses temporary images generated by charts generated by a server instance:

```
http://serverinstance:1234/scopeserver/servlet/  
imageservlet?action=get&store=file &loc=tmp/chart/serverinstance/  
chart-uid.jpg&del=true
```


Authentication and Authorization

The image servlet uses the Report server authentication and authorization mechanism for images stored in the Library. Therefore, to ensure that images are served, make sure that the `User` object has been set in the `User Session` object.

The images stored in the well-known directory in the Report server distribution do *not* use the authentication and authorization mechanism. Anyone can view them using the image servlet.

Library Permissions

If the image is stored as a part of report output, then the image content is created in the same folder and with the same permission as the report output. The content type is set to `GENERIC`. The name of the image file uses the pattern:

```
chart-<uid>.<imagetype>
```

where `<uid>` is a unique ID generated in the server. The UID is unique to the server machine.

8 Incorporating Reports into HTML

Most developers need to create complex HTML output. Typically, you need to group multiple components into a single report and embed reports into an existing template or web site. This chapter shows how to do this.



Pagination applies to the data rather than the component. If multiple components use the same data, they are paginated the same way. To paginate reports on the same page differently, duplicate the query and use a different instance of the query for each differently paginated report.

The ways of incorporating reports into HTML are as follows (in increasing order of flexibility):

- [Using the StandardDashboard](#) on page 75
- [Using the StandardRecordGrid or StandardBandedTable](#) on page 75
- [Using Templates](#) on page 75
- [Writing Your Own HTML Page](#) on page 76
- [Calling Reports from JSP or Servlets](#) on page 78

Using the StandardDashboard

The simplest way to create a multi-component report is to use the Report Designer. If you create a multi-component report, the reports are automatically placed in a `StandardDashboard` component.

Using the StandardRecordGrid or StandardBandedTable

The `StandardRecordGrid` is more flexible and more complex than the `StandardDashboard`. It uses `IFrames`, and is more flexible at including image and text than `StandardDashboard`. `StandardBandedTable` is more flexible still, providing nesting.

Using Templates

Use templates when the same Report server both accesses your data source and serves your end users. To use custom templates, follow these steps:

- 1 Create the report.
- 2 Publish the report on the Report server.

3 Link to the wrapping JSPs.

Select Audit ships with sample template header and footer files, called `provencalheader.jsp` and `provencalfooter.jsp`, for a fictitious food distribution company.

Changing the Default Templates

All reports use the default header and footer templates defined in the following two files:

```
WEBAPPS_HOME/scopeserver/header.jsp
```

```
WEBAPPS_HOME/scopeserver/footer.jsp
```

To modify the headers and footers for your web site's reports, edit these two files.

Specifying the Templates for a Report

To specify header and footer templates for a particular report, include the `template` attribute in the `rdl:layout` tag. The name of the `.jsp` files called by a template are:

```
<templatename>header.jsp
```

and

```
<templatename>footer.jsp
```

where `<templatename>` is the name of the `template` attribute of the `rdl:layout` tag.

For example, to use the `provencal` template, include the following block in the RDL file:

```
<rdl:layout template="provencal">
...
</rdl:layout>
```

This block uses following header and footer templates:

```
WEBAPPS_HOME/scopeserver/provencalheader.jsp
```

```
WEBAPPS_HOME/scopeserver/provencalfooter.jsp
```

Writing Your Own HTML Page

You can usually create the multi-component reports you need using only the Report Designer. However, if you prefer, you can write your own HTML code to tie the reports, text and links together. To do this, you must be able to access the main multi-component page and all the reports it links to using URLs, using frames or JavaScript.

Multi-component pages can use IFrames or other technologies to load the URL. You can put each report into its own inline frame, position it where you like and add other HTML code for images, lines and links. See [Example](#) on page 77 for a sample multi-component page using IFrames. If you cannot use URLs to call the reports, use a Select Audit API instead. See [Calling Reports from JSP or Servlets](#) on page 78.

When you use the HTTP API to call a report, the Report server typically returns an HTML page, though it can return other formats. You can, however, publish a page in HTML format directly to the Report server and call it using the HTTP “API”, just as you would a report. Once published to the Report server, access to the multi-component HTML file is secured through the standard Report server security mechanism.

Example

The following example shows an HTML page containing customized formatting, descriptive text, links, and two reports:

```
<html>
<head>
<title>My Main Page</title>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
</head>
<body bgcolor="#FFFFFF" leftMargin=20 topMargin=20 marginheight="0"
      marginwidth="0" >
<!-- MAIN TABLE -->
<table border=0 cellpadding=0 cellspacing=0 >
<!-- ROW 1 -->
<tr>e
<!-- COLUMN 1 WHICH CONTAINS PROJECT LOGO-->
<td style="vertical-align:top;text-align:left;width:400">

</td>
<!-- COLUMN 2 WHICH CONTAINS LINK TO SECOND MULTI-COMPONENT REPORT -->
<td style="text-align:right;width:400">
Main View | <a href="/scopeserver/servlet/
scopecenter?action=show&p_fn=/
User%20Scopes/-Dashboard%20(Secondary%20View)-">Secondary View</a>
</td>
</tr>
<!-- ROW 2 -->
<tr>
<!-- COLUMN 1, 2 WHICH CONTAIN DASHBOARD TITLE-->
<td colspan="2" style="background-color:#FFFFFF; color:#000000
;text-align:left; font: bold large Times, serif;">
My Main Analysis
</td>
</tr>
<!-- ROW 3 -->
<tr>
<!-- COLUMN 1, 2 WHICH CONTAIN REPORTS AND DESCRIPTIVE TEXT-->
<td colspan="2" valign="top">
<!-- MAIN DIVISION-->
<div style="position:relative; top:0; left:0; width:800; height:1000;
border-top: solid black 1px; border-bottom: solid black 1px;">
<!-- INLINE FRAME WHICH CONTAINS FIRST REPORT -->
```

```

<iframe name="i1"src="/scopeserver/ScopeServer?_p_r=/User%20Scopes/
  main_analysis_table_view" style="position:relative; top: 10;
  left: 10;
  width:800; height:400" border=none frameborder=0 allowtransparency>
</iframe>
<!-- INLINE FRAME WHICH CONTAINS SECOND REPORT -->
<iframe name="i1"src="/scopeserver/ScopeServer?_p_r=/User%20Scopes/
  main_analysis_graphical_view" style="position:relative; top: 510;
  left: 10; width:800; height:400" border=none frameborder=0
  allowtransparency>
</iframe>
<!-- SUB DIVISION WHICH CONTAINS DESCRIPTIVE TEXT -->
<div style="position:absolute; top:600; left:500; width:300;
height:200; font: Times, serif;background-color:#FFFFFF; color:#999999">
How many items were created?<br/>
Which group buys more?<br/>
</div>
</div>
</td>
</tr>
<!-- ROW 4 -->
<tr>
<!-- COLUMN 1, 2 WHICH CONTAIN LINK TO SECOND DASHBOARD -->
<td colspan="2" style="text-align:right;width:800">
Main View | <a href="/scopeserver/servlet/
scopecenter?action=show&_p_fn=/
  User%20Scopes/-Dashboard%20(Security%20View)-">Secondary View</a>
</td>
</tr>
</table>
</body>
</html>

```

Calling Reports from JSP or Servlets

If you want to link reports to an already-developed web application, or if your application dynamically generates web content, link your page to reports using the Select Audit-supplied APIs.

9 Using JavaScript for HTML Output

This chapter describes how to use JavaScript within an RDL file to control HTML output.

JavaScript is a good way to add custom functionality to your reports. For example, you can use JavaScript to ensure that the end user types a string with valid date syntax into a report text control. You can also use it to provide rollover text.

To incorporate JavaScript in an RDL file, use the `StandardInclude` component. You can put the JavaScript code directly in the RDL file, but it is better to reference an external JavaScript file using the `SRC` attribute, because some characters, particularly curly braces (`{ }`), must be escaped if they appear directly in the RDL file.

The JavaScript file that you invoke must be accessible by specifying a path on the file system. The path is relative to `WEBAPPS_HOME/scopeserver`.

Where in RDL to Put the JavaScript

The placement of the `StandardInclude` component containing the JavaScript reference is significant. The script must appear after the object it acts on. For example, if the script acts on a control, you must place the `StandardInclude` component after the `controls` block containing that control.

The basic rules for placing JavaScript calls in RDL are listed below:

- Put the `StandardInclude` component where you want the script executed.
- If the action is to be executed immediately, have the JavaScript execute unconditionally (see [Directly Invoking JavaScript](#) on page 80).
- If the action is to be executed at some event, put the JavaScript inside a function and use the browser's object model to invoke it (see [JavaScript Inside a Function](#) on page 80).

Examples

This section contains examples of the two ways to incorporate JavaScript into RDL.

These examples are taken from a single RDL file and a single JSP file. To see the complete files from which these snippets are taken, see the [Examples](#) page that ships with this documentation.

Directly Invoking JavaScript

The following is an example of a `StandardInclude` component that executes right away. As soon as the RDL file executes this `StandardInclude` component, an alert is fired.

```
<rdl:useComponent type="StandardInclude" name="inlineScript">
  <rdl:arg name="text">
    <![CDATA[
      <SCRIPT>
        alert("This alert should appear right when the report is
          loaded.");
      </SCRIPT>
    ]]>
  </rdl:arg>
</rdl:useComponent>
```

JavaScript Inside a Function

This example illustrates using JavaScript to ensure that a text control contains an integer value. The text field bound to the `pSalesAmount` parameter triggers the JavaScript `priceCheck` function when the `onblur` event is triggered. (The browser's object model associates `onblur` with moving the focus off the control.)

Do the following to achieve this:

- 1 Write a JavaScript function called `PriceCheck.js`:

```
function priceCheck(editObj)
{
  var pricePattern = /^-?\d+$/gi;
  if (!pricePattern.test(editObj.value))
  {
    alert(
      "The sales amount field must contain a valid integer number
      (i.e. 1000)"
    );
    editObj.select();
  }
}
```

- 2 Put the `PriceCheck.js` file in the `WEBAPPS_HOME/scopeserver/clientscripts` directory.
- 3 In the RDL file, add a `StandardInclude` component that points to the JavaScript file. Put the component at the end of the layout block:

```
<rdl:useComponent type="StandardInclude" name="PriceCheckScript">
  <!-- Include a JavaScript file for checking the price threshold -->
  <rdl:arg name="text"><![CDATA[
    <SCRIPT SRC="clientscripts/PriceCheck.js"></SCRIPT>
  ]]>
```



```
</rdl:arg>
</rdl:useComponent>
```

- 4 Associate the JavaScript file with an action on the control. The RDL code that defines this text field in the control block should now look like the following:

```
<rdl:textField cols="6" wrap="default" lines="1"
    style="font-family:Arial; font-size:9pt;" password="false"
    parameter="pSalesAmount"
    labelStyle="font-family:Arial; font-size:9pt;"
    >having sales amount greater than US$
<rdl:action event="onblur">
    <![CDATA[
        priceCheck(this);
    ]]>
</rdl:action>
</rdl:textField>
```


10 Formatting PDF Output

This chapter provides technical information and stylistic guidelines for creating well-formatted PDF report output.

See `examples/Reports/SampleInvoice.rdl` for an example of the report formatted for PDF output.

Technical Overview

Select Audit uses the XSL:Formatting Objects (XSL:FO) standard for formatting PDF output. (For details on the XSL standard, see <http://www.w3.org/TR/2001/REC-xsl-20011015/Overview.html#contents>.) XSL:FO describes the visual layout of documents to be translated into various output types. Apache's FOP (Formatting Objects Processor) (http://docs.pushtotest.com/soapdocs/install/FAQ_Tomcat_SOAP_SSL.html) is an open-source library that renders XSL:FO documents into printer-friendly formats, including PDF.

The Report server comes bundled with the Apache FOP processor to provide PDF generation out of the box. In addition, the Report server supports another third-party PDF renderer, XEP, made by RenderX. By default, the Report server is configured to use FOP instead of XEP globally, but you can configure it on a report-by-report basis.



XEP is not bundled with the Report server.

When the Report server requests the PDF channel as part of the report execution process (for example, through the use of the download control or the `_p_ch=pdf` HTTP parameter), the following events occur:

- 1 The Report server formatting engine uses the relevant PDF JSP files to generate header and footer information in XSL:FO format (see the files `FODocHeader.jsp`, `printhead.jsp` and `printfooter.jsp` in the `webapps/scopeserver` directory).
- 2 Each standard layout component used in the report generates XSL:FO output.
- 3 The Report server formatting engine passes the generated XML document to the FOP processor.
- 4 The Report server formatting engine outputs the generated PDF document (from FOP) to the user.

RDL Arguments for PDF Formatting

RDL contains several arguments and tags specifically for PDF usage:

- Various page-size properties (see [Page Dimensions](#) on page 84).
- The `pdfWidth` argument, which controls the column width for PDF output within a cell. The formatting engine does not recognize the style sheet column width arguments that are used for HTML output.
- The `PDFContentDisposition` property in the `<rdl:properties>` block, which dictates whether the document is displayed to the user inline or as a new window.
- The `forenderer` parameter, which dictates the type of renderer to use (FOP or XEP). You can also set the property to *none* to see the generated XML directly.
- In `StandardBandedTable`, the `componentWidth` argument, which dictates the PDF size of bands placed next to each other (using the band break).
- In `StandardBandedTable`, the `columnWidth` block, which dictates each column width within a single XML block for the table.

Page Dimensions

To set page dimensions, use the properties illustrated in the example below. Keep in mind that you may want to reserve top and bottom margin space for the header and footer.

```
<rdl:properties>
  <rdl:property name="pageWidth">8.5in</rdl:property>
  <rdl:property name="pageHeight">11in</rdl:property>
  <rdl:property name="pageMarginLeft">.5in</rdl:property>
  <rdl:property name="pageMarginRight">.5in</rdl:property>
  <rdl:property name="pageMarginTop">1in</rdl:property>
  <rdl:property name="pageMarginBottom">1in</rdl:property>
</rdl:properties>
```

The defaults for these properties are set in the `conf/defaultscope.xml` file.

Customizing the Header and Footer

To customize the PDF header (for example, to put the date and user information in every page header), modify the `FODocHeader.jsp` file. You need a basic understanding of XSL:FO to do this. See `webapps/scopeserver/FODocHeader.jsp` for an example.

For a reference of XSL:FO, see <http://www.w3.org/TR/2001/REC-xsl-20011015/Overview.html#contents>.

Page Breaks

The `StandardBandedTable` component uses the `pageBreak` argument in the header sections to generate a break before the header. If you are not using `StandardBandedTable`, another option is to insert a “dummy” component in the relevant section of your RDL file, as follows:

```
<rdl:useComponent name="pgbrk" type="StandardBandedTable">
  <rdl:arg name="dataSet"></rdl:arg>
  <rdl:arg name="header">
    <rdl:arg name="pageBreak">true</rdl:arg>
  </rdl:arg>
</rdl:useComponent>
```

PopCharts Image Size

To ensure that PopCharts images are properly displayed in PDF, set the chart dimensions explicitly in the image style to match the dimensions in RDL, including the border dimensions, as in the following example:

```
<rdl:arg name="imageStyle">width:150px;height:100px;border:0
</rdl:arg>
```

Note that the unit of measurement indicator (in this example, px for pixels) is required. This property is accessible in the Properties window.

Using UTF-8 Fonts in PDFs

Follow these steps to use UTF-8 fonts in PDFs:

Create TrueType Font Metrics

- 1 Locate the TTF font file you want to use for example, `C:\WINDOWS\Fonts\ArialUni.ttf`.
- 2 Create a new folder, for example, `c:\fop` and change directories into it.
- 3 Create a metrics file such as `ttfarialuni.xml` in Windows from the TrueType font, as follows:

```
java -cp build\fop.jar;lib\avalon-framework.jar;
lib\xml-apis.jar;lib\xercesImpl.jar;
lib\xalan.jar org.apache.fop.fonts.apps.TTFReader
C:\WINDOWS\Fonts\ArialUni.ttf ttfarialuni.xml
```

This creates `ttfarialuni.xml` in `c:\fop`.

Register Fonts with FOP

Create a new file in `c:\fop` and call it `userconfig.xml`. Type the following content in that file:

```
<!-- <!DOCTYPE configuration SYSTEM "config.dtd" --> -->
<configuration>
  <entry>
    <key>fontBaseDir</key>
    <value>C:\fop</value>
  </entry>
  <font>
    <font metrics-file="ttfarialuni.xml" embedfile="
C:\WINDOWS\Fonts\ArialUni.ttf" kerning="yes">
    <font-triplet name="ArialUni" style="normal" weight="normal" />
    <font-triplet name="ArialUni" style="normal" weight="bold" />
    <font-triplet name="ArialUni" style="italic" weight="normal" />
    <font-triplet name="ArialUni" style="italic" weight="bold" />
  </font>
</font>
</configuration>
```

Since the configuration file is XML, be sure to keep it well-formed. In font-triplets, `ArialUni` is the name of the font. You can call it anything you want as long as you are consistent.

Modify `defaultscope.xml`

In `defaultscope.xml`, edit the properties `fopConfigFile` and `fopFont`.

- For `fopConfigFile`, type the location of your config file created in [Register Fonts with FOP](#) on page 86, for example:

```
<Property name="fopConfigFile">C:\\fop\\userconfig.xml</Property>
```

- For `fopFont`, type the name of the font you specified in that config file. Note that the name is case-sensitive and it must match the case specified in the config file. For example:

```
<Property name="fopFont">ArialUni</Property>
```



At this point, this font will be embedded into every PDF file generated by the server. Make sure you have the distribution rights for that font!

Miscellaneous Formatting Tips

This section contains some other formatting suggestions.

Cell Padding

Use the cell padding style argument to prevent text from bleeding into table borders. For example:

```
<rdl:arg name="style">font-weight:bold;padding-left:3pt</rdl:arg>
```

Cell Colors

In `StandardBandedTable`, use row styles instead of cell styles to prevent white space (or table background color) from appearing in remainder of cells in situations where some cells have a line break and others don't.

Checking XSL:FO Output

To check the XSL:FO output for debugging or educational purposes, run the report with the `_p_ch=pdf&_p_forenderer=none` parameters. This will generate the XML that would normally be passed to the FOP engine, but instead is passed to your browser window for display.

Constraints

This section describes constraints in PDF rendering.

Repeating Table Headers

XSL:FO supports the concepts of table-header and table-body. With the more recent versions of FOP, table-headers also have the behavior of repeating on page breaks (for tables that span multiple pages).

Each table has only one header section. Therefore, if you use `StandardBandedTable`, you might design a report where each band looks like a new table, but is in fact the continuation of one larger table. This way, only the global table header, not the band headers, appear on each page.

Custom Components

If you write custom components, you must also write XSL:FO to support PDF rendering. The standard layout components provide good examples of this output.

Hyperlinks

Hyperlinks are not rendered in PDF format.

StandardInclude and CDATA Markup

The `StandardInclude` component enables report developers to set the format of embedded HTML. The `StandardInclude` component and embedded HTML are not converted to PDF format. For example, the formatting of the following RDL code is not preserved in PDF output:

```
<rdl:arg name="text"><![CDATA[My <h1/>Heading</h1>]]></rdl:arg>
```

Fonts

FOP supports only the base 14-font package defined in the Adobe PDF specification, which includes Helvetica, Times, Courier, Symbol and ZapfDingbats. FOP automatically maps other fonts specified by style component arguments to one of the above fonts. The Report server does not control that mapping. Therefore, when deciding on fonts for styles, indicate the optimal font first and then a secondary font as a backup for PDF display.

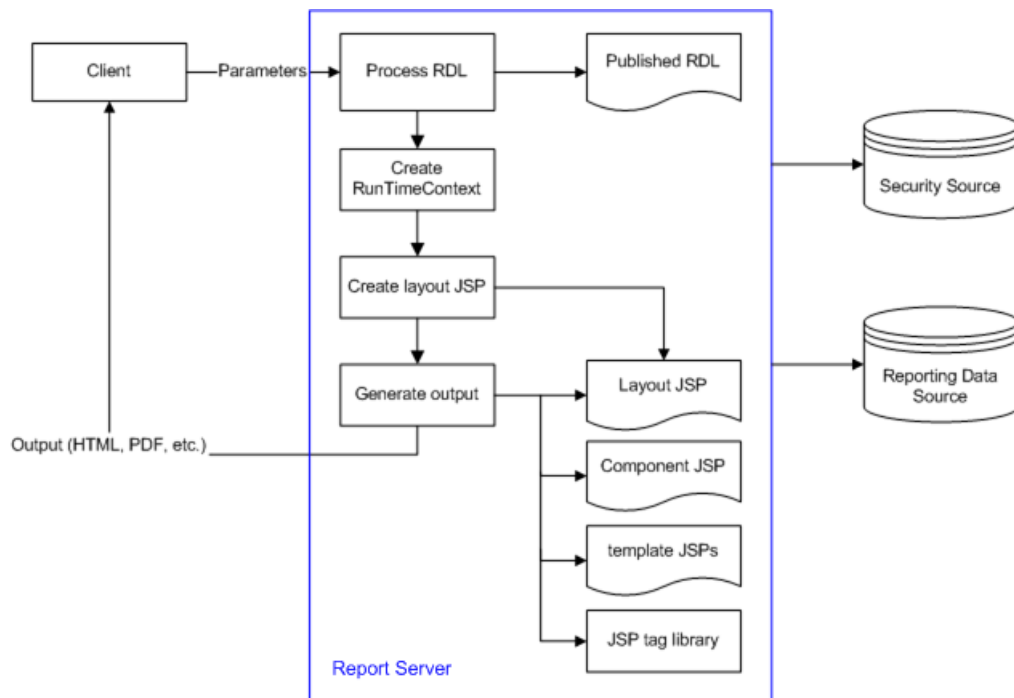
Oversized Page Content

If a generated component “stretches” to the page boundaries, it is cut off. To avoid this, explicitly set the column widths and the page dimensions to provide the best proportions for optimal display.

11 Runtime RDL Processing

This chapter shows how RDL is processed at runtime.

Figure 2 RDL processing



The processing steps are listed below:

- 1 The request is received.
- 2 The request is passed through the authentication filter.
- 3 The parameters are extracted.
- 4 The RDL file is parsed.
- 5 The report output is constructed.
- 6 The report output is sent to the client.

Step 1: The Request is Received

The Report server receives a request from the client to run a report.

Step 2: The Request is Passed Through the Authentication Filter

The request goes through the standard Report server Authentication Filter, which verifies that a user is authenticated and exists in the directory. The flow of the authentication and authorization process depends on the Report server configuration settings.

Step 3: The Parameters are Extracted

The Report server servlet extracts parameters from the request. The Report server uses standard parameters to determine the report to be executed and its output channel. The most commonly-used parameters are listed below:

<code>_p_r</code>	The name of the published RDL file.
<code>_p_ch</code>	The output channel (HTML, PDF, Excel, CSV, XML).
<code>_p_pi</code>	The name of the profile.
<code>_p_pg</code>	Part-of-page mode.

Custom parameters are passed in the request as name-value pairs. These parameters can be applied to either report content or layout.

Step 4: The RDL File is Parsed

The Report server retrieves content of the RDL template file from the library and parses the RDL.

Initialize the `RunTimeContext` object by setting standard properties and objects, including the `User` object, the output channel, default and report-override report properties, parameters, the `Content` object, and compiled JavaScript expressions.

Construct the layout JSP file in the `scopeserver/tmp/layout` directory. The layout JSP file contains tags related to the layout section of the RDL template and is reconstructed only when the layout section of the RDL template changes. The tags used in the layout JSP file are defined in the Report server JSP tag library: `scopeserver/WEB-INF/rdl.tld`.

Step 5: The Report Output is Constructed

The Report server constructs report output by including contents of the layout template and layout JSP in the `HttpResponse` object.

The `RunTimeContext` object is set in the request and is available in the layout template and layout JSP through the RDL object. The RDL object is an instance of `com.panscopic.scopeserver.taglibs.RDL` and is initialized by including the `RDL.jsp` file through the JSP include directive:

```
<%@ include file="RDL.jsp" %>
```

The layout template consists of the header and footer JSP files in the `scopeserver` directory. The naming convention of these files is:

```
[template name]header.jsp
```

```
[template name]footer.jsp
```

The template is applied to the report through the `template` attribute of the `layout` RDL argument, as follows:

```
<layout template="[template name]">
```

The layout JSP invokes the appropriate tag implementations from the tag library. After the `<rdl:useComponent>` tag is processed, the content of the corresponding component JSP is included in the `HttpResponse` object. The component is defined by component JSP file and referenced in the `rdl:useComponent` tag through the `type` attribute:

```
rdl:useComponent type="[component name]">
```

The component implementation provides functionality for accessing a data source, iterating through the data result set, and providing presentation logic for different output channels. The `RunTimeContext` object can be accessed in the component JSP through the RDL object.

Step 6: The Report Output is Sent to the Client

The report output is sent to the client for rendering and display.

12 RDL Generation Toolkit

The RDL Generation Toolkit is a Java API that enables you to generate RDL code programmatically. Once the RDL code is generated, you can save it in a RDL file, upload the report to the Report Center Library and modify it using the Report Designer.

The RDL Generation Toolkit is built with the Velocity template engine. Included in the Toolkit is a Velocity template. If your application requires only the features listed in [Functionality Overview](#) on page 93, you do not need to alter this template. If you need additional report functionality, create a new Velocity template, alter the supplied one or even extend the API itself. For more information on Velocity, see <http://jakarta.apache.org/velocity>.

Functionality Overview

The RDL Generation Toolkit supports the report functionality described in [Table 8](#):

Table 8 RDL Generation Toolkit Functionality

Functionality	Description
Properties	All properties defined in <code>defaultscope.rdl</code> .
Parameters	<ul style="list-style-type: none">• Single-value parameters with or without a default value.• Multi-value parameters with values from a query (inline or Catalog-referenced) or a fixed list.• Catalog-referenced parameters.
Data Sources	<ul style="list-style-type: none">• SQL• Stored procedures• Catalog-referenced <p>Note: You can parameterize SQL queries and stored procedure calls using standard Report server parameter syntax.</p>
Styling	Styling all or part of a report. Styles are defined in one or more standard theme XML files.

Table 8 RDL Generation Toolkit Functionality (cont'd)

Functionality	Description
Layout components	StandardBandedTable component: <ul style="list-style-type: none"> • Supports any number of columns. • Automatically enables column sorting. • Allows you to define any number of nested groups (bands). • Allows you to define a group as expandable. • Supports group and table level summaries. • Allows you to define column labels and apply formatting masks to data elements.
	StandardCrossTab component: <ul style="list-style-type: none"> • Supports any number of row and column groups. • Supports row group, column group and table level summaries. • Allows you to define row and column group labels and apply formatting masks to data elements.
	StandardPopChart component: <ul style="list-style-type: none"> • Supports Catalog-referenced PCXML only.

The RDL Generation Toolkit does *not* support:

- Report controls.
- Expressions in the data source return block and layout.
- Non-SQL data sources (unless Catalog-referenced).
- Defining the layout template.

Package Overview

Table 9 lists the packages are included in the RDL Generation Toolkit:

Table 9 RDL Generation Toolkit Packages

Package	Description
doc	RDL Generation Toolkit Java documentation.
lib	The directory containing the RDLGenerationToolkit JAR file and other necessary Library files.
sampleApp	The sample application demonstrating the RDL Generation Toolkit API. It uses the SOAP API to upload generated report RDL code to the Report Center, run the report and display report output embedded in the sampleApp JSP.
source	Java source classes of the RDL Generation Toolkit API. The RDLGeneratorExecutor executable Java class shows how to use the RDL Generation Toolkit API.

Table 9 RDL Generation Toolkit Packages (cont'd)

Package	Description
template.vm	The generic Velocity template that the RDL Generation Toolkit uses to generate reports.

Extending the Functionality

The RDL Generation Toolkit utilizes Velocity technology to generate RDL code and provides a generic Velocity template that enables you to create definitions for most common report layouts. You can modify this template or create a new one to provide additional functionality. You can also extend the RDL Generation Toolkit API itself; the source code is provided as part of the Toolkit package.

Sample Application

The RDL Generation Toolkit package includes a sample web application that demonstrates usage of the RDL Generation Toolkit API. The generated RDL file does the following:

- It sets the `pageMarginTop` property for PDF output format.
- It creates five parameters, including single-value, multi-value and Catalog-referenced parameters.
- It creates six data sets, including SQL query, parameterized SQL query and Catalog-referenced data sets.
- It creates six layout components of various types, including simple and group table, chart and crosstab.
- It applies a global theme to the report.
- It uses the Report server SOAP API to upload the parameter, SQL query and PCXML definitions to the Report server Catalog.
- It uses the Report server SOAP API to execute generated RDL on the Report server and retrieve report output.
- It displays report output embedded in the resulting HTML page.

Using the Toolkit

The following steps describe how to use the RDL Generation Toolkit.

- 1 Deploy the sample application to your web application server.
- 2 Modify `sampleApp/index.jsp` (optional):

In the `INIT SCOPESESERVER` section set Report server SOAP URL according to your environment using the following template:

`http://[host name]:[port number]/scopeserver/soapserver`

- 3 Start your web application server.
- 4 Go to `http://[host name]:[port number]/sampleApp/index.jsp`.

13 PopChart Support

PopChart Basics

PopChart graphs are described using a custom XML syntax called PCXML. PCXML files, also called appearance files, have the extension `.pcxml`. PCXML includes tags to describe the chart's type, its layout and configuration, and the data that it should display. An appearance file may contain many chart objects, each with its own configuration. It may also include other objects, such as labels, legends and images.

Use the Report Designer or hand-code RDL to design the `StandardPopChart` component that uses the appearance file.

The PopChart server is embedded in the Report server. At report generation time, the Report server uses PCScript to insert data and other dynamic elements into the each of the chart objects. Select Audit can also override settings within the appearance file.

PCScript cannot manipulate every PCXML tag. However, it does have methods for adding any PCXML snippet on the fly to override existing values. Using these methods you can provide standard Select Audit parameters. (See [Using the addPCXML and setPCXMLAttribute Tags](#) on page 101 for details.)

Terminology

The terms used in this section are:

Categories	The X-axis data values. Categories are typically strings like Salesperson Name, or Region. Categories are specified with the <code>categories</code> argument in the RDL <code>useComponent</code> block.
Series	The Y-axis data values. Typically, these are the main values for graphs. Strings like Total Sales and Closing Price are typical values. Series are specified with the <code>series</code> argument in the RDL <code>useComponent</code> block. This block contains data label and data value information.
Data Labels	The labels required by each series. Each label is denoted with a <code>label</code> argument in the RDL <code>useComponent</code> block.
Data Values	The values assigned to a series. Each series requires at least one data value. Some graph types require multiple data values per series. For these graphs, use multiple data tags. Data values are denoted within the RDL <code>data</code> block.

Data Requirements for PopChart Types

This section describes the PopChart graph types and the data requirements for each.

Table 10 PopChart Types

PopChart Graph Type	Data Requirements
bar stacked bar line line bar combo area radar	One category. One or more series. Fixed number of series. One data value in each series.
pareto	Multiple categories. One or more series. Fixed number of series. One data value in each series.
pie	A single title, which becomes the category name. A series for the labels. The number of series is typically dynamic. A series for the data values. The number of series is typically dynamic. See Pie Chart Tips on page 100 for more information on creating PopChart pies in the StandardPopChart component.
X-Y X-Y bubble time bubble time plot	No category. One or more series. Each series requires at least two data values representing the X and Y coordinates respectively. An optional third data value converts the graph to a bubble graph, where the last value is the size of the bubble. For time plots, the first data value in each series should be a date. You can sort dates using either the AddPCXML tag or the appearance file.
stock graphs (candlestick, high-low / open-close)	A single category value. One or more series. Each series requires least two data values (representing high/low stock values). Optional third and forth values represent open/close values respectively.
gauge	Must have a value. May have label, min, max, and dataSet. If min and max are set in the appearance file, they are not required by the StandardPopChart component.
unknown	This graph type is used if the type is unspecified or of a type unknown to the Report Designer. No limitations are placed on the number of series you can have or the number of data fields per series. You must have at least one data series, however.

How Select Audit Uses PopCharts

The `StandardPopChart` component classifies PopCharts as follows:

- graph
- pie charts
- gauge
- map

Graph represents all graph types except pie charts. (Even pie charts sometimes have type `graph` in `StandardPopChart`; see [Pie Chart Tips](#) on page 100.)

See the *HP Select Audit 1.1 Report Designer's Guide* for more information on PopChart support in the Report Designer.

How PopCharts are Represented in RDL

PopCharts are represented in RDL by a `useComponent` block of type `StandardPopChart` containing the following:

- A pointer to a PCXML file (or a complete inline PCXML file).
- An image type (defaults to `JPEG`), height and width.
- One or more blocks with `arg` names `graph`, `pie`, `gauge`, `map` or `extra`.

The following sample `useComponent` block is for a single graph with two series:

```
<rdl:useComponent name="a"Chart_2" type="StandardPopChart">
  <rdl:arg name="pcxmlFile">pop.pcxml</rdl:arg>
  <rdl:arg name="imageType">JPEG</rdl:arg>
  <rdl:arg name="height">400</rdl:arg>
  <rdl:arg name="width">700</rdl:arg>
  <rdl:arg name="graph">
    <rdl:arg name="object">graph</rdl:arg>
    <rdl:arg name="dataSet">Query1</rdl:arg>
    <rdl:arg name="maxRows">20</rdl:arg>

    <rdl:arg name="series">
      <rdl:arg name="label">US$ Sold</rdl:arg>
      <rdl:arg name="data">{data.Query1.PriceExt}</rdl:arg>
      <rdl:arg name="data">{data.Query1.SumQuantity}</rdl:arg>
      <rdl:arg name="data">2</rdl:arg>
    </rdl:arg>

    <rdl:arg name="series">
```

```

        <rdl:arg name="label">Quantity Ordered</rdl:arg>
        <rdl:arg name="data">{data.Query1.PriceExt}</rdl:arg>
        <rdl:arg name="data">{data.Query1.SumQuantity}</rdl:arg>
    </rdl:arg>

    </rdl:arg> <!-- end of graph -->
    ...
</rdl:useComponent>

```

Using the Extra Argument

Use the `extra` argument to do the following:

- Add drill-down capability to a region that does not normally take drilldowns in a PopChart. (See [Adding Drilldown Capability](#) on page 100.)
- Set or change PCXML objects or tags. (See [Using the addPCXML and setPCXMLAttribute Tags](#) on page 101.)
- Pass Select Audit parameters to the chart. (See [Using the addPCXML and setPCXMLAttribute Tags](#) on page 101 for an example.)

Adding Drilldown Capability

To add drilldowns to region without drilldown support in PopChart, use the `extra` block to override the object on which you want to drill down and add drilldown capabilities to that object.

The following RDL snippet illustrates adding drilldown to a title:

```

<rdl:arg name="extra">
    <rdl:arg name="object">title</rdl:arg>
    <rdl:arg name="addPCXML"><![CDATA[<Text>CLICK ON ME!</Text>]]>
</rdl:arg>
    <rdl:arg name="drilldown">
        <rdl:arg name="url"><![CDATA[http://www.panscopic.com]]>
        </rdl:arg>
    </rdl:arg>
</rdl:arg>

```

Pie Chart Tips

The slices of pie charts can be generated in one of two ways:

- All the slices of the pie are created from a single data column.
- Each slice of the pie corresponds to its own data column.

If all the slices of the pie are created from a single column, use the `pie` attribute of the `StandardPopChart`. To assign a different data column to each slice, use `graph` rather than `pie`. In the `graph` block, assign a different series to each slice.

Using the `addPCXML` and `setPCXMLAttribute` Tags

`addPCXML` and `setPCXMLAttribute`, which correspond to PCScript methods of the same name, override values in the appearance file. They can be used either in the main section of the appearance file or on a specific object.

These two arguments typically let you use Select Audit parameters in a PopChart.

For example, the following RDL code sets the `PCXML` attribute:

```
<rdl:arg name="extra">
  <rdl:arg name="object">pie1</rdl:arg>
  <rdl:arg name="addPCXML">
    <![CDATA[<Properties PieExplodedSeriesNumber='{param.explode}' /
>]]>
  </rdl:arg>
</rdl:arg>
```

where the parameter named `explode` is defined in the RDL parameters block. The `PieExplodedSeriesNumber` attribute of the **Properties** tag on the chart is set to the parameter's value. Any attributes that can be modified using `addPCXML` or `setPCXMLAttribute` can be configured this way at run time.

The following more complete example illustrates adding drilldowns to a graph:

```
<rdl:useComponent name="Chart_2" type="StandardPopChart">
  <rdl:arg name="pcxmlFile">drill_down.pcxml</rdl:arg>
  <rdl:arg name="imageType">FLASH</rdl:arg>
  <rdl:arg name="height">600</rdl:arg>
  <rdl:arg name="width">800</rdl:arg>
  <rdl:arg name="extra">
    <rdl:arg name="object">graph</rdl:arg>
    <rdl:arg name="addPCXML"><![CDATA[<Drilldown
      MetaString='{url.scopeserver}
        ?{url.scope("/User Scopes/pop_chart/orders_over_time")}
        &pProductName=%_CATEGORY_NAME' />]]></rdl:arg>
  </rdl:arg>
  <rdl:arg name="graph">
    <rdl:arg name="categories">{data.Query1.PRODUCT_NAME}</
rdl:arg>
    <rdl:arg name="series">
```

```
<rdl:arg name="label">Cost</rdl:arg>
  <rdl:arg name="data">{data.Query1.Cost}</rdl:arg>
</rdl:arg>
<rdl:arg name="series">
  <rdl:arg name="label">Revenue</rdl:arg>
  <rdl:arg name="data">{data.Query1.Revenue}</rdl:arg>
</rdl:arg>
<rdl:arg name="dataSet">Query1</rdl:arg>
<rdl:arg name="maxRows">{param.pCount}</rdl:arg>
</rdl:arg>
</rdl:useComponent>
```

Limitations

When you use the Ad Hoc Wizard on a report containing a PopChart, you get a standard Select Audit chart, and initial column selections are not recognized.

14 Localization

Localization involves customizing an existing product so that it can be used in specific international markets. This includes: translating the text strings, the data formats, and some settings depending on the targeted market.

Localizing Reports

Localizing reports involves defining one or more resource bundles and assigning resource IDs to the relevant objects in the report. Resource bundles may be external or internal to the report and multiple bundles of both types may be used in a single report. External bundles use the standard Java `.properties` file format and naming convention. Internal bundles use RDL syntax, as shown in [Sample Report](#) on page 105.

Resources Section in RDL

The report must include a Resources section for localization. This section should be placed between the Properties and Parameters sections. It contains one or more resource child objects, as described below.

External Resource Files

All external resources must be located in or under `WEB-INF/bundles` in the Report server deployment.

A localized report links to these files using one or more resource tags in RDL. Each resource tag includes a name (label) and URI for the bundle. The URI includes the basename of the `.properties` files and their path relative to `WEB-INF/bundles`.

If the basename is `mydictionary` and the files are located in `WEB-INF/bundles/mybundles/`, the RDL might be as below:

```
<rdl:resources>
  <rdl:resource name="mydict" uri="mybundles/mydictionary" />
</rdl:resources>
```

Note that these files are cached by the server when run. Therefore, you may need to restart the server if you change the files after they have been accessed.

Resource IDs

Once a resource has been defined within the report, resource IDs may be assigned to the report objects. If more than one resource bundle has been defined, the IDs should include their resource name as a prefix. If no resource name is given, the first resource found in the file is used.

For example, if `title` is an ID that exists in the `mydictionary.properties` resource file defined above, the following RDL might be used for the value of the report title text element in a banded table:

```
<rdl:arg name="value" resourceid="mydict.title">Report Title</rdl:arg>
```

The following RDL would also work, if `mydictionary` was the only or the first resource listed in the RDL:

```
<rdl:arg name="value" resourceid="title">Report Title</rdl:arg>
```

The `resourceID` property is supported for all user-visible labels and masks. The Report Designer exposes these supported instances in the Property Pane.

Arguments and JavaScript

The value of a resource ID in a `.properties` file may include argument references, for example, Page {0} of {1}. A reference to that resource ID must then include the two argument values: `resourceid="mydict.pageno(12,100)"`. These values cannot themselves be variables.

The value of a resource ID may also contain JavaScript, either alone or in combination with text, for example, Hello: {param.myParameter}. All JavaScript must be surrounded by curly braces and any interior braces must be escaped with a double backslash (`\\{` and `\\}`). Also, a resource ID value cannot include both {0} arguments and JavaScript.

Internal Resources

Internal resources exist entirely within the report. Therefore, they have a name but no URI. Each internal resource contains a set of child objects defining a single default bundle and any number of additional language bundles. Each bundle has a locale property that associates the bundle with a specific locale. This property corresponds to the Java `.properties` suffix and uses the same syntax. Therefore, the `fr` bundle below will be used when the language of the current locale is French.

If another bundle is created for Canadian French, the locale property will be set to `fr_CA` and so on.

```
<rdl:resource name="localwords">
  <rdl:default locale="en">
    <rdl:id name="subtitle1" index="1">English Version:</rdl:id>
    <rdl:id name="subtitle2" index="2">Hello</rdl:id>
  </rdl:default>
  <rdl:bundle locale="fr">
    <rdl:id index="1">Version Française:</rdl:id>
    <rdl:id index="2">Bonjour</rdl:id>
  </rdl:bundle>
```



```
</rdl:resource
```

Each bundle consists of a series of ID objects. In the default bundle, these objects have a name and an index. In the other bundles, these objects have only an index, which links each ID to the corresponding default ID. The ID name is then passed as the value of the resourceID property:

```
<rdl:arg name="value" resourceid="localwords.subtitle2">Hello</rdl:arg>
```

Testing Localized Reports

You must change the Language Preference option for Internet Explorer in order to test a localized report from within the Report Designer. You can do this from the Internet Options found in the Control Panel. The **Languages** button is at the bottom of the first tab on the **Internet Properties** dialog.

To test localized reports from Report Center, change the language option for your preferred browsers.

Sample Report

Before running the following report, create two files, `dept.properties` and `dept_fr.properties`, and place them on the Report server in the `WEB-INF/bundles` directory.

The files should contain the following:

```
dept.properties: title=My Report Title
dept_fr.properties: title=Mon Titre de Rapport
```

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE rdl:RDL SYSTEM "ReportDescriptionLanguage.dtd">
<rdl:RDL xmlns:rdl="http://www.panscopic.com/RDL"
name="LocalizedSample">
  <rdl:resources>
    <rdl:resource name="dept" uri="dept"/>
    <rdl:resource name="localwords">
      <rdl:default locale="en">
        <rdl:id name="subtitle1" index="1">English Version:</rdl:id>
        <rdl:id name="subtitle2" index="2">Hello</rdl:id>
      </rdl:default>
      <rdl:bundle locale="fr">
        <rdl:id index="1">Version Française:</rdl:id>
        <rdl:id index="2">Bonjour</rdl:id>
      </rdl:bundle>
    </rdl:resource>
  </rdl:resources>
</rdl:layout>
```

```

<rdl:useComponent name="dashboard0" type="StandardDashboard">
  <rdl:arg name="row">
    <rdl:arg name="cell">
      <rdl:arg name="style">width:236;height:25;textalign:
        left;vertical-align:top;</rdl:arg>
      <rdl:arg name="text">
        <rdl:arg name="value" resourceId="dept.title">DefaultTitle
        </rdl:arg>
        <rdl:arg name="noBreak">>false</rdl:arg>
      </rdl:arg>
      <rdl:arg name="columnsSpanned">2</rdl:arg>
    </rdl:arg>
  </rdl:arg>
  <rdl:arg name="row">
    <rdl:arg name="cell">
      <rdl:arg name="style">width:136;height:25;textalign:left;
        vertical-align:top;</rdl:arg>
      <rdl:arg name="text">
        <rdl:arg name="value"resourceId="localwords.subtitle1">
          Default Version:</rdl:arg>
        <rdl:arg name="noBreak">>false</rdl:arg>
      </rdl:arg>
    </rdl:arg>
    <rdl:arg name="cell">
      <rdl:arg name="style">width:100;height:25;textalign:
        left;vertical-align:top;</rdl:arg>
      <rdl:arg name="text">
        <rdl:arg name="value"resourceId="localwords.subtitle2">
          Howdy!</rdl:arg>
        <rdl:arg name="noBreak">>false</rdl:arg>
      </rdl:arg>
    </rdl:arg>
  </rdl:arg>
  <rdl:arg name="columns">2</rdl:arg>
</rdl:useComponent>
</rdl:layout>
</rdl:RDL>

```

A Select Audit Variable Syntax

This appendix shows how to use Select Audit variables within RDL. There are four types of Select Audit variables:

- Parameter Variables
- User Variables
- Data Variables
- Cell Name Variables

Curly braces (`{ }`) are used to indicate Select Audit variables.

Select Audit variables can appear in the following places in the RDL file:

- In `rdl:column` value attributes.
- As `rdl:arg` values. The exception is when the name of the `rdl:arg` name attribute is expression. In this case, the “bracket” Select Audit variable syntax is not permitted, but you can use *any* JavaScript expression as the expression value.
- Within `sql` blocks (for RDBMS data sources) and `url` blocks (for XML data sources).

Parameter Variables

Select Audit provides two types of parameter variables: one for use within a content block, and one for use within the layout block.

Content Block Parameter Syntax

The syntax for parameters within the content block is shown below:

```
{param.<paramName>(<argument1>, <argument2>, [<argument3>])}
```

The parameter can take either two or three arguments. The first argument represents what will appear before the parameter’s first value. The second argument represents what will appear after the parameter’s last value. The third (optional) argument represents the separator characters between parameter values. The third argument is ignored if the parameter can take only one value. If the third argument is not included, a comma followed by a space is assumed.



`ejb` blocks use a simplified parameter syntax: `{param.<paramname>}`.

The parameter may evaluate to `NULL`. To ensure that the SQL statement is still valid, Select Audit inserts `1=1` if needed after `WHERE`, `AND` or `OR` when this occurs.

Examples

Assume a parameter called `region` that can take values `EAST`, `WEST`, `NORTH` and `SOUTH`.

Single-value Parameters

When the parameter can have only one value, there is no need to include the third argument. For example, if the end user chooses the value `EAST` for the `region` parameter, the following query:

```
SELECT * FROM tableX WHERE {param.region("region=", "'')}
```

evaluates to:

```
SELECT * FROM tableX WHERE region='EAST'
```

In this example, if the end user does not choose a value for the region, the Select Audit inserts `"1=1"` and the query evaluates to:

```
SELECT * FROM tableX WHERE 1=1
```

which returns all rows from `tableX`.

Multi-value Parameters

If comma followed by space is an acceptable separator, you don't need to include the third argument. This is often the case if the parameter returns integers or other data types that don't need to be put between single quotation marks in the SQL language.

If the parameter returns a string value, you typically do need to specify the third argument. For example, assume the end user selects both `NORTH` and `EAST` from a multi-valued list. The query:

```
SELECT * FROM tableX WHERE region IN {param.region("(', ')", ',', ' ')}
```

evaluates to:

```
SELECT * FROM tableX WHERE region IN ('NORTH', 'EAST')
```

Layout Block Parameter Syntax

Parameters used within the `layout block` let you to fetch either the value of a parameter or its label. The syntax for parameters in the `layout block` is:

```
{param.<paramname>.label}
```

or

```
{param.<paramname>.value}
```

For example, if your report contains a control that allows the end user to set the table header, the `useComponent block` of the `layout block` may contain the following line:

```
<rdl:arg name="Header">{param.headerParam.label}</rdl:arg>
```

You can use JavaScript expression syntax, for example:

```
<rdl:arg name="Header">'Report: View by ' + {param.headerParam.label}</rdl:arg>
```

Parameter Types

Parameter variables are JavaScript String objects. Therefore, you can use any method available to these objects. See [Example](#) on page 11 for sample code using the `equals` method on a layout parameter expression.

User Variables

The name of an attribute associated with an end user can be passed to a query in much the same way as a parameter. User names are needed to enable permissions and security.

The syntax of a user variable is identical to that of a parameter variable.

Content Block User Variable Syntax

The syntax for user variables within the `content` block is:

```
{user.<attributeName>(<argument1>, <argument2>, [<argument3>])}
```

The `user variable attribute` can take either two or three arguments. The first argument represents what will appear before the user variable attribute's first value. The second argument represents what will appear after the user variable attribute's last value. The third (optional) argument represents the separator characters between user variable attribute values. The third argument is ignored if the user variable attribute can take only one value. If the third argument is not included, a comma followed by a space is assumed.



`ejb` blocks use a simplified user variable syntax: `{user.<attributeName>}`.

The user variable may evaluate to `NULL`. To ensure that the SQL statement is still valid, `Select Audit` inserts `1=1` if needed after `WHERE`, `AND` or `OR` when this occurs.

Examples

Assume a user variable attribute called `region` that can take values `EAST`, `WEST`, `NORTH` and `SOUTH`.

Single-value User Variable Attributes

When the user variable attribute can have only one value, there is no need to include the third argument. For example, if the end user's `region` attribute has the value `EAST`, the following query:

```
SELECT * FROM tableX WHERE {user.region("region=", "'')}
```

evaluates to:

```
SELECT * FROM tableX WHERE region='EAST'
```

In this example, if the end user's `region` attribute has not been assigned a value, the `Select Audit` inserts `"1=1"` and the query evaluates to:

```
SELECT * FROM tableX WHERE 1=1
```

which returns all rows from `tableX`.

Multi-value User Variable Attributes

If comma followed by space is an acceptable separator, you don't need to include the third argument. This is often the case if the user variable attributes evaluate to integers or other data types that don't need to be put between single quotation marks in the SQL language.

If the user variable attribute is a string value, you typically do need to specify the third argument. For example, assume the end user selects both NORTH and EAST from a multi-valued list. The query:

```
SELECT * FROM tableX WHERE region IN {user.region("(" , "'") , "' , '"}
```

evaluates to:

```
SELECT * FROM tableX WHERE region IN ('NORTH', 'EAST')
```

Layout Block Parameter Syntax

The syntax for user variable attributes in the layout block is shown below:

```
{user.<attributeName>}
```

For example, if your report assigns a different table header to each user, the useComponent block of the layout block may contain the following line:

```
<rdl:arg name="Header">{user.name}</rdl:arg>
```

You can use JavaScript expression syntax, for example:

```
<rdl:arg name="Header">'Welcome ' + {user.name}</rdl:arg>
```



Layout parameter expressions are really JavaScript String objects, so you can use JavaScript methods, such as “equals”. See [Example](#) on page 11 for sample code using the “equals” object on a layout parameter expression.

User Variable Types

User variables are JavaScript String objects. Therefore, you can use any method available to these objects. For information on the JavaScript String class, see <http://developer.netscape.com/docs/manuals/js/core/jsref15/contents.html>.

Data Variables

Data variables represent return values from a query. They are typically used in the layout block of the RDL file, and refer to return values in the <XMLTag>data block.

The syntax of a data variable is:

```
{data.<data_block_name>.<return_column_name>}
```

For example, the following data variable represents the values of the product_id column in the salesquery <XMLTag>data block.

```
{data.salesquery.product_id}
```

For tables and crosstabs, the following syntax is also valid:

```
{data.<data_block_name>.summary.<return_column_name>}
```

Group tables also may use:

```
{data.<data_block_name>.group.name}
```

to represent the name of the current group.

Data Variable Types

The class returned by a data variable depends on the `type` attribute of the returned column. The following table shows the object type returned for each column type:

Column Type	Data Variable Object Type
string	JavaScript String
short	JavaScript Number
int	JavaScript Number
integer	JavaScript Number
long	JavaScript Number
float	JavaScript Number
double	JavaScript Number
money	JavaScript Number
date	Java java.util.Date

Cell Name Variables

Cell name variables represent the current cell value in a crosstab. The syntax is:

```
(crosstab.thiscell.{cellname})
```

`cellname` represents the value of the `data` argument in the cell definition in the layout section of the RDL file. For example, if the name of the `data` layout argument for a cell is `quantity`, then the following expression represents the value in that cell:

```
(crosstab.thiscell.quantity)
```

Cell Name Variable Types

Cell name variables are JavaScript Number types.

URL Variables

URL variables let you pass values to a URL with the proper encoding. The syntax is shown below:

```
url.param.report_parameter_name("url_parameter_name")
```

For example, to pass a RDL parameter called `employee` with value `John Smith` to a script to be used as part of a URL, use RDL code like the following:

```
<rdl:arg name="hyperlink">
http://mywebsite.com/cgi-bin/
someScript.cgi?{url.employee("personsName")}
</rdl:arg>
```

At runtime, the hyperlink becomes:

```
http://mywebsite.com/cgi-bin/someScript.cgi?personsName=John%20Smith
```

Script Variables

Script variables allow you to put JavaScript logic in a query. The syntax is shown below:

```
{script=JavaScriptExpression}
```

The value between braces is exactly the same as for the value of `rdl:arg` when `type` is set to `javascript`. You can access parameter variables and user variables from within the `{script=...}` syntax. This variable can be used **ONLY** in a query. It cannot be used anywhere else in RDL. The following sample SQL code uses the value of the parameter `showUS` to determine whether to show US or non-US customers:

```
SELECT CUSTOMERS.COMPANY_NAME, ORDER_DETAILS.UNIT_PRICE,
PRODUCTS.UNIT_PRICE,
PRODUCTS.PRODUCT_NAME, CUSTOMERS.COUNTRY
FROM CUSTOMERS, ORDERS, ORDER_DETAILS,
PRODUCTS
WHERE CUSTOMERS.CUSTOMER_ID = ORDERS.CUSTOMER_ID
And ORDER_DETAILS.ORDER_ID = ORDERS.ORDER_ID
And PRODUCTS.PRODUCT_ID = ORDER_DETAILS.PRODUCT_ID
{script=if (param.showUS == "true") \{
" And CUSTOMERS.COUNTRY = 'USA'";
\} else \{
" And CUSTOMERS.COUNTRY != 'USA'";
\}}
```


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