

Oracle® Application Express

App Builder User's Guide



Release 21.1

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Oracle Application Express App Builder User's Guide, Release 21.1

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Preface

Oracle Application Express App Builder User's Guide describes how to use the Oracle Application Express development environment to build and deploy database-centric web applications. Oracle Application Express turns a single Oracle database into a shared service by enabling multiple workgroups to build and access applications as if they were running in separate databases.

- [Audience](#)
- [Documentation Accessibility](#)
- [Related Documents](#)
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Audience

Oracle Application Express App Builder User's Guide is intended for application developers who are building database-centric web applications using Oracle Application Express. The guide describes how to use the Oracle Application Express development environment to build, debug, manage, and deploy applications.

To use this guide, you must have a general understanding of relational database concepts and an understanding of the operating system environment under which you run Oracle Application Express.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc>.

Access to Oracle Support

Oracle customers that have purchased support have access to electronic support through My Oracle Support. For information, visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info> or visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs> if you are hearing impaired.

Related Documents

For more information, see these Oracle resources:

- *Oracle Application Express Release Notes*
- *Oracle Application Express Installation Guide*
- *Oracle Application Express End User's Guide*
- *Oracle Application Express Administration Guide*

- *Oracle Application Express SQL Workshop Guide*
- *Oracle Application Express API Reference*
- *Oracle Database Concepts*
- *Oracle Database Administrator's Guide*
- *Oracle Database SQL Language Reference*
- *SQL*Plus User's Guide and Reference*

Conventions

The following text conventions are used in this document:

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

1

Changes in Release 21.1 for Oracle *Application Express App Builder User's Guide*

All content in *Oracle Application Express App Builder User's Guide* has been updated to reflect release 21.1 functionality and user interface changes.

New Features and Updates

The following are features and updates in Oracle Application Express release 21.1:

- **Application and Page Checksum**
View the application and page checksums to compare different application deployments and determine if the application or pages are different.
See [Viewing Page and Application Checksums](#).
- **Font APEX Icons**
Search for and view Font APEX icons on the Font APEX page. Font APEX is the icon library for Oracle Application Express and the Universal Theme.
See [Accessing Font APEX](#).
- **New Color Picker Item Type**
This release includes a new Color Picker that utilizes the Oracle JET Color Spectrum component and adds new configuration options. New functionality includes:
 - Different display modes: Popup, Inline, Color-only Popup, and Native Color Picker.
 - Color presets: custom or from the theme.
 - Optional contrast checking.
 - Various value return formats: Hex, rgb/rgba, hsl/hsla, or any CSS color value.See [Available Item Types](#) and search for **Color Picker**.
- **Native Map Region Type**
Create maps to visualize location data (real coordinates) on a map. Key features:
 - Point, Line, Polygon, Heat Map and Extruded Polygon (3D Polygon) layer types.
 - Background maps are from [Oracle Maps Cloud](#). Ready to use, no API Key required.
 - Fully Interactive: Drag and Zoom, show details about objects on the map.
 - Oracle Spatial (SDO_GEOMETRY), GeoJSON and simple numeric columns.
 - Leverages Oracle Spatial (Indexes, Coordinate Transformations), if available.
 - Visualize data from local SQL queries, REST Enabled SQL or from REST Data Sources.See [Creating Maps](#).
- **New Data Loading**

New data application data loading supports CSV, XLSX, XML, and JSON formats. Key features include:

- Column mapping occurs at design time, removing the burden for end users.
- Flexible column mappings based on simple names or regular expressions.
- Data conversion with transformation rules or lookup queries.
- Easy work flow for end users: upload the file, verify the preview, and load data.
- CSV, XLSX, XML, and JSON data formats can be loaded to tables or collections.
- Configure data loading to Append, Merge or Replace data, with or without Error Handling.
- Simple new Process Type Data Loading: Customize Data Loading pages as you wish.

See [Creating Applications with Data Loading Capability](#)

- Runtime Developer Toolbar Options Theme Roller and Edit Logo

The Runtime Developer toolbar which displays at the bottom on editable applications now includes a new Customize menu with two options: Theme Roller and Edit Logo.

- As in past releases **Theme Roller** is a live CSS editor that enables you to quickly change the theme style, colors, and other application attributes. The **Show Common**, **Show All**, and **Help** buttons have been removed. The **Set as Current** button has been replaced with **Save** and **Save As** buttons. Clicking either button now automatically triggers Set as Current behavior. In addition, Theme Roller now includes integration with your Web browser's developer console.
- **Edit Logo** offers a quick way to add or change the logo users see at runtime.

See [Using Theme Roller and Edit Logo](#).

- Updated Redwood Light Theme Style

The new Redwood Light theme style replaces the previous version and is more inline with the Redwood Design System. In addition, Redwood Light features new CSS class options that are editable in Theme Roller.

See [About the Redwood Light Theme Style](#).

Deprecated and Desupported Features

The following features have been desupported so all related discussions have been removed from this publication:

- Legacy Websheets
- Legacy Charts (based on AnyChart HTML5 Chart Component, AnyChart Flash Chart Component, and AnyChart AnyMap Interactive Maps Component)
- Legacy Map Charts

See [Deprecated Features and Desupported Features in Oracle Application Express Release Notes](#).

2

Quick Start

"Quick Start" offers a quick introduction to Oracle Application Express. This section explains how to access your development environment, describes the Workspace home page, the App Builder home page, and the Application home page, explains how to edit your account profile and user preferences, and how to access product documentation.

Tip:

If you are accessing an on-premises installation, complete the installation process before continuing. See *Oracle Application Express Installation Guide*.

- [About Accessing Your Development Environment](#)
How you sign in and access Oracle Application Express depends upon your user role and where Oracle Application Express resides.
- [Understanding Oracle Application Express](#)
Oracle Application Express provides you with all the tools you need to build apps in a single, extensible platform, which runs as a part of Oracle Database.
- [Understanding the Workspace Home Page](#)
When you sign in to Oracle Application Express, the Workspace home page appears. Use the Workspace home page to access key development components including App Builder, SQL Workshop, Team Development, and the Gallery.
- [Understanding App Builder](#)
Developers use App Builder to create and manage applications and application pages.
- [Changing Your Profile or Password](#)
Edit your account profile to update your profile (email address, first or last name, upload a profile photo, or change your password).
- [Editing User Preferences and Enabling Dark Mode](#)
Click the Account menu to enable or disable Dark Mode or edit user preferences.
- [Using Oracle Application Express Documentation](#)
Oracle Application Express provides a hosted online documentation library and field-level Help. You can browse or search content or download the entire library by going to the Oracle Application Express Documentation page in the Oracle Help Center.

2.1 About Accessing Your Development Environment

How you sign in and access Oracle Application Express depends upon your user role and where Oracle Application Express resides.

Oracle Application Express may reside in a local on-premises Oracle Database or in a hosted environment, such as a Oracle Cloud service. The sign in process differs depending upon the installation type.

Oracle Application Express On-premises

If you are running Oracle Application Express on-premises, sign in to your Oracle Application Express workspace.

See Also:

"Signing In to Your Workspace" in *Oracle Application Express Installation Guide*.

About Accessing Oracle Application Express in Oracle Cloud

Oracle Application Express is installed and enabled in Oracle APEX Application Development (APEX Service) and Oracle Autonomous Database Shared Exadata Infrastructure such as Autonomous Transaction Processing and Autonomous Data Warehouse.

Oracle Application Express is available in Exadata Cloud Service and Database Cloud Service in Oracle Cloud Infrastructure. However, you need to manually customize your databases to install and enable Oracle Application Express by following on-premises installation process or using cloud tooling such as Terraform.

See Also:

- [Get an Environment](#)
- "Welcome to Oracle APEX Application Development Service" in *Getting Started with Oracle APEX Application Development*
- "Creating Applications with Oracle Application Express on Autonomous Database" in *Using Oracle Autonomous Database on Shared Exadata Infrastructure*
- "Oracle Application Express (APEX) on Oracle Cloud Infrastructure Database" white paper on the [Oracle Cloud Infrastructure Technical White Papers](#) page

2.2 Understanding Oracle Application Express

Oracle Application Express provides you with all the tools you need to build apps in a single, extensible platform, which runs as a part of Oracle Database.

When you install Oracle Application Express, you can install either a runtime environment or a full development environment.

- [What is Oracle Application Express?](#)
- [How Oracle Application Express Works](#)
- [About the Differences Between Runtime and Full Development Environments](#)

2.2.1 What is Oracle Application Express?

Oracle Application Express is a hosted declarative development environment for developing and deploying database-centric web applications. Thanks to built-in features such as user interface themes, navigational controls, form handlers, and flexible reports, Oracle Application Express accelerates the application development process.

The Application Express engine renders applications in real time from data stored in database tables. When you create or extend an application, Oracle Application Express creates or modifies metadata stored in database tables. When the application is run, the Application Express engine then reads the metadata and displays the application.

To provide stateful behavior within an application, Oracle Application Express transparently manages session state in the database. Application developers can get and set session state using simple substitutions and standard SQL bind variable syntax.

2.2.2 How Oracle Application Express Works

Oracle Application Express installs with your Oracle database and consists of data in tables and PL/SQL code. Whether you run the Oracle Application Express development environment or run an application built using Oracle Application Express, the process is the same. Your browser sends a URL request that is translated into the appropriate Oracle Application Express PL/SQL call. After the database processes the PL/SQL, the results are relayed back to your browser as HTML. This cycle happens each time you either request or submit a page.

Oracle Application Express does not use a dedicated database connection. Instead, each request is made through a new database session, consuming minimal CPU resources. Application session state is managed in the database tables by the Application Express engine.

Behind the scenes, the Application Express engine renders and processes pages. The Application Express engine also performs these tasks:

- Session state management
- Authentication services
- Authorization services
- Page flow control
- Validation processing

2.2.3 About the Differences Between Runtime and Full Development Environments

When you install Oracle Application Express, you can install two different environments:

- **Runtime environment.** In a runtime environment users can run applications but cannot modify them. Select this option for production implementations.
- **Full development environment.** In a full development environment, users can develop, modify, run, and delete Application Express applications. This option provides complete access to the Oracle Application Express environment described in this document.

 **See Also:**

- *Oracle Application Express Installation Guide*
- "Installing Exported Applications into a Runtime Environment" in *Oracle Application Express Administration Guide*

2.3 Understanding the Workspace Home Page

When you sign in to Oracle Application Express, the Workspace home page appears. Use the Workspace home page to access key development components including App Builder, SQL Workshop, Team Development, and the Gallery.

Each Oracle Application Express development instance can contain multiple workspaces. A **workspace** is a virtual private database which enables multiple users to work within the same Oracle Application Express installation while keeping their objects, data and applications private. This section describes the sections that make up the Workspace home page.

- [Workspace Home Page](#)
- [Top Apps and Top Users Dashboards](#)
- [Messages Region](#)
- [Developer Navigation Tools](#)
- [Available Updates Region](#)

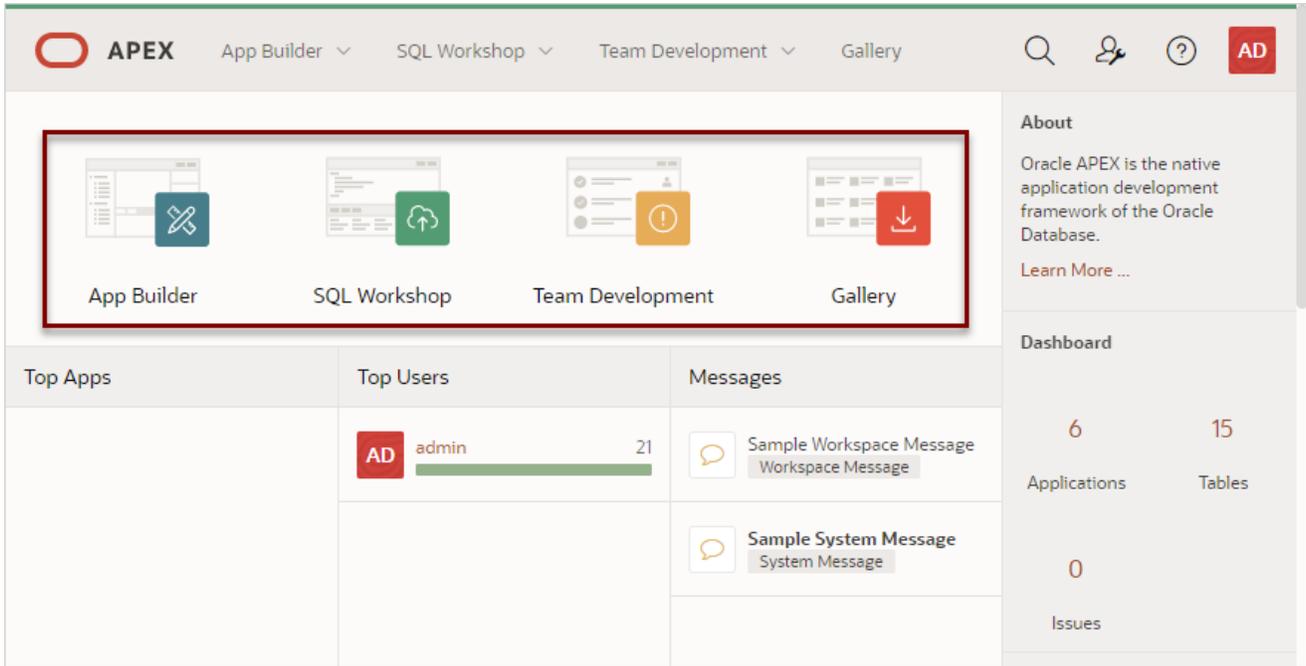
2.3.1 Workspace Home Page

Workspace Home Page Icons

The center of the Workspace home page features the following large icons:

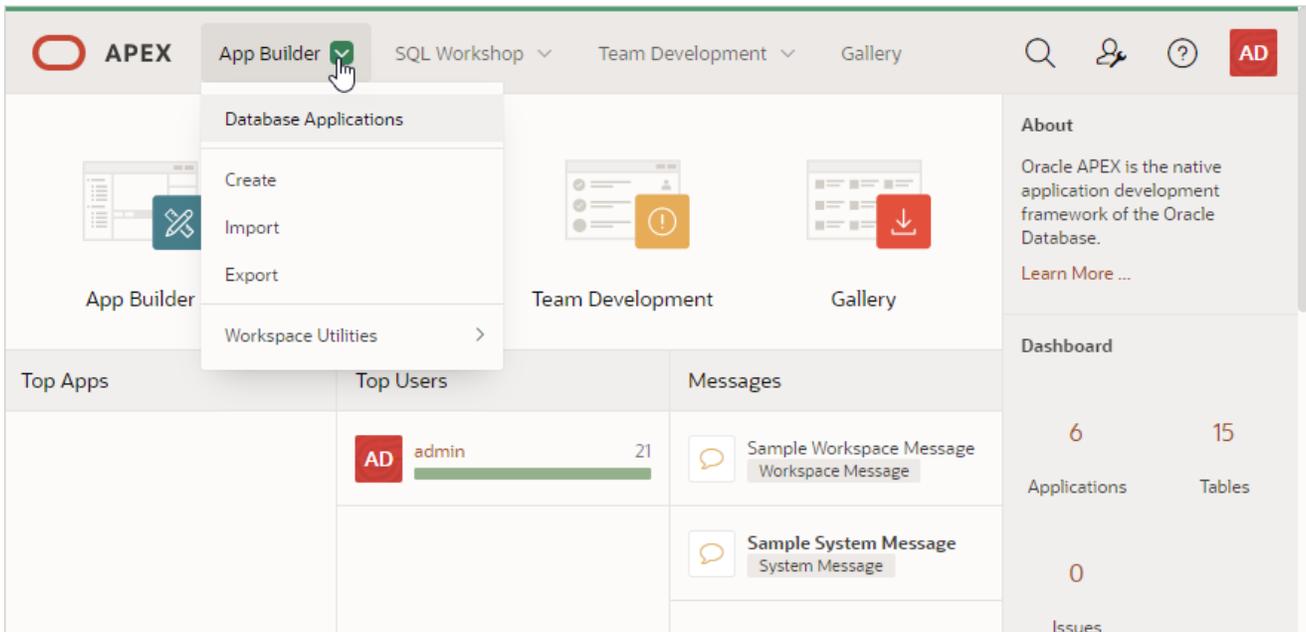
- **App Builder** - Create an application, composed of a set of HTML pages, based on database objects.
- **SQL Workshop** - Access tools for viewing and managing database objects.
- **Team Development** - Track and manage issues in a conversational fashion. You can create templates to provide users with starter text for issues and comments. You can apply labels and label groups, assign issue owners, and set milestones.
- **Gallery** - The Gallery enables you to access to Starter Apps, Sample Apps, and plug-ins available in the [Oracle APEX GitHub Repository](#).

Starter Apps are functional apps that provide stand-alone point-solutions, designed to meet simple requirements that do not require a large and unnecessarily complex solution. You can use these apps "out of the box" or extend them with your own custom functionality. *Sample Apps* highlight specific functionality and are intended to serve as a developer guide on how to make use of a particular feature. *Plug-ins* enable you to extend your APEX applications with custom functionality that is not available natively in the platform. Follow the on-screen instructions.



Menu Bar

A menu bar displays at the top of the page. This menu bar displays on most App Builder pages. Click a menu to access an alternate navigation path to different components within App Builder, SQL Workshop, or Team Development. The illustration that follows shows the **App Builder** menu.



 **See Also:**

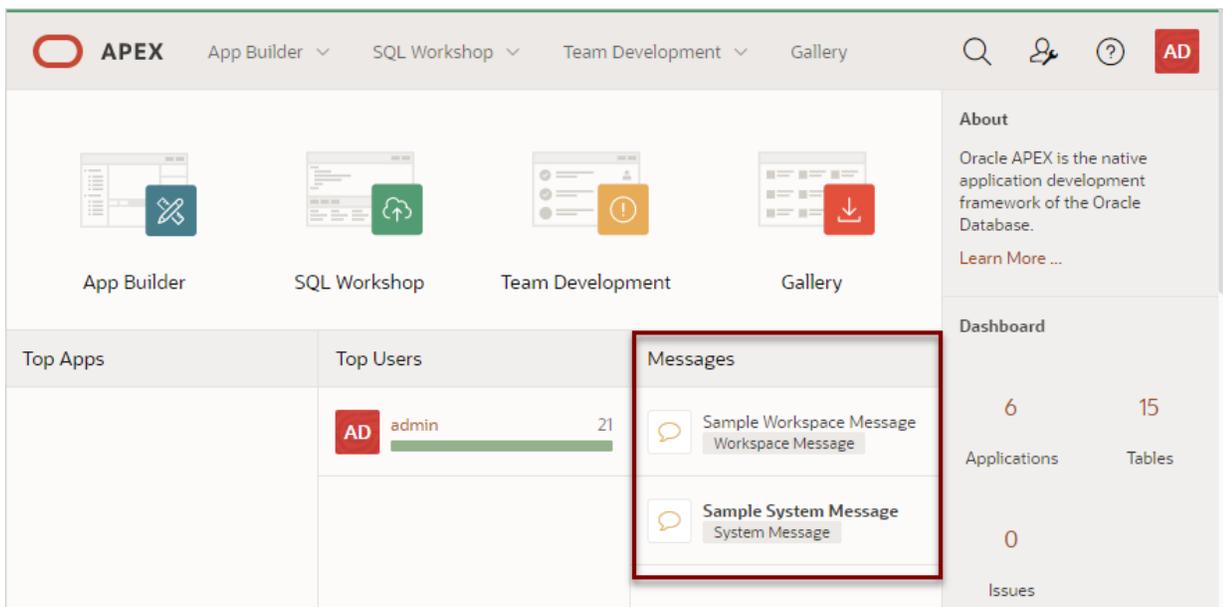
- "App Builder Concepts"
- *Oracle Application Express SQL Workshop Guide*
- "Managing Team Development"

2.3.2 Top Apps and Top Users Dashboards

The Top Apps and Top Users regions display at the bottom of the page. These regions offer real time information about development activities in the current workspace.

2.3.3 Messages Region

The Messages region displays to the right of Top Apps and Top Users.



The Messages region can display two types of messages:

- System messages
- Workspace messages

System messages and **Workspace messages** include a gold icon to the left of message text. Depending upon the message type, a textual identifier, either `System Message` or `Workspace Message`, also displays beneath the message text.

 **See Also:**

"Defining a System Message" and "Defining a Workspace Message in Workspace Administration" in *Oracle Application Express Administration Guide*

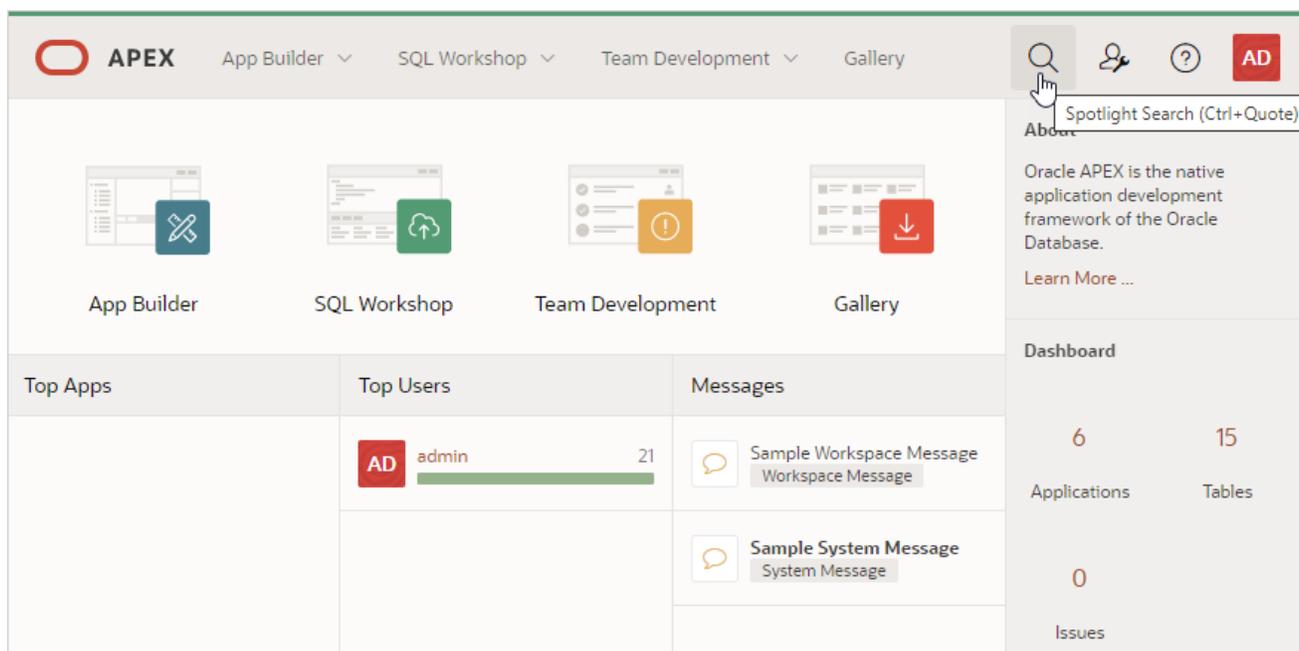
2.3.4 Developer Navigation Tools

Developer Navigation tools display in the header region on many Oracle Application Express pages, including the Workspace home page, App Builder home page, the Application home page, Page Designer, and Shared Components.

- [Global Search](#)
- [Administration Menu](#)
- [Help Menu](#)
- [Account Menu](#)

2.3.4.1 Global Search

The Global Search icon (also known as Spotlight Search) displays in the header region in upper right corner of Application Express header page and provides an effective way to navigate App Builder.



Key features of Global Search include:

- Offers effortless navigation within a workspace enabling you to quickly find applications, pages, Shared Components, Application Express menus, and so on.
- Search for component names and immediately set focus to those items in Page Designer.

- Provides a unified search experience throughout Application Express.

About Using Global Search

You can activate Global Search in two ways:

- Click the **Spotlight Search** icon in the upper right corner
- Use the keyboard shortcut (Ctrl + Quote) (') (US Keyboards only)

Use Global Search to search all applications in the workspace no matter what your location in the current workspace. For example, if your workspace contains the *Sample Database Application*, entering *Sample* will find it. Similarly, you can access global navigation menus that appear at the top window adjacent to the Oracle logo. For example, enter *SQL Commands* in the Global Search field to instant access SQL Commands.

To close the Global Search dialog, press the `Esc` key, or click anywhere outside the results.

Syntax to Navigate to a Page or Search for a Regular Expression

Within App Builder and on the Application home page, use the following syntax to navigate to a specific page or search for a regular expression:

```
page_ID  
application_ID:page_ID  
application_ID-page_ID  
regexp:expression
```

Where:

- *application_ID* is the numeric identification number (or ID) that identifies an application.
- *page_ID* is the numeric identification number that identifies a specific page.
- *regexp*: is literal text.
- *expression* is a regular expression to search for.

The following example navigates you to page 10 of application 570:

```
10  
570-10  
570:10
```

You can also use this syntax to navigate to the Shared Components page of a given application:

```
application_ID:s  
application_ID-s
```

Where:

- *application_ID* is the numeric identification number (or ID) that identifies an application.

The following example demonstrates how to navigate to the Shared Components page of application 570:

```
570:s  
570-s
```

About Navigating Search Results

Global Search results display in a dialog. Use the Up and Down arrows keys to navigate the results and press **Enter** to make a selection. Since the the **Global Search** icon displays on nearly every page in Application Express, you can continue to narrow your search until you find the app, page, or component (such as the item, button, or region) which contains the keyword.

Other available shortcuts change depending on where you are in App Builder, for example:

- In Page Designer - To search for a page, press **Ctrl + 4**.
- In App - To search within an application, press **Ctrl + 3**.
- All Apps - To search all applications, press **Ctrl + 2**.
- Current Workspace - To search a workspace, press **Ctrl + 1**.

Example 2-1 Search Example

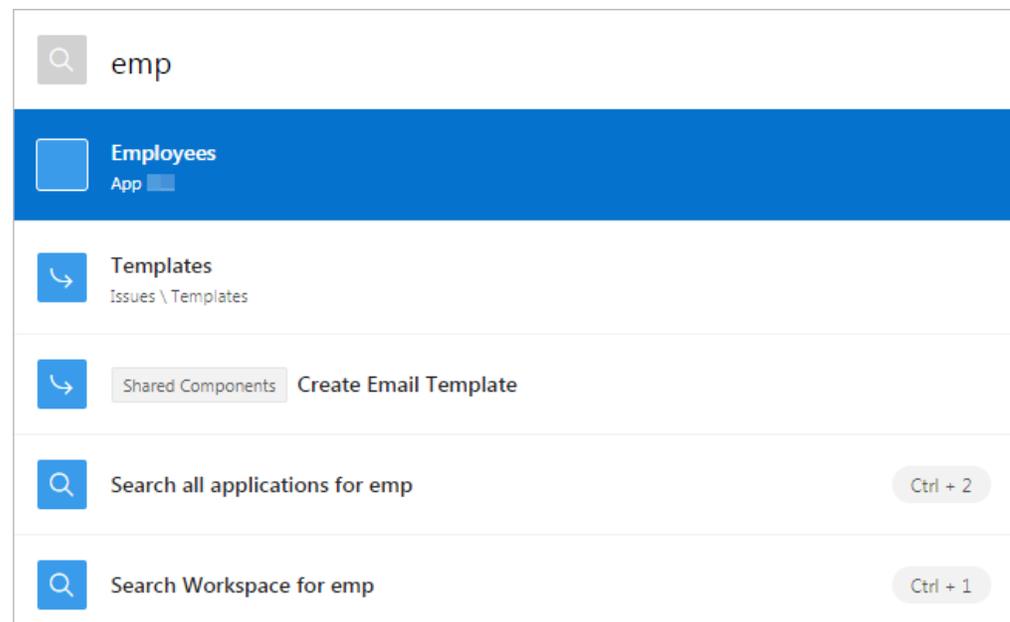
Suppose you need to find an application called *Employees* which includes interactive grid built on the EMP table.

1. Find the application.

- a. On the Workspace home page, click the Global Search field and enter `emp`.

Global Search would return the results:

- Employees
- Templates
- Create Email Template
- Search all applications for emp
- Search Workspace for emp



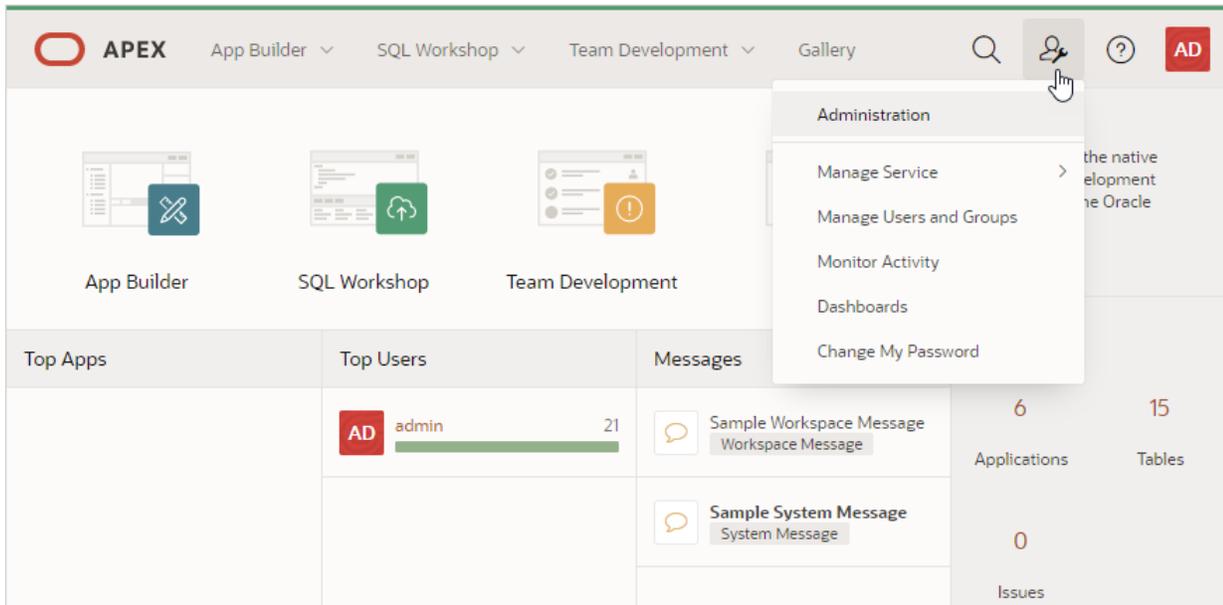
 **Note:**

Templates and Create Email Template appear because they contain the text string `emp`.

- b. Select **Employees** to view that application.
The Employees application appears.
2. **Search the application.**
 - a. On the Application home page, click the Global Search field and enter `EMP`.
Global Search returns the results that include numerous pages and other items.
 - b. Select the option the includes a page reference.
The page appears in Page Designer.
3. **Search the page.**
 - a. In Page Designer, find the Global Search field and enter `EMP` again.
Global Search returns the results that include numerous components.
 - b. Select a component (such as a process, column, region, and so on).

2.3.4.2 Administration Menu

The Administration menu displays to the right of the Global Search field and features an outline person with a wrench.



Clicking the Administration menu displays the following options:

- **Administration** links to the Workspace Administration page. To access the Oracle Application Express development environment, users sign in to a shared work

area called a **workspace**. Workspace administrators monitor and administer a workspace. Common workspace administration tasks include managing service requests, configuring workspace preferences, creating workspace announcements, managing session state, creating user accounts, and managing groups.

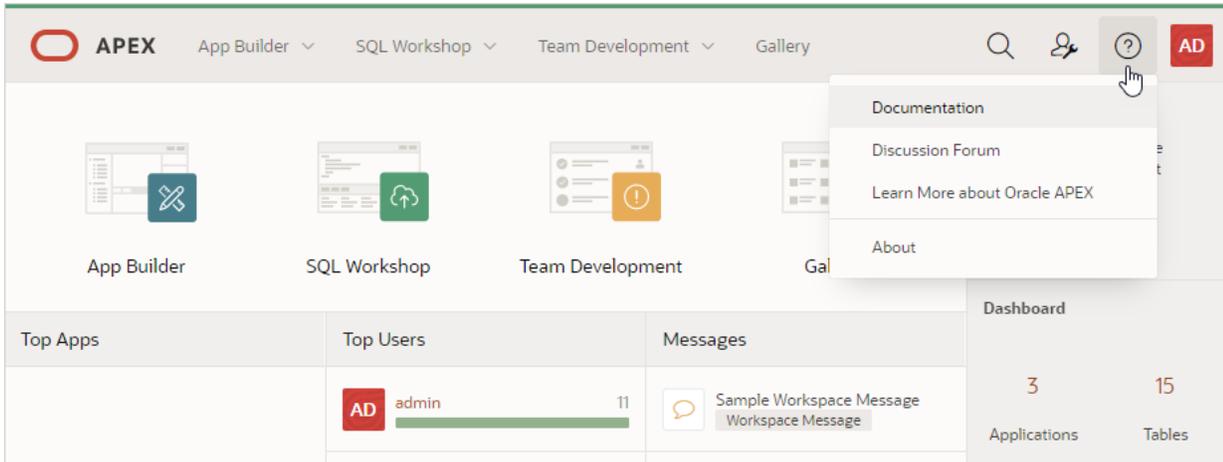
- **Manage Service** displays a submenu of options on the Manage Service page. Administrators use the Manage Service page to manage service requests, configure workspace preferences, edit workspace announcements, and view workspace utilization reports.
- **Manage Users and Groups** links to Manage Users and Groups page. Workspace administrators can create new user accounts, manage existing user accounts, and change user passwords.
- **Monitory Activity** links to the Monitor Activity page. Use this page to monitor changes to page views, developer activity, page view analysis, and active sessions. It also shows reports on such information as login attempts and external click counts.
- **Dashboards** links to the Dashboard page. Use this page to view details about the current workspace and monitor users, activity, developer activity, performance, application development, and view database details.
- **Change My Password** links to the Change Password section of the Edit Profile dialog box.

 **See Also:**

- "Workspace and Application Administration" in *Oracle Application Express Administration Guide*
- "Manage Service Page" in *Oracle Application Express Administration Guide*
- "Managing Users in a Workspace" in *Oracle Application Express Administration Guide*
- "Monitoring Activity Within a Workspace" in *Oracle Application Express Administration Guide*
- "Viewing Workspace Dashboards" in *Oracle Application Express Administration Guide*
- ["Changing Your Profile or Password"](#)

2.3.4.3 Help Menu

The **Help** menu features a question mark enclosed with a circle.



Click the Help menu to access the following menu items:

- **Documentation** links to Oracle Application Express, Oracle Help Center.
- **Discussion Forum** links to the [Categories](#) page where you can access **APEX Discussions**.
- **Learn More about Oracle APEX** links to the [Oracle Application Express page](#).
- **About**. Links links to the About Application Express dialog. This dialog includes information about the Oracle Application Express instance and the database version.

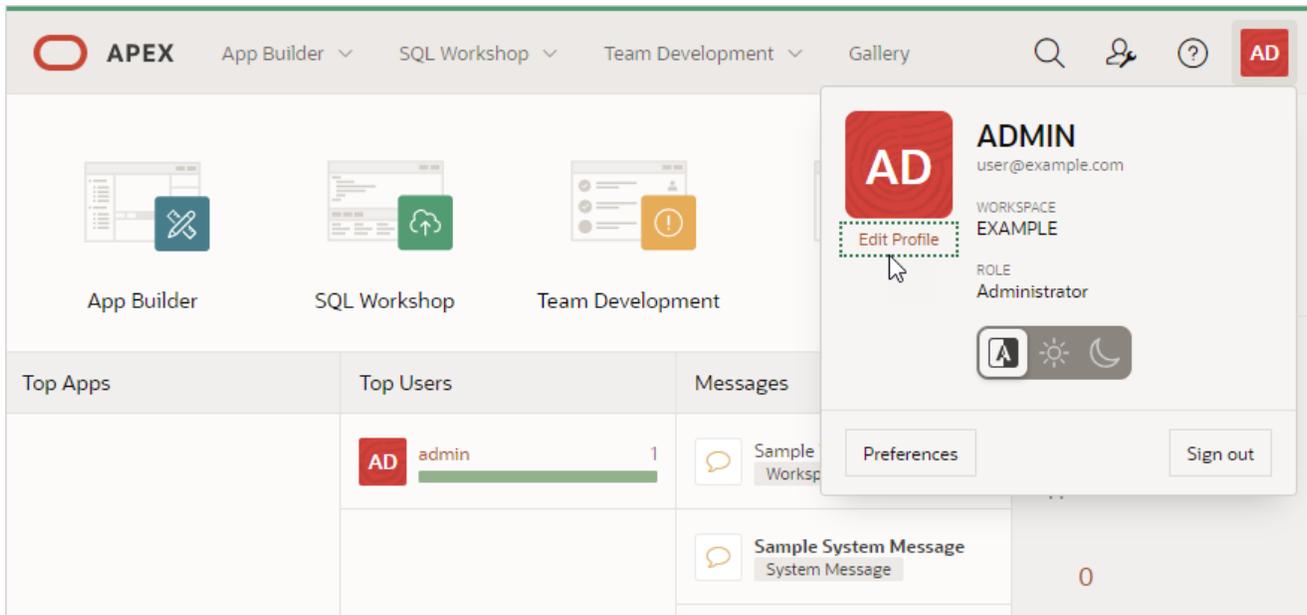


See Also:

["Using Oracle Application Express Documentation"](#)

2.3.4.4 Account Menu

The Account menu displays in the upper right corner of the page. You open the Account menu can be opened by clicking on the User icon in the header.



Click the Account menu to view your username, current workspace, and user role. If Single Sign On (SSO) is enabled, the link **Change Workspace** also appears. Key controls on this menu include:

- **Edit Profile.** Click **Edit Profile** to edit your first and last name, upload or choose a photo image, alter your email address (if SSO is not enabled), and reset your password.

 **Tip:**

If you are using Single Sign-on authentication, **Change Workspace** also displays. Click **Change Workspace** to view a list of workspaces you have access to.

- **Appearance.** Configure the **Appearance** switch to determine how the Application Express user interface displays. Options include:
 - **Automatic** detects the appropriate setting based on existing system or browser settings.
 - **Light Mode** renders the user interface using the standar color scheme.
 - **Dark Mode** renders the user interface using an inverted color scheme, applying light-colored text, icons and graphical user interface elements on a darker background.
- **Preferences.** Click **Preferences** to change your default schema, default date format, configure whether SQL Workshop CSV downloads are in Unicode, and control how windows display when App Builder runs applications.
- **Sign Out.** Click **Sign Out** to log out the current workspace.

 **See Also:**

- "Changing Your Profile or Password"
- "Editing User Preferences and Enabling Dark Mode"

2.3.5 Available Updates Region

The Available Updates region displays on the lower right side of the page and indicates if updates are available for Oracle Application Express and the Oracle REST Data Services. If your installation is current the following message displays:

System is up-to-date

To configure updates, click **Set Preferences for Available Updates**. In the dialog, enable or disable updates by selecting **Yes** or **No** from the Check for Available Updates list and click **Apply Changes**.

 **Tip:**

To perform this check, Oracle Application Express transmits the version number of Application Express and other system components to Oracle Corporation. In order to continuously improve our products, Oracle is interested in learning about product usage. To that end, statistics can occasionally be sent to Oracle describing the product features in use. No personally identifiable information is sent. To review Oracle's privacy policy see <http://www.oracle.com/us/legal/privacy/overview/index.html>

2.4 Understanding App Builder

Developers use App Builder to create and manage applications and application pages.

The App Builder home page displays all installed applications in the current Oracle Application Express instance. When a developer selects an application to edit, the Application home page appears. Use the Application home page to run, edit, import, export, copy, or delete applications.

- [Accessing App Builder](#)
Access App Builder by clicking the App Builder icon on the Workspace home page.
- [Understanding the App Builder Home Page](#)
Use App Builder to create new applications, select an application to edit, import previously exported applications, view the Dashboard, or access workspace utilities.
- [Accessing the Application Home Page](#)
Access the Application home page by clicking the App Builder icon on the Workspace home page and then selecting an application.

- [Understanding the Application Home Page](#)
Use the Application home page to run, edit, import, export, copy, or delete applications.



See Also:

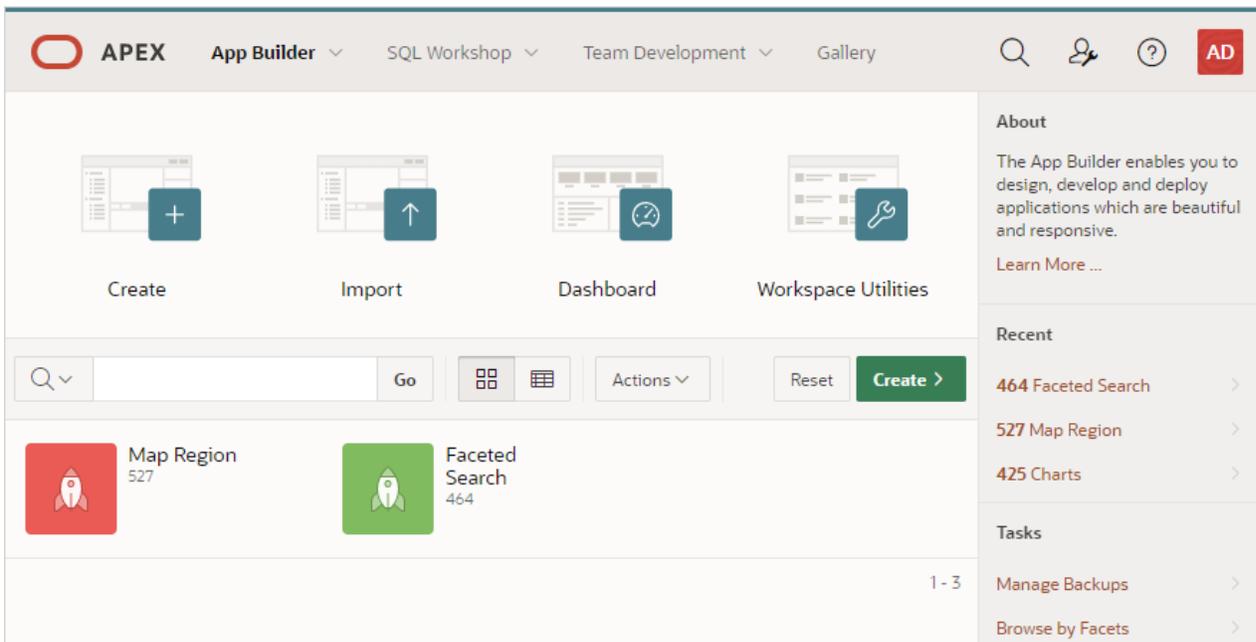
"Quick Start" and " App Builder Concepts"

2.4.1 Accessing App Builder

Access App Builder by clicking the App Builder icon on the Workspace home page.

1. To access App Builder:
 1. Sign in to Oracle Application Express.
 2. On the Workspace home page, click the **App Builder** icon.

The App Builder home page appears.



The App Builder home page displays currently installed applications as shown in the previous illustration.



Tip:

In a new workspace, the bottom of the page displays two additional regions. Click **Create a New App** to access the Create Application Wizard and create a new application. Click **Install a Starter or Sample App** to access the Gallery and install sample apps, plug-ins, and pre-built apps you can use as is or customize.

 **See Also:**

- ["Understanding the App Builder Home Page"](#)
- ["Creating Database Applications"](#)

2.4.2 Understanding the App Builder Home Page

Use App Builder to create new applications, select an application to edit, import previously exported applications, view the Dashboard, or access workspace utilities.

 **Tip:**

In a new workspace, the bottom of the page displays two additional regions. Click **Create a New App** to access the Create Application Wizard and create a new application. Click **Install a Productivity and Sample Apps** to access the App Gallery page and install a Productivity and Sample App and load sample data. Once you create an application or install a sample or productivity application, these regions no longer appear.

- [App Builder Home Page Icons and Navigation Bar](#)
The top of the App Builder home page features four large icons (Create, Import, Dashboard, and Workspace Utilities) and the bottom of the page displays all currently installed applications.
- [Reset and Create Buttons](#)
The Reset and Create buttons display in the center of the page to the right of the navigation bar.
- [Recent List and Tasks List](#)
The App Builder home page feature two regions on the right side of the page: Recent and Tasks.
- [Workspace Utilities](#)

 **See Also:**

["Accessing App Builder"](#) and ["Developer Navigation Tools"](#)

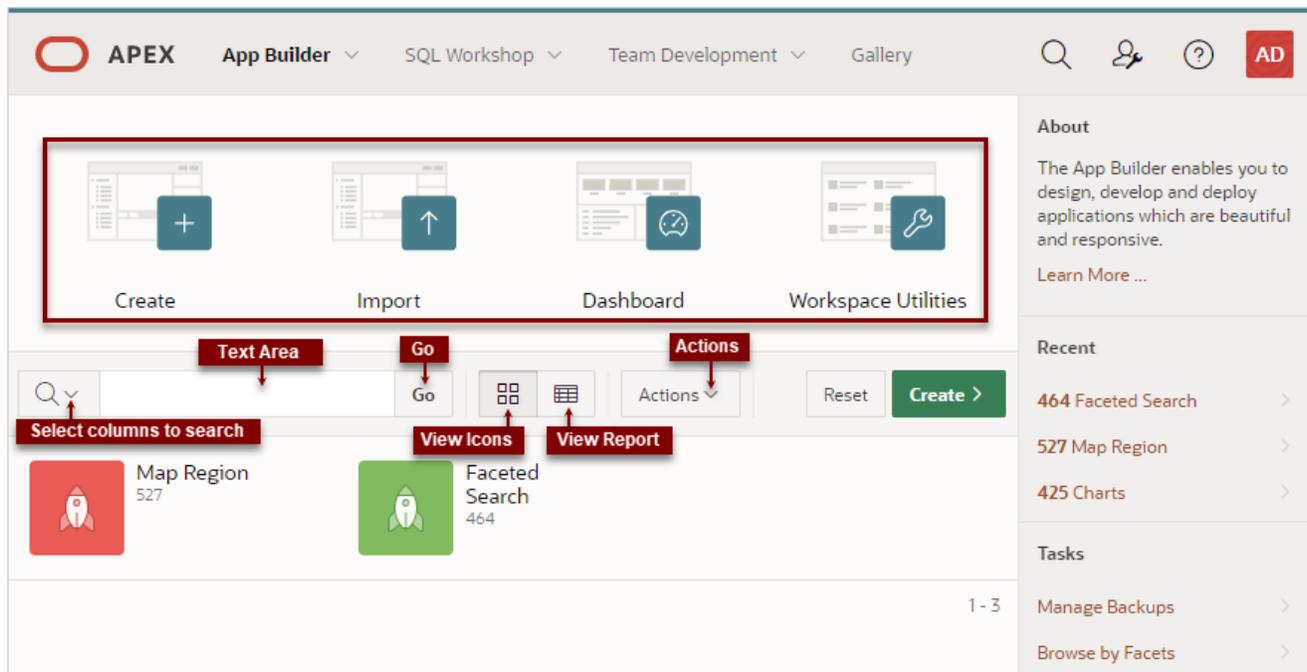
2.4.2.1 App Builder Home Page Icons and Navigation Bar

The top of the App Builder home page features four large icons (Create, Import, Dashboard, and Workspace Utilities) and the bottom of the page displays all currently installed applications.

About App Builder Home Page Icons

The top of App Builder home page contains four large icons:

- **Create.** Launches the Create Application Wizard. Use the Create Application Wizard to build a complete application containing multiple pages.
- **Import.** Launches the Import Wizard. Use this wizard to import export files from the export repository.
- **Dashboard.** Links to the App Builder Dashboard which displays metrics about applications in the current workspace.
- **Workspace Utilities.** Use the Workspace Utilities page to manage: App Builder Defaults, REST Enabled SQL Services, Remote Servers, Application Groups, Web Credentials, Workspace Themes, Export, Application Express Views, and Manage Backups.



About the Navigation Bar

The bottom of App Builder home page displays all installed applications. You can customize how the applications display using the navigation bar in the center of page.

Available controls include:

- **Select columns to search** - This control features a magnifying glass button. Click this button to narrow your search to only specific columns. To search all columns, select **All Columns**.

- **Text area** - Enter case insensitive search criteria (wildcard characters are implied) and click **Go**.
- **Go button** - Executes a search or applies a filter.
- **View Icons** (default) - Displays each application as a large icon identified by the application name.
- **View Report** - Displays each application as a line in a report. Each line includes the application ID, the application name, when the application was last updated, the page count, and who last updated the application.
- **Actions menu** - Displays the Actions menu. Use this menu to customize the report view.

 **Tip:**

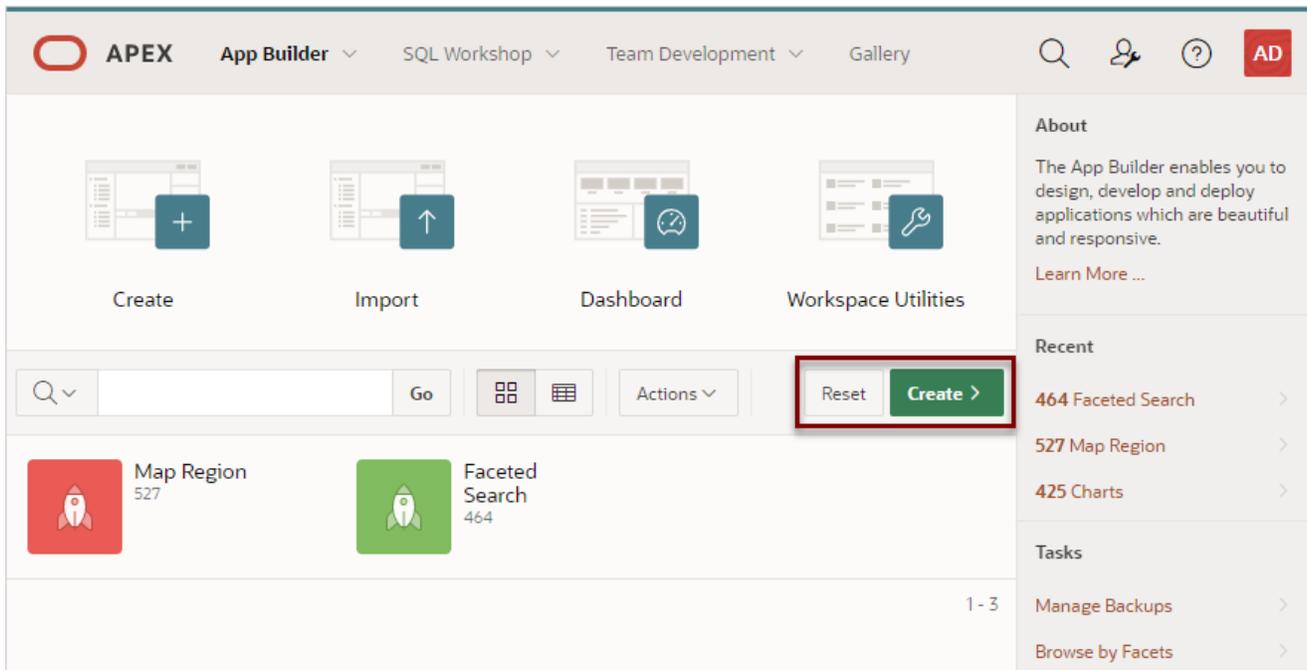
In a new workspace, the bottom of the App Builder home page displays two regions: **Create a New App** and **Install a Starter or Sample App**. Follow the on-screen instructions. Once you create or install an application, these region disappear.

 **See Also:**

- ["About the Create Application Wizard"](#)
- ["Importing Export Files"](#)
- ["About the Actions Menu"](#)

2.4.2.2 Reset and Create Buttons

The Reset and Create buttons display in the center of the page to the right of the navigation bar.

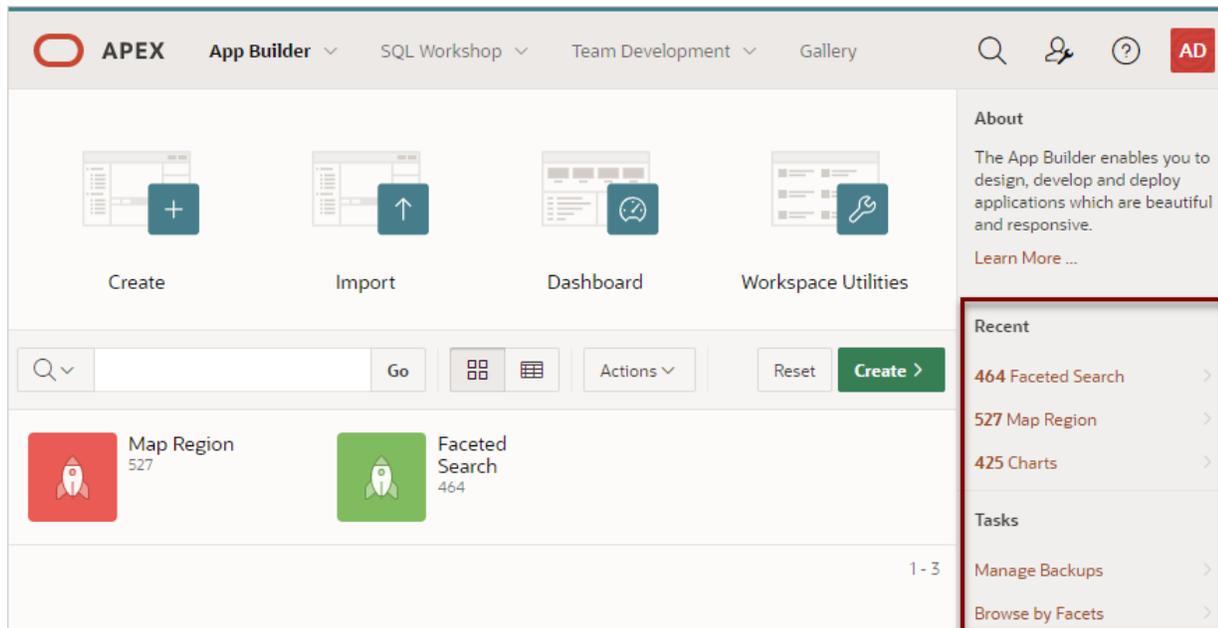


Use the **Reset** and **Create** buttons as follows:

- Click **Reset** to return the page to the default display.
- Click **Create** to create a new application, create an application from a file, install a starter app, launch Quick SQL, or copy an application.

2.4.2.3 Recent List and Tasks List

The App Builder home page features two regions on the right side of the page: Recent and Tasks.



Recent

The **Recent** region contains links to recently viewed applications.

Tasks

The **Tasks** region displays on the middle of the right side of the page and features the following links:

- **Manage Backups** - Links to the Manage Backups page.
- **Browse by Facets** - Links to the Search Applications page.



See Also:

["Managing Application Backups"](#)

2.4.2.4 Workspace Utilities

Click the **Workspace Utilities** icon to access the Workspace Utilities page. The Workspace Utilities page contains links to common workspace utilities including App Builder Defaults, REST Enabled SQL services, Remote Servers, Application Groups, Web Credentials, Workspace Themes, Export, Application Express Views, and Manage Backups.

 **See Also:**
[Using Workspace Utilities](#)

2.4.3 Accessing the Application Home Page

Access the Application home page by clicking the App Builder icon on the Workspace home page and then selecting an application.

Use the Application home page to run, edit, import, export, copy, or delete applications.

To access the Application home page:

1. Sign in to Oracle Application Express.
The Workspace home page appears.
2. Click the **App Builder** icon.
The App Builder home page appears.
3. Select an application on the Application home page.
The Application home page appears.

 **See Also:**
["Understanding the Application Home Page"](#)

2.4.4 Understanding the Application Home Page

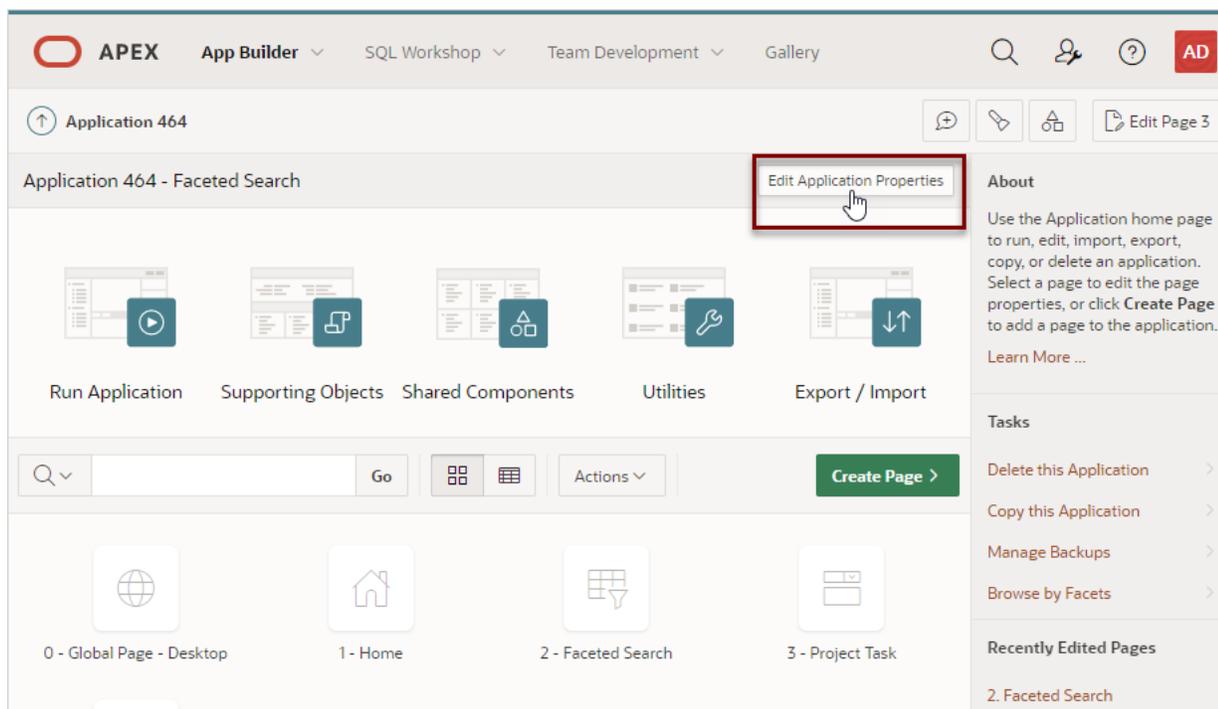
Use the Application home page to run, edit, import, export, copy, or delete applications.

When a developer selects an application on the App Builder home page, the Application home page appears.

- [Edit Application Properties Button](#)
- [Application Home Page Icons](#)
- [Create Page Button](#)
- [Application Home Page Navigation Bar](#)
- [Application Home Page Tasks List](#)
- [Recently Edited Pages](#)

 **See Also:**
["Accessing App Builder"](#) and ["Developer Navigation Tools"](#)

2.4.4.1 Edit Application Properties Button



The application ID and the application name display at the top of the Application home page. The application ID also displays in the breadcrumb at the top of the page.

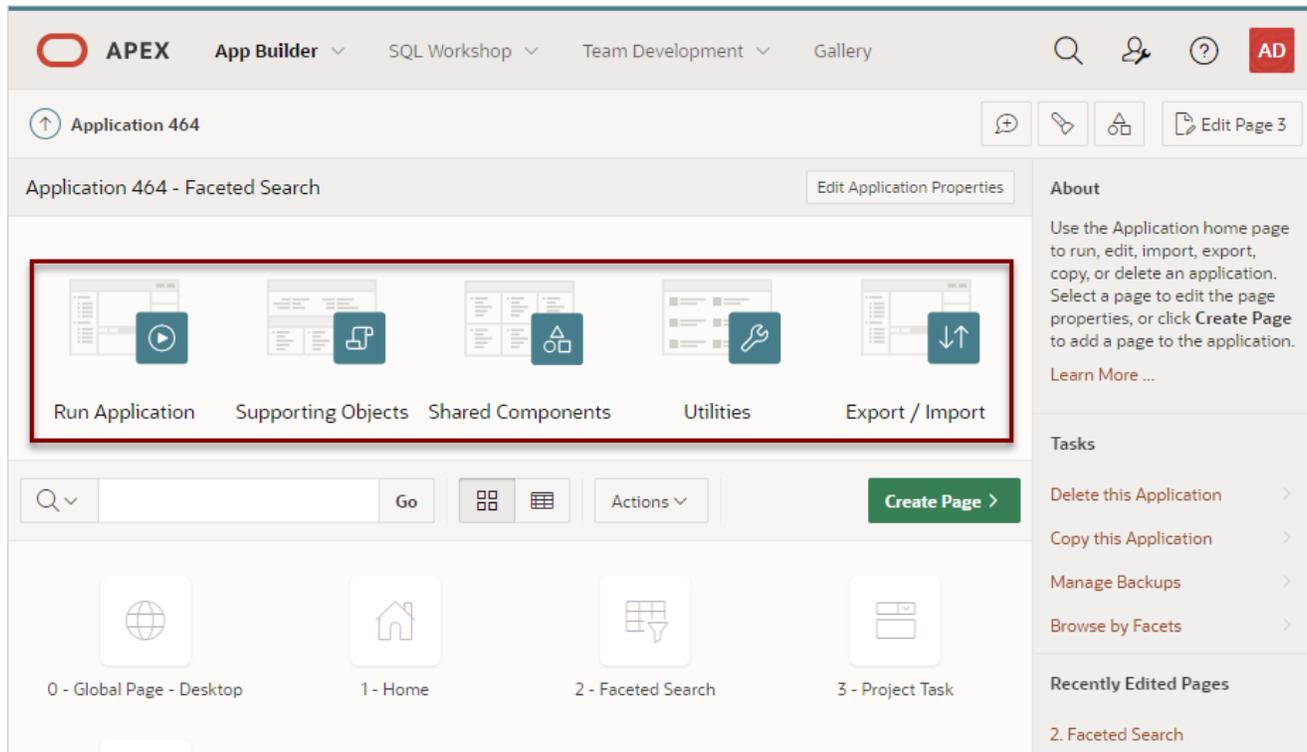
The Edit Application Properties button displays to the right of the application ID and name. Click **Edit Application Properties** to edit the application definition, including the application Name and Application Alias.



See Also:

["Editing the Application Definition"](#)

2.4.4.2 Application Home Page Icons



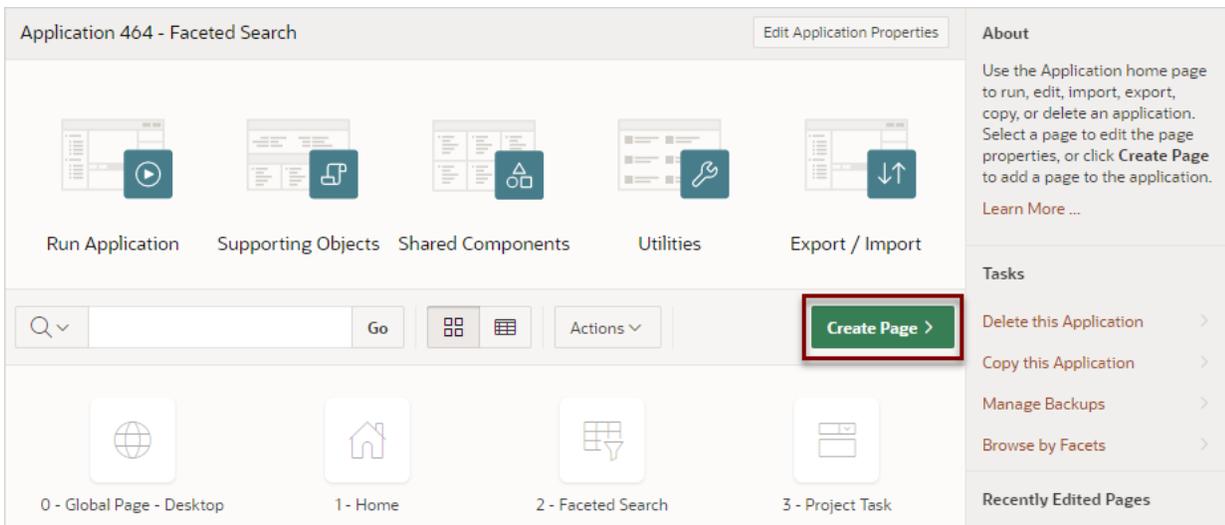
The following large icons appear beneath the application ID and application name:

- **Run Application** submits the home page in the current application to the Application Express engine to render viewable HTML.
- **Supporting Objects** links to the Supporting Objects page. Use Supporting Objects to define database object installation scripts that are invoked when importing an application. You can also define deinstallation scripts to drop objects when deleting an application.
- **Shared Components** links to the Shared Components page. Shared components can display or be applied on any page within the application.
- **Utilities** links to the Utilities page. Use this page to monitor developer activity, view dashboards, run Advisor, and view numerous other reports.
- **Export/Import** links you to the Export/Import Wizard. Use this wizard to import and export an entire application and related files such as cascading style sheets, images, static files, script files, themes, user interface defaults, and workspace users.

 **See Also:**

- ["Running an Application or Page"](#)
- ["How to Create a Custom Application"](#)
- ["Managing Shared Components"](#)
- ["Using Application Utilities"](#)
- ["Exporting an Application and Application Components"](#)

2.4.4.3 Create Page Button



Application 464 - Faceted Search

Edit Application Properties

Run Application Supporting Objects Shared Components Utilities Export / Import

Search Go Actions

Create Page >

0 - Global Page - Desktop 1 - Home 2 - Faceted Search 3 - Project Task

About

Use the Application home page to run, edit, import, export, copy, or delete an application. Select a page to edit the page properties, or click **Create Page** to add a page to the application.

Learn More ...

Tasks

- Delete this Application >
- Copy this Application >
- Manage Backups >
- Browse by Facets >

Recently Edited Pages

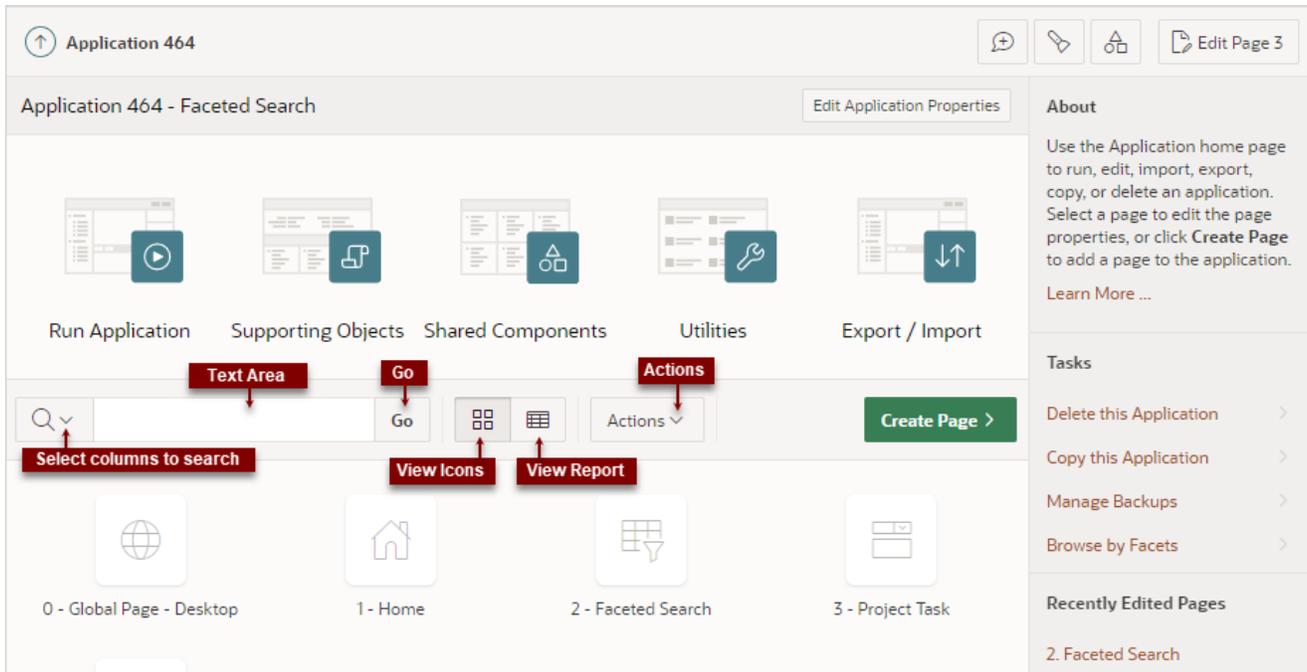
Clicking the **Create Page** button launches a wizard that walks you through creating a page in an application.

 **See Also:**

- ["Adding a New Page to an Application"](#)

2.4.4.4 Application Home Page Navigation Bar

A navigation bar displays in the center of the Application home page. You can use the navigation to search for pages or customize the appearance of the page.



The Application home page navigation bar contains the following controls:

- **Select columns to search** - This field contains a magnifying glass icon. Click this icon to narrow your search to only specific columns. To search all columns, select **All Columns**.
- **Text area** - Enter case insensitive search criteria (wildcard characters are implied) and click **Go**.
- **Go button** - Executes a search or applies a filter.
- **View icons**. Use these icons to toggle between three views:
 - **View Icons** (default) - Displays each page as a large icon identified by the page name.
To view a page, click the page icon.
 - **View Report** - Displays each page as a line in a report. Each line includes the page number (ID), the page name, when the page was last updated and by whom, the page type, any associated group, the user interface, and lock status.
To view a page, click the page name. Click the **Lock** icon to prevent conflicts during application development. Click the **Run** icon to run the associated page and render viewable HTML.
- **Actions menu** - Displays the Actions menu. Use this menu to customize the report view.

 **See Also:**

- ["App Builder Home Page Icons and Navigation Bar"](#)
- ["Locking and Unlocking a Page"](#)

2.4.4.5 Application Home Page Tasks List

A Tasks list displays on the right side of the Application home page.

The Tasks list contains the following links:

- **Delete this Application** deletes the current application.
- **Copy this Application** creates a copy of the current application.
- **Manage Backups** - Links to the Manage Backups page.
- **Browse by Facets** - Links to the Search Applications page.

See Also:

- ["Deleting an Application"](#)
- ["Copying a Database Application"](#)
- ["Managing Application Backups"](#)

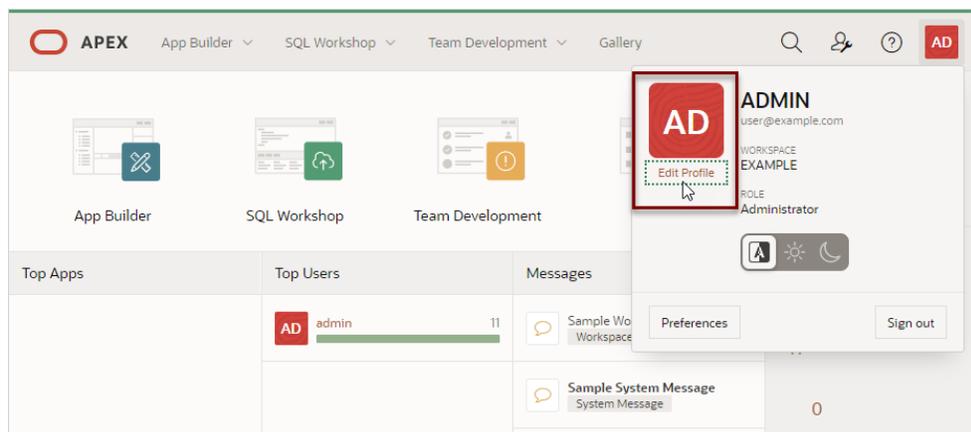
2.4.4.6 Recently Edited Pages

Recently Edited Pages region contains links to recently edited pages within the current application. To link to specific page, click the page ID and name.

2.5 Changing Your Profile or Password

Edit your account profile to update your profile (email address, first or last name, upload a profile photo, or change your password).

1. To edit your account profile:
 1. Click the **Account** menu in the header region.
 2. Click **Edit Profile**.



The Edit Profile dialog appears.

3. Under Profile Details, edit the following:
 - Email Address - Enter the email address used for general correspondence and notifications about resetting passwords.
 - Email Address - Enter the first or given name to further identify the user. This optional field is used for informational purposes only.
 - Last Name - Enter the last or given name to further identify the user. This optional field is used for informational purposes only.
4. Under Profile Photo, add, change, or remove your photo.
5. Under Change Password, enter a new password.
6. Click **Apply Changes**.

 **Tip:**

You can also reset your password and recover your workspace name from the Sign In page. See "Resetting Your Password from the Sign In Page" and "Recovering Your Workspace Name" in *Oracle Application Express Installation Guide*

2.6 Editing User Preferences and Enabling Dark Mode

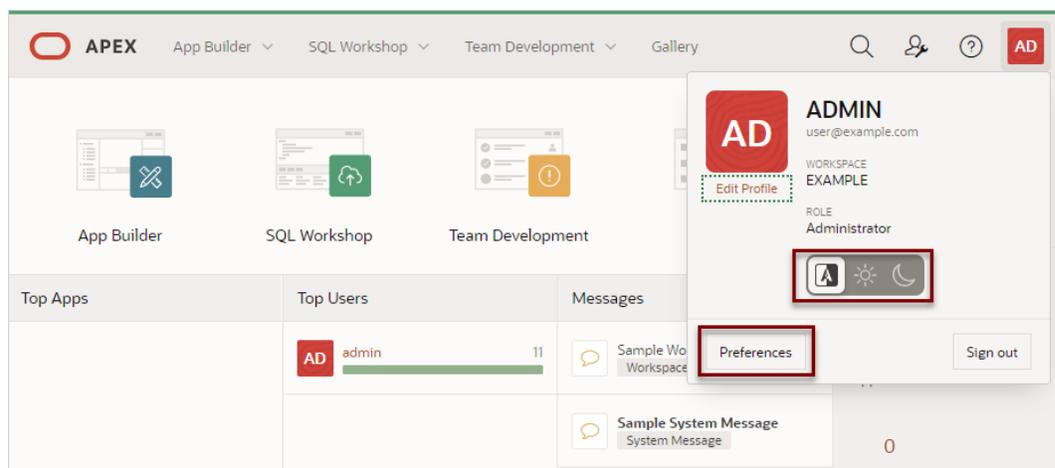
Click the Account menu to enable or disable Dark Mode or edit user preferences.

Configure the **Appearance** switch to determine if the Application Express user interface displays in **Dark Mode**, **Light Mode**, or **Automatic Mode**.

Click **Preferences** to change your default schema, default date format, configure whether SQL Workshop CSV downloads are in Unicode, and control how windows display when App Builder runs applications.

To enable Dark Mode or edit preferences:

1. To configure the **Appearance** switch or user Preferences:
 1. Click the **Account** menu in the header region.



2. Configure the **Appearance** switch to determine if the Application Express user interface displays in Dark Mode or Light Mode. Options include:
 - **Automatic** detects the appropriate setting based on existing system or browser settings.
 - **Light Mode** renders the user interface using the standard color scheme. detects the appropriate setting based on existing system or browser settings.
 - **Dark Mode** renders the user interface using an inverted color scheme, applying light-colored text, icons and graphical user interface elements on a darker background.
3. To configure Preferences, click **Preferences**. In the Preferences dialog, edit the following:
 - **Default Schema** - Specifies the default schema used for data browsing, application creation, and SQL script execution. When using workspaces that have more than one schema available, this schema is the default for creating applications, performing SQL queries, and so on. This feature does not control security, only the user's preference.
 - **Default Date Format** - Specify the default Oracle date format for the user. This option controls the default date format within SQL Workshop.
 - **Unicode CSV Downloads** - Specify whether to provide SQL Workshop CSV downloads in Unicode. This does only affect SQL Workshop and not custom applications.
 - **Run application in new window** - Specify how Oracle Application Express manages windows or tabs when running applications from App Builder when using Mozilla Firefox and Microsoft Internet Explorer. This setting has no effect when using other browsers, such as Google Chrome and Apple Safari. If set to **On**, the default, browser preferences are ignored and a new window always opens. If set to **Off**, the runtime application opens in a new window or tab based on Browser preferences. Mozilla Firefox and Microsoft Internet Explorer generally do not set focus to another tab in the same window, except when that tab is first launched.
 - **Use single window to run all applications** - Specify whether different applications reuse the same application runtime window or tab. If set to **On**, applications run from the App Builder reuse the window or tab used for running the previous application. If set to **Off**, applications you run display in its own window or tab.
4. Click **Apply Changes**.

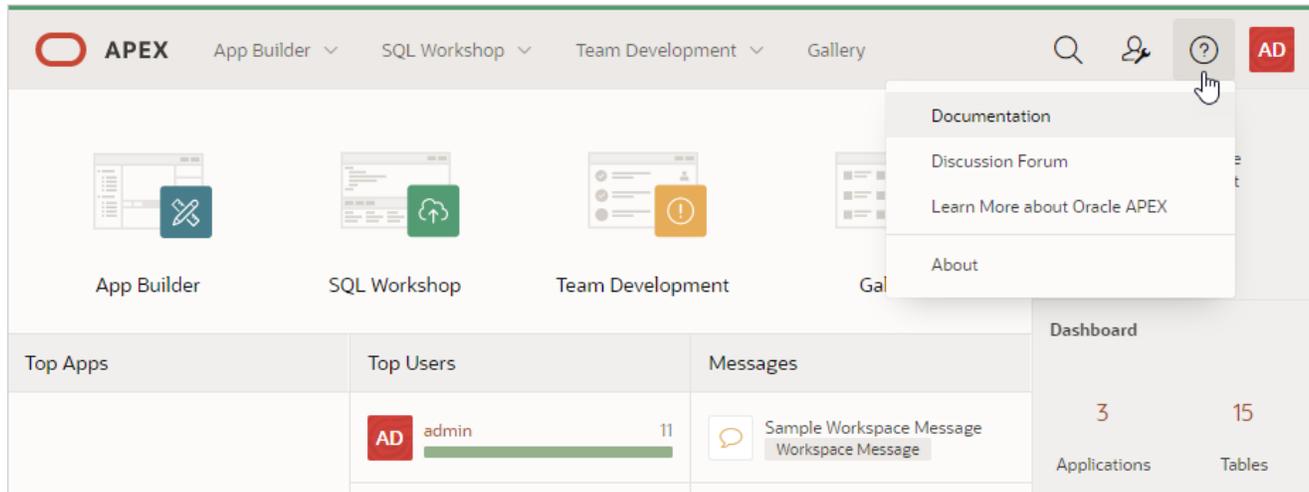
2.7 Using Oracle Application Express Documentation

Oracle Application Express provides a hosted online documentation library and field-level Help. You can browse or search content or download the entire library by going to the Oracle Application Express Documentation page in the Oracle Help Center.

- [Accessing Oracle Help Center](#)
- [Searching the Oracle Help Center](#)
- [Downloading the Documentation Library](#)
- [Viewing Help](#)

2.7.1 Accessing Oracle Help Center

Oracle Help Center offers a comprehensive library of publications that describe how to use Oracle Application Express. Whether you are new to Oracle Application Express or an advanced user, you can find useful information about Oracle Application Express, including getting started guides, tutorials, and advanced features.



You can access Oracle Help Center from by clicking **Learn More...** links in the product UI, or by clicking the **Help** menu in the upper right corner and selecting **Documentation**.

About Using Oracle Help Center

When the Oracle Help Center appears:

1. On the Oracle Application Express Documentaton page, select a release (if applicable).
2. To browse topics, select a subject area.
3. To view all publications in the library:
 - In the left navigation menu, select **Books**.
 - Find and select the appropriate publication.
4. To download the library locally:
 - In the left navigation menu under **Books**, select **Download**.

Redirecting the Help Menu

Administrators can redirect the Help menu at the instance-level in **Manage Instance**, **Instances Settings** in the Oracle Application Express Administration Services application. Oracle Application Express Administration Services is a separate application that enables an Instance administrator to manage an entire Oracle Application Express hosted instance. This functionality is not available to some customers who are using a hosted instance.



See Also:

"Configuring the Help Menu" in *Oracle Application Express Administration Guide*

2.7.2 Searching the Oracle Help Center

You have the option to search Oracle Help Center by book, product, category, or all publications. Searching a specific publication tends to yield the best results.

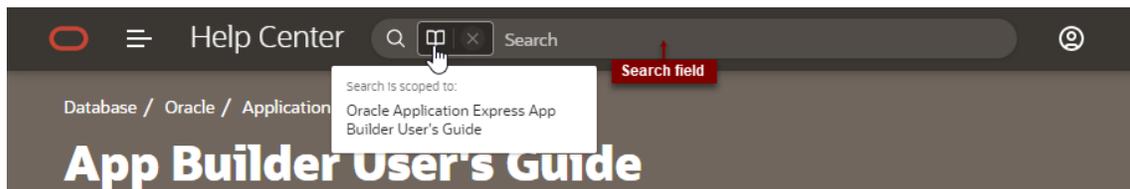
1. To search a specific publication:
 1. Access Oracle Help Center:
 - a. Click the **Help** menu in the upper right corner. The **Help** menu features a question mark enclosed with a circle.
 - b. Select **Documentation**.

Oracle Help Center appears, displaying documentation for the current release.

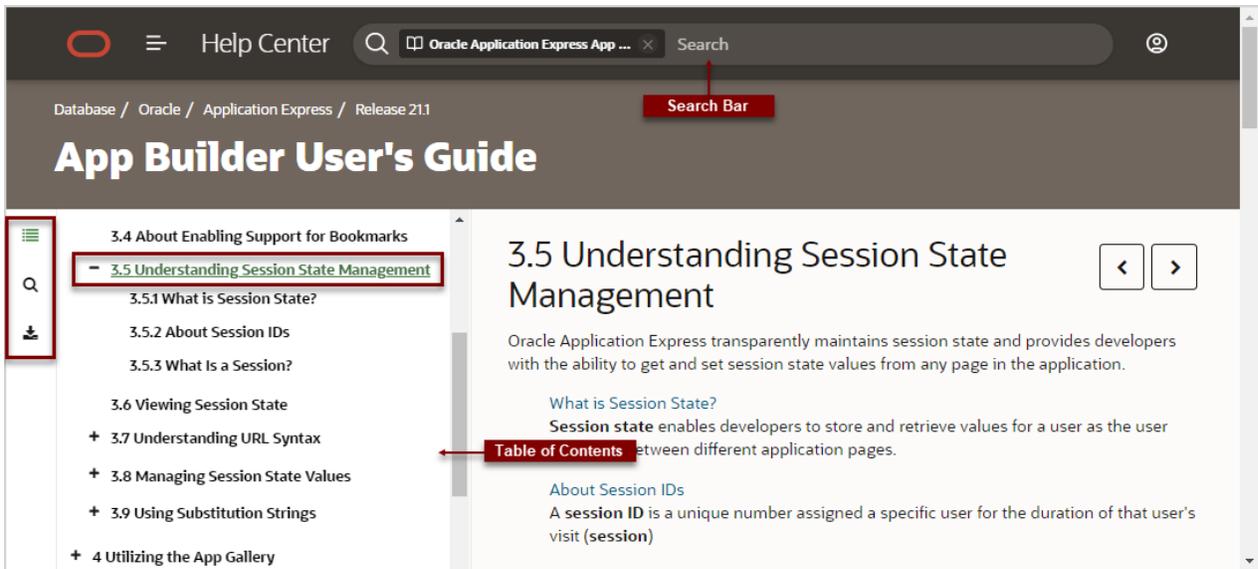
2. Locate publication:
 - a. From the left navigation menu, select **Books**.
 - b. Locate the publication and click the **HTML** link.

The publication appears.

Note that the Search bar at the top of page displays the title of the selected publication.



3. To search the publication, enter keywords in the Search bar and press Enter.
Search results appear.
4. Select a topic to review.
The topic appears. Notice the table of contents highlights the selected topic.



Notice the following icons on the left side of the table of contents:

-  **Table of Contents** - Click this icon to show or hide the table of contents.
-  **Search** - Click this icon search the book, product, or category.
-  **Download** - Click this icon to download the current publication.

2.7.3 Downloading the Documentation Library

1. To download the online documentation library:
 1. Access Oracle Help Center:
 - a. Click the **Help** menu in the upper right corner. The **Help** menu features a question mark enclosed with a circle.
 - b. Select **Documentation**.Oracle Help Center appears, displaying documentation for the current release.
 2. Under **Books**, select **Download**.
 3. Save the ZIP file locally.
 4. Download the ZIP file and extract it locally.
 5. Open the extracted folder and click **Readme.html**.
 6. Click **Start Here**.

2.7.4 Viewing Help

Most select lists, check boxes, items, and fields within the Oracle Application Express include Help. Help displays in two different ways depending upon where you are viewing it.

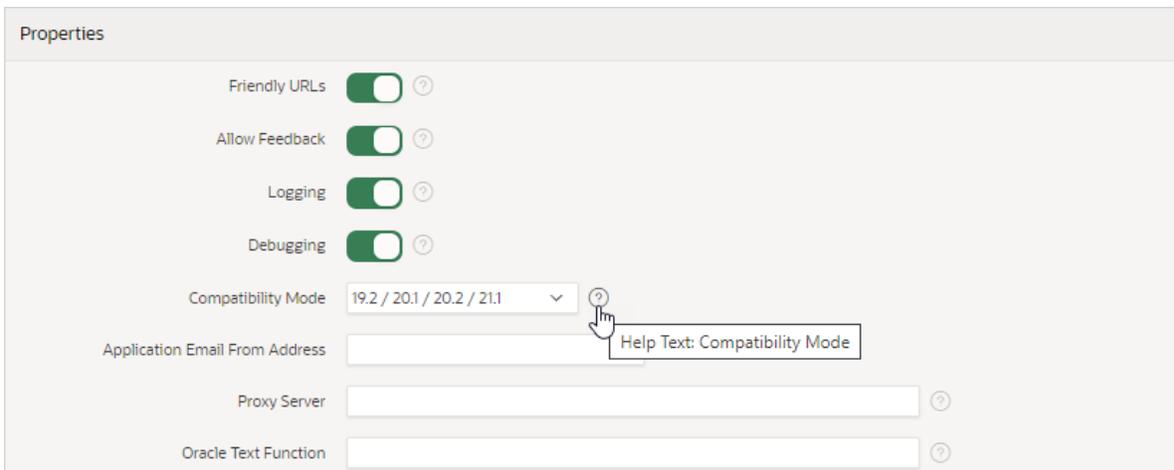
- [Viewing Field-level Help in Oracle Application Express](#)
- [Viewing Help in Page Designer](#)

2.7.4.1 Viewing Field-level Help in Oracle Application Express

Most select lists, check boxes, items, and fields within the Oracle Application Express include field-level Help.

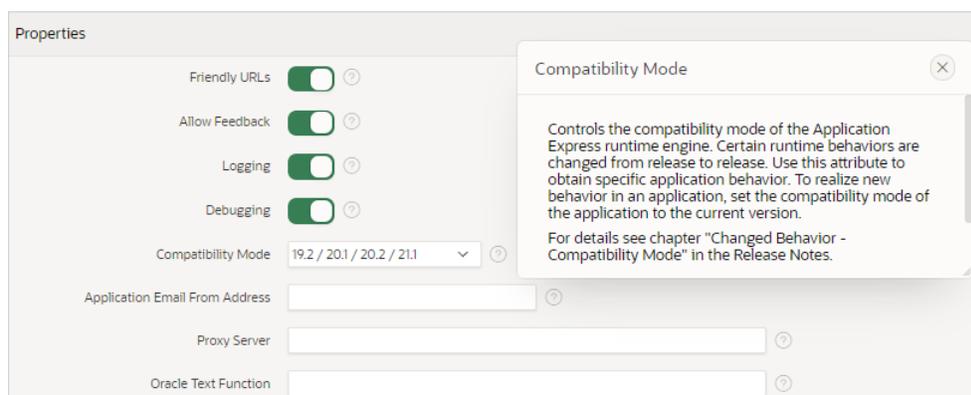
1. To view field-level help:
1. Navigate to the attribute you need information about.

Most attributes in Oracle Application Express include field-level Help. Attributes with field-level Help, have light gray icon that resembles a question mark (?). Passing your cursor over the icon displays the tooltip, **Help Text:**



2. To view field-level Help, click the **Help Text** icon.

A Help window appears.



Tip:

To access field-level help with the keyboard, focus on the correct field and then press **Alt+F1**.

See Also:

["Accessing Oracle Help Center"](#)

2.7.4.2 Viewing Help in Page Designer

Page Designer includes Help for all attributes in the Property Editor.

1. To view Help in Page Designer:

1. Access Page Designer.

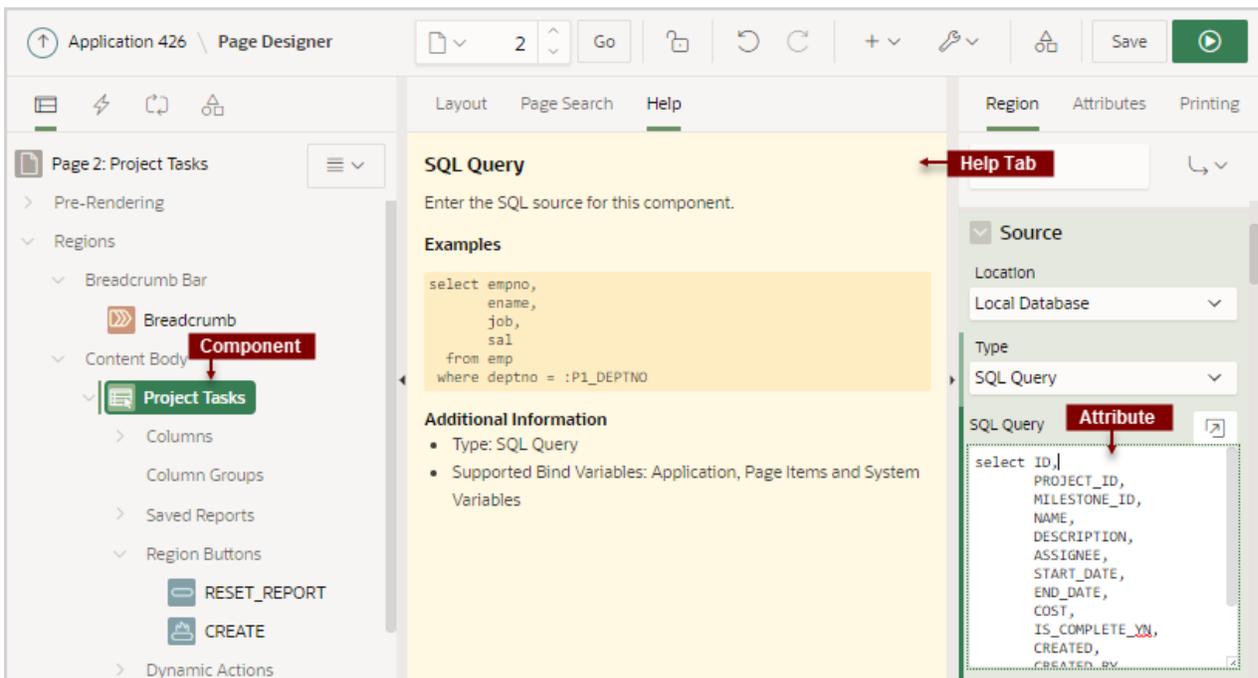
Page Designer appears.

2. Select a component or control in either the left pane or the central pane.

As you change focus in either view, the Property Editor automatically updates to reflect the currently selected component.

3. In the Property Editor, select an attribute.

4. To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.



Once you activate the Help pane, the content that displays changes every time you select another attribute.

 **Tip:**

To view an online summary that describes just the Page Designer window, view a page in Page Designer, click the **Help** menu at the top of the page, and select **Getting Started with Page Designer**.

 **See Also:**

["Viewing a Page in Page Designer"](#)

3

App Builder Concepts

To efficiently use App Builder, developers must understand some key concepts including managing user interface design, viewing rendered application page, understanding page processing and rendering, managing session state, understanding URL syntax, managing session state values, and using built-in substitution strings.

- [Understanding Database Applications](#)
An Oracle Application Express application is an HTML interface that exists on top of database objects such as tables or procedures.
- [Running an Application or Page](#)
To view a rendered version of your application, you run or submit it to the Application Express engine. The Application Express engine dynamically renders and processes pages based on data stored in database tables.
- [How Does Page Processing and Page Rendering Work?](#)
Learn how the Application Express engine renders and processes pages, when Oracle Application Express issues implicit commits, how conditional rendering and processing works, and how to verify user identify or control access to controls and components.
- [About Enabling Support for Bookmarks](#)
Developers can assist users who bookmark application pages by either using zero as the session ID, or enabling Rejoin Sessions.
- [Understanding Session State Management](#)
Oracle Application Express transparently maintains session state and provides developers with the ability to get and set session state values from any page in the application.
- [Viewing Session State](#)
View the Session page by clicking **Session** on the Runtime Developer toolbar.
- [Understanding URL Syntax](#)
Oracle Application Express applications support two types of URL syntax: **Friendly URL Syntax** and **f?p Syntax**.
- [Managing Session State Values](#)
Manage session state to store and retrieve values for a user as the user navigates between different application pages.
- [Using Substitution Strings](#)
Use substitution strings within templates, region source, or any attribute that specifies supported for substitutions to pass information and replace a character string with another value.
- [Using Template Directives](#)
Use template directives to control how attributes that support substitution strings are processed.



See Also:

[" Understanding App Builder"](#)

3.1 Understanding Database Applications

An Oracle Application Express application is an HTML interface that exists on top of database objects such as tables or procedures.

About Database Applications

A database application is a collection of pages linked together using navigation menus, tabs, buttons, or hypertext links. Application pages share a common session state and authentication.

To create a database application, an developer runs the Create Application Wizard to declaratively assemble pages and navigation. Individual pages are organized using containers called regions. Regions can contain text, custom PL/SQL, reports, charts, maps, calendars, web service content, or forms. Forms are made up of fields (called items) which can be selected from the multitude of built-in types (such as text fields, text areas, radio groups, select lists, check boxes, date pickers, and popup list of values).

Developers can also create their own custom item types using plug-ins. Session state (or application context) is transparently managed and the user interface presentation is separated from the application logic enabling developers to manage the look and feel of an application by simply selecting a different theme.

What Is an Application Page?

A page is the basic building block of an application. Every application consists of one or multiple pages. Each page can have buttons and fields (called **items**) which are grouped into containers called **regions**. Pages can include application logic (or processes). You can branch from one page to the next using conditional navigation; perform calculations (called **computations**); perform validations (such as edit checks); and display reports, calendars, and charts. You view and edit a page in Page Designer.



See Also:

- ["Creating Database Applications"](#)
- [" Understanding App Builder"](#)
- ["Editing Pages in Page Designer"](#)

3.2 Running an Application or Page

To view a rendered version of your application, you run or submit it to the Application Express engine. The Application Express engine dynamically renders and processes pages based on data stored in database tables.

- [Run Application and Run Page Buttons](#)
- [How Your Browser Impacts the Way Applications Run](#)
- [Running an Application from the App Builder Home Page](#)
- [Running an Application from the Application Home Page](#)
- [Running a Page on the Application Home Page](#)



See Also:

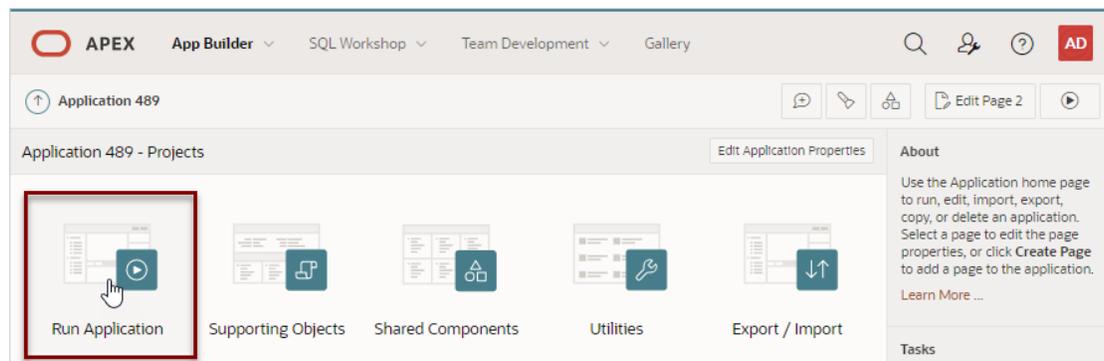
["Running a Page from Page Designer"](#)

3.2.1 Run Application and Run Page Buttons

As you create new pages, you can run them individually, or run an entire application.

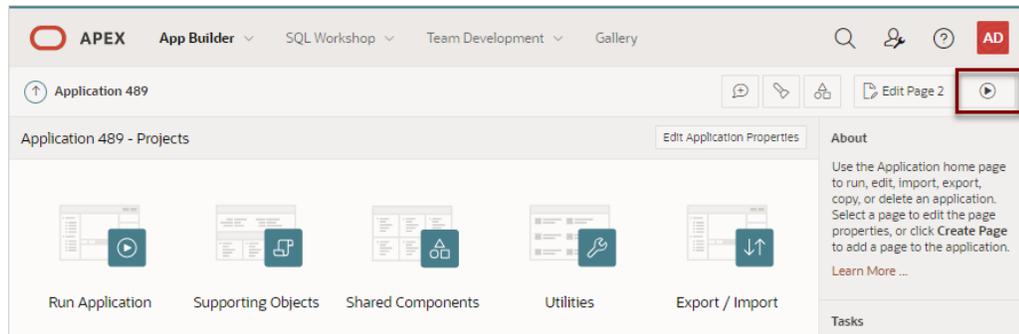
Run Application Button

The **Run Application** button displays on the Application home page and features with a large run (or play) button. To run the application from the application home page, click **Run Application**.



Run Page Button

The Run Page button resembles a small, black play button and displays in the upper right corner of many pages within App Builder. Clicking the **Run Page** button runs the current page or the last selected page.



3.2.2 How Your Browser Impacts the Way Applications Run

When you run an application, the application displays in a new window. Whether that new window is a new tab or new browser windows depends upon how you have configured your web browser. If you are using Google Chrome or Apple Safari, the running application displays in a new tab by default. If you are using Microsoft Internet Explorer or Mozilla Firefox, the application displays in a new browser window by default. You can further control how Oracle Application Express manages tabs and windows when running an application by editing your account preferences.



See Also:

["Editing User Preferences and Enabling Dark Mode"](#)

3.2.3 Running an Application from the App Builder Home Page

1. To run an application from the App Builder home page:
 1. On the Workspace home page, click **App Builder**.
 2. You can customize the App Builder home page by selecting the following icons in the navigation bar:
 - **View Icons** (default)
 - **View Report**
 3. To run the application in Icon View:
 - a. On the navigation bar, click the **View Icons** icon:
Each application displays as a large icon identified by the application name.
 - b. Click **Run Application** at the top of the page.
 4. To run the application in Report View:
 - a. On the navigation bar, click the **View Report** icon:
Each application displays as a line in a report. Each line includes the application ID, the application name, when the application was last updated, the page count, and who last updated the application.
 - b. Click **Run Page** in the far right column.



See Also:

["How Your Browser Impacts the Way Applications Run"](#)

3.2.4 Running an Application from the Application Home Page

1. To run an application from the Application home page:
 1. On the Workspace home page, click **App Builder**.
The App Builder home page appears.
 2. Select an application.
 3. Click **Run Application** in the middle of page.
The application displays in a new window.



See Also:

["How Your Browser Impacts the Way Applications Run"](#)

3.2.5 Running a Page on the Application Home Page

1. To run a page from the Pages list:
 2. On the Workspace home page, click **App Builder**.
 3. Select an application.
 4. Click the **View Report** icon.
Selecting **View Report** displays each page as a line in a report. Each line includes the page number, the page name, when the page was last updated, who last updated the page, the page type, the selected user interface, a lock icon, and a Run button.
 5. Locate the page you want to run.
 6. Click **Run Page** in the far right column.
The application displays in a new window.



See Also:

["Locking and Unlocking a Page"](#) and ["How Your Browser Impacts the Way Applications Run"](#)

3.3 How Does Page Processing and Page Rendering Work?

Learn how the Application Express engine renders and processes pages, when Oracle Application Express issues implicit commits, how conditional rendering and processing works, and how to verify user identity or control access to controls and components.

- [How the Application Express Engine Renders and Processes Pages](#)
- [About Implicit Commit Points](#)
- [Understanding Conditional Rendering and Processing](#)
- [About Verifying User Identity](#)
- [About Controlling Access to Controls and Components](#)

3.3.1 How the Application Express Engine Renders and Processes Pages

The Application Express engine dynamically renders and processes pages based on data stored in Oracle database tables. To view a rendered version of your application, you request it from the Application Express engine with a URL. When you run an application, the Application Express engine relies on two processes:

- **Show Page** - Show Page is a page rendering process that assembles all the page attributes (including regions, items, and buttons) into a viewable HTML page. When you request a page using a URL, the engine is running **Show Page**.
- **Accept Page** - Accept Page performs forms page processing, including computations, validations, processes, and branching. When you submit a page, the Application Express engine is running **Accept Page** or performing page processing during which it saves the submitted values in the session cache and then performs any computations, validations, or processes.

3.3.2 About Implicit Commit Points

Oracle Application Express issues implicit commits at the following points:

- On load, after a page finishes rendering
- On submit, before branching to another page
- On submit, if one or more validations fail, before re-rendering the page
- After a computation
- After changing the value of an item, for example after a PL/SQL process that modifies a bind variable value or when `APEX_UTIL.SET_SESSION_STATE` is called.
- When `APEX_MAIL.PUSH_QUEUE` is called

**See Also:**

"SET_SESSION_STATE Procedure" and "PUSH_QUEUE Procedure" in *Oracle Application Express API Reference*

3.3.3 Understanding Conditional Rendering and Processing

Developers can use conditions in an application to control how pages and page components display and when processes, computations, and validations execute.

- [What is a Condition?](#)
- [Selecting a Condition](#)
- [Condition Example: Current Page in Expression 1](#)
- [Condition Example: Exists](#)
- [Condition Example: PL/SQL Expression](#)

3.3.3.1 What is a Condition?

A condition is a small unit of logic that helps you control the display of regions, items, buttons, and tabs and the execution of processes, computations, and validations. For example, when you apply a condition to a button, the rendering engine evaluates the condition during the rendering (or Show Page) process. Whether the condition passes or fails determines if the button displays.

**See Also:**

["Available Conditions"](#) for a detailed listing of available condition types

3.3.3.2 Selecting a Condition

You specify a condition by selecting a condition type. You can select a condition type when you first create the control or component, or later when editing the control or component.

Depending upon the type of condition you select, you enter the appropriate values in the fields provided. The condition evaluates to true or false based on the values you enter. Click the select list to view a complete list of all available conditions for a given component or control.

3.3.3.3 Condition Example: Current Page in Expression 1

Current page in Expression 1 evaluates to true if the current page number is contained within the comma-delimited list of pages provided. For example:

3,100,203

If the current page is 100, then this condition evaluates to true and the condition passes.

3.3.3.4 Condition Example: Exists

Exists (SQL query returns at least one row) is expressed as a SQL query. If the query returns at least one row, then the condition evaluates as true. For example:

```
SELECT 1 FROM employees WHERE department_id = :P101_DEPTNO
```

This example references item `P101_DEPTNO` as a bind variable. You can use bind variables within application processes and SQL query regions to reference items from session state. If one or more employees are in the department identified by the value of `P101_DEPTNO`, then the condition evaluates as true.



See Also:

["Referencing Session State Using Bind Variable Syntax"](#)

3.3.3.5 Condition Example: PL/SQL Expression

Use **PL/SQL Expression** to specify an expression in valid PL/SQL syntax that evaluates to true or false. For example:

```
NVL(:MY_ITEM, 'NO') = 'YES'
```

If the value of `:MY_ITEM` is YES, as in the previous example, then the condition evaluates as true. If the value of `:MY_ITEM` is anything other than YES, then the condition evaluates as false.

3.3.4 About Verifying User Identity

Authentication is the process of establishing users' identities before they can access an application. Authentication may require a user to enter a user name and password, or may involve the use of a digital certificate or a secure key.

Oracle Application Express supports modular authentication, making it easy to switch authentication methods when needed. You can establish a user's identity by selecting from several built-in authentication methods, or by using a wizard to create your own custom authentication approach.



See Also:

["Establishing User Identity Through Authentication"](#)

3.3.5 About Controlling Access to Controls and Components

While conditions control the rendering and processing of specific controls or components on a page, authorization schemes control user access. Authorization is a broad term for controlling access to resources based on user privileges.

Authorization schemes use the identities established by authentication to grant privileges on applications and objects within them. You can specify an authorization scheme for an entire application, a page, or a specific page control such as a region, item, or button. For example, you could use an authorization scheme to selectively determine which tabs, regions, or navigation bar entries a user sees.



See Also:

["Providing Security Through Authorization"](#)

3.4 About Enabling Support for Bookmarks

Developers can assist users who bookmark application pages by either using zero as the session ID, or enabling Rejoin Sessions.

In previous releases, if the pages within an application were public and did not require authentication, you could assist users in bookmarking pages by using zero as the session ID. Although this approach is still supported, Oracle Application Express now includes a new feature called Rejoin Sessions that enables developers to control this type of support at the page, application, or instance-level.



See Also:

["About Rejoin Sessions"](#)

3.5 Understanding Session State Management

Oracle Application Express transparently maintains session state and provides developers with the ability to get and set session state values from any page in the application.

- [What is Session State?](#)
Session state enables developers to store and retrieve values for a user as the user navigates between different application pages.
- [About Session IDs](#)
A **session ID** is a unique number assigned a specific user for the duration of that user's visit (**session**)
- [What Is a Session?](#)
A **session** is a logical construct that establishes persistence (or stateful behavior) across page views. Each session is assigned a unique identifier. The Application Express engine uses this identifier (or session ID) to store and retrieve an application's working set of data (or session state) before and after each page view.

3.5.1 What is Session State?

Session state enables developers to store and retrieve values for a user as the user navigates between different application pages.

Hypertext Transfer Protocol (HTTP), the protocol over which HTML pages are most often delivered, is a stateless protocol. A web browser is only connected to the server for as long as it takes to download a complete page. Each page request is treated by the server as an independent event, unrelated to any page requests that happened previously or that may occur in the future. To access form values entered on one page on a subsequent page, the values must be stored as session state. Oracle Application Express transparently maintains session state and provides developers with the ability to get and set session state values from any page in the application.

3.5.2 About Session IDs

A **session ID** is a unique number assigned a specific user for the duration of that user's visit (**session**)

The Application Express engine establishes the identity of the user for each page request and the session ID to fetch session state from the database. The most visible location of the session ID is in the URL for a page request. The session ID displays as the third parameter in the URL:

- f?p URL Syntax:

```
https://apex.example.com/ords/f?p=392:3:13766599855150
```

- f?p URL Syntax:

```
https://apex.example.com/ords/mycompany/r/hr-app/update-employees?  
session=13766599855150
```

In both examples, the session ID is 13766599855150.

Another visible location is in the page's HTML POST data and indirectly in the contents of a session cookie. This cookie is sent by the Application Express engine during authentication and is maintained for the life of the application (or browser) session.

Oracle Application Express assigns new session IDs during authentication processing, records the authenticated user's identity with the session ID, and continually checks the session ID in each page request's URL or POST data with the session cookie and the session record in the database. These checks provide users with flexibility and security.

While the session ID is the key to session state, the session cookie and the session record safeguard the integrity of the session ID and the authentication status of the user.



See Also:

["Understanding URL Syntax"](#)

3.5.3 What Is a Session?

A **session** is a logical construct that establishes persistence (or stateful behavior) across page views. Each session is assigned a unique identifier. The Application Express engine uses this identifier (or session ID) to store and retrieve an application's working set of data (or session state) before and after each page view.

Because sessions are entirely independent of one another, any number of sessions can exist in the database at the same time. A user can also run multiple instances of an application simultaneously in different browser programs.

Sessions are logically and physically distinct from Oracle database sessions used to service page requests. A user runs an application in a single Oracle Application Express session from sign in to sign out with a typical duration measured in minutes or hours. Each page requested during that session results in the Application Express engine creating or reusing an Oracle database session to access database resources. Often these database sessions last just a fraction of a second.



See Also:

"Viewing Active Sessions" in *Oracle Application Express Administration Guide*

3.6 Viewing Session State

View the Session page by clicking **Session** on the Runtime Developer toolbar.

The Session page provides valuable information about the session in which the application is currently running. Most of the behavior of an Oracle Application Express application is driven by values in session state. For example, a button may display conditionally based on the value of an item session state. This section describes how to view session state for a page.

To view the Session page:

1. Run the application as a developer.
2. Locate the Runtime Developer toolbar. By default, the Runtime Developer toolbar displays at the bottom of the page.



3. Click **Session** on the Developer toolbar.

The Session page appears and displays the following information displays at the center of the page.

- **Application** - Identifies the application name.
- **Session** - Displays the session ID for the current session.
- **User** - Identifies the current user.
- **Workspace** - Displays the current workspace ID.

- **Browser Language** - Identifies the current browser language.
4. Configure the fields at the top of the page and click **Set** to alter the display:
- **Page** - Locate a page. Enter a page number.
 - **Find** - Enter a case insensitive query. Use Find to search item name and item value, or collection name (depending upon your view).
 - **Rows** - Select the number of items to display.
 - **View** - Select a session state report to view.



See Also:

- ["Understanding Page-Level Items"](#)
- ["Managing Application-Level Items"](#)
- ["About Using Collections"](#)
- ["Using Substitution Strings"](#) for information about referencing item values

3.7 Understanding URL Syntax

Oracle Application Express applications support two types of URL syntax: **Friendly URL Syntax** and **f?p Syntax**.



Tip:

Applications created using Oracle Application Express release 20.1 or later use **Friendly URL Syntax**. You can change existing applications to use Friendly URLs by editing the Friendly URLs attribute in the application Definition. See ["Enabling or Disabling Friendly URL Syntax."](#)

- [Understanding Friendly URL Syntax](#)
Friendly URL Syntax creates a URL structure that identifies the address of Oracle Application Express, the application, the page, and uses standard web parameter syntax.
- [Understanding f?p URL Syntax](#)
f?p URL Syntax is a legacy syntax that creates a unique URL structure that identifies the address of Oracle Application Express, the application ID, page number, and session ID.
- [Hiding the Session ID on Public Pages](#)
Hide the session ID in a URL by making a page public.

3.7.1 Understanding Friendly URL Syntax

Friendly URL Syntax creates a URL structure that identifies the address of Oracle Application Express, the application, the page, and uses standard web parameter syntax.

 **Note:**

The Friendly URL Syntax described in this section is different from a vanity URL or custom domain name. Configuring a vanity URL (or custom domain name) for your Application Express instance is typically done at the web server or load balancer-level and is not discussed in this publication.

 **Tip:**

Applications created using Oracle Application Express release 20.1 or later use Friendly URL Syntax. You can revert to f?p Syntax by disabling the Friendly URLs attribute.

- [About Friendly URL Syntax](#)
Friendly URL Syntax uses a standard URL hierarchy and passes parameters in a similar fashion to other web applications.
- [Enabling or Disabling Friendly URL Syntax](#)
Determine if an application uses Friendly URL Syntax or f?p Syntax by enabling or disabling the Friendly URLs attribute.
- [Customizing a Friendly URL](#)
Customize a Friendly URL by editing the Path Prefix, Application Alias, or Page Alias.

3.7.1.1 About Friendly URL Syntax

Friendly URL Syntax uses a standard URL hierarchy and passes parameters in a similar fashion to other web applications.

Friendly URL Hierarchy and Syntax

Friendly URL Syntax creates a URL with the following directory hierarchy and syntax:

```
https://hostname:port/ords/path_prefix/r/app_alias/page_alias?parameters
```

Friendly URL Example

```
https://hostname:port/ords/mycompany/r/hr-app/update-employees?  
session=13766599855150
```

Where:

- `https:` stands for HyperText Transfer Protocol and operates at the application layer.
- `hostname` is the domain name of the server. It can also include a port number or an IP address.
- `port` is the port number assigned when configuring Oracle REST Data Services.
- `ords` is the service name defined when configuring Oracle REST Data Services.

- `mycompany` is the `path_prefix` which is URI path prefix used to access RESTful Services. When you create a workspace, this value defaults to workspace name. You can customize the URI path prefix by editing the Path Prefix attribute in Administration, Manage Service, Workspace Preferences, SQL Workshop.
- `r` is the router shortcut. This value is a constant and should never be changed.
- `hr-app` is the `app_alias`. In a new application, the Application Alias defaults to the application Name. You can edit the Application Alias in the application Definition. The Application Alias must be unique within the workspace.
- `update-employees` is the `page_alias`. In a new application, the Page Alias defaults to the page Name. You can edit the Page Alias in Page Designer. Page aliases must be unique within the application. When creating a new page, if a Page Name is already used as a Page Alias, then a numeric value is appended to the new Page Alias to make it unique.
- `?session=13766599855150` identifies the session ID. When you run an application, the Application Express engine generates a session number that serves as a key to the user's session state.

About URL Parameters

The part of the URL after `/?` can list parameters.

`http://hostname:port/ords/path_prefix/r/app_alias/page_alias?parameters`
(Such as –

`p7_customer_id=377&clear=7&session=1247058356345&cs=3MdkfQa9NLmkyHAbwGPg3U-nmA7XIw5sWjU2rMzSvOy_wP1_z7BBI-Gbh2JgvffARgcYJy8id4VtL3d011tYm0w)`

Supported parameters include:

- `session`
- `request`
- `clear`
- `debug`
- `application/page items`
- `printerFriendly`
- `trace`
- `timezone`
- `lang`
- `territory`
- `cs`
- `dialogCs`
- `x01`

 **See Also:**

- "Understanding Session State Management"
- "About Publishing the Database Application URL"

3.7.1.2 Enabling or Disabling Friendly URL Syntax

Determine if an application uses Friendly URL Syntax or f?p Syntax by enabling or disabling the Friendly URLs attribute.

Applications created using Oracle Application Express release 20.1 or later use Friendly URL Syntax. You can revert to f?p Syntax by disabling the Friendly URLs attribute.

1. To enable Friendly URL Syntax:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.

The Application home page appears.

3. From Application home page, you can access the Definition page in two ways:

- Click the **Edit Application Properties** button.
- From Shared Components:
 - Click **Shared Components**.
 - Under Application Logic, click **Application Definition Attributes**.

The Definition page appears.

4. Under Properties, configure the **Friendly URLs** attribute:

- **On** - If set to **On**, application uses Friendly URLs Syntax in which the URL consists of a directory structure based on the Application Alias, Page Alias, and standard web parameter syntax.
- **Off** - If set to **Off**, the application uses f?p= Syntax.

5. Click **Apply Changes** to save your changes.

3.7.1.3 Customizing a Friendly URL

Customize a Friendly URL by editing the Path Prefix, Application Alias, or Page Alias.

Friendly URL Syntax creates a URL with the following directory hierarchy and syntax:

```
https://hostname:port/ords/path_prefix/r/app_alias/page_alias?parameters
```

You can customize the follow parts of Friendly URL:

- Path Prefix - *path_prefix* is URI path prefix to be used to access RESTful Services. When you create a workspace, this value defaults to workspace name. You can customize the URI path prefix by editing Path Prefix attribute in Workspace Administration.

- Application Alias - *app_alias* is an alternate alphanumeric application identifier called the Application Alias. In a new application, the Application Alias defaults to the application Name. You can edit the Application Alias in the application Definition.
- Page Alias - *page_alias* is an alphanumeric alias for this page called the Page Alias. In a new application, the Page Alias defaults to the page Name. You can edit the Page Alias in Page Designer.

Friendly URL Customization Example

Suppose you have an application with the following URL:

```
http://hostname:port/ords/example/r/355/2?session=13766599855150
```

Suppose you want to make the following changes:

- *path_prefix* - Change `example` to `mycompany`.
- *app_alias* - Change `355` to `myapp`.
- *page_alias* - Change `2` to `myinfo`.

The revised URL will display as:

```
http://hostname:port/ords/mycompany/r/myapp/myinfo?  
session=13766599855150
```

1. To customize a Friendly URL by editing the Path Prefix, Application Alias, or Page Alias:
 1. Sign in to Oracle Application Express.
 2. To change the Path Prefix:
 - a. Navigate to the Workspace Administration page. At the top of the Workspace home page, click the **Administration** menu and select **Administration**.
 - b. On the Workspace Administration home page, click **Manage Service** and then click **Set Workspace Preferences**.
 - c. Scroll down to SQL Workshop.
 - d. In **Path Prefix**, enter a new Path Prefix. In a new workspace, Path Prefix defaults to the workspace name. For example change the Path Prefix to `mycompany`.
-  **Tip:**
Path Prefix only displays if **Enabled RESTful Services** is set to **Yes**.
- e. Click **Apply Changes** to save your changes.
Manage Service page appears.
 - f. Return to the Workspace home page. Click the APEX logo (Oracle APEX Home) in the upper left corner.
3. To change the Application Alias:

- a. On the Workspace home page, click the **App Builder** icon.
 - b. Select the application.
 - c. On Application home page, click the **Edit Application Properties** button.
The application Definition page appears.
 - d. Under Name, edit the **Application Alias** attribute. For example, enter `myapp`.
 - e. Click **Apply Changes** to save your changes.
4. To change the Page Alias:
- a. View the page in Page Designer.
 - b. In either the Rendering tab, select the page name.
 - c. In the Property Editor, find the Identification group.
 - d. Under Identification, Page Alias attribute - Enter an alphanumeric alias for this page. For example, enter `myinfo`.
 - e. To save your changes, click **Save** or **Save and Run Page**.
5. Run the page. Click or **Save and Run Page**.
- The revised URL displays as:

```
http://hostname:port/ords/mycompany/r/myapp/myinfo?session=13766599855150
```



See Also:

"Enabling RESTful Services and Defining a Path Prefix for a Workspace" in *Oracle Application Express Administration Guide*

3.7.2 Understanding f?p URL Syntax

f?p URL Syntax is a legacy syntax that creates a unique URL structure that identifies the address of Oracle Application Express, the application ID, page number, and session ID.

- [About f?p URL Syntax](#)
f?p URL Syntax creates a unique URL structure that identifies the location and address of Oracle Application Express, the application ID, page number, and session ID.
- [About Using f?p Syntax to Link Pages](#)
Create links between application page using f?p syntax.
- [Calling a Page Using an Application Alias or Page Alias](#)
Use URL syntax to call a page using an application alias and/or page alias.
- [Calling a Page from a Button URL](#)
Use URL syntax to call a page from a button URL.

3.7.2.1 About f?p URL Syntax

f?p URL Syntax creates a unique URL structure that identifies the location and address of Oracle Application Express, the application ID, page number, and session ID.

f?p URL Structure and Syntax

f?p URL Syntax creates a URL with the following structure and syntax:

```
https://hostname:port/ords/f?p=<app_id>:<page_number>:<session_id>
```

f?p URL Example

```
https://hostname:port/ords/f?p=392:3:13766599855150
```

This example indicates:

- `https:` stands for HyperText Transfer Protocol and operates at the application layer.
- `hostname` is the domain name of the server. It can also include a port number or an IP address.
- `port` is the port number assigned when configuring Oracle REST Data Services.
- `ords` is the service name defined when configuring Oracle REST Data Services.
- `f?p=` is a prefix used by Oracle Application Express to route the request to the correct engine process.
- `392` is the ID of the application being called. The application ID is a unique number that identifies each application.
- `3` is the number of the page within the application. Page number must be unique within the application.
- `13766599855150` is the session number. When you run an application, the Application Express engine generates a session number that serves as a key to the user's session state.



See Also:

- ["Understanding Session State Management"](#)
- ["About Publishing the Database Application URL"](#)

3.7.2.2 About Using f?p Syntax to Link Pages

Create links between application page using f?p syntax.

App Builder includes many wizards that automatically create these references for you. However, you may have to create the syntax yourself in some situations.

To create links between pages in an application, use the following `f?p` syntax:

```
f?p=App:Page:Session:Request:Debug:ClearCache:itemNames:itemValues:PrinterFriendly
```

The following table describes the arguments you can pass when using `f?p` syntax.

Table 3-1 f?p Syntax Arguments

Syntax	Description
App	<p>Indicates an application ID or alphanumeric application alias.</p> <p>An application alias is a unique alternate alphanumeric application identifier that developers can use in place of the application ID. You define an Application Alias editing the Application Definition.</p> <p>See Also: "Managing Application Attributes"</p>
Page	<p>Indicates a page number or alphanumeric page alias.</p> <p>A page alias is a unique alternate alphanumeric for a page number. Developers can use a page alias in place of the page number ID. You define a Page Alias by editing the page attributes.</p> <p>See Also: "Managing Page Attributes"</p>
Session	<p>Identifies a session ID. You can reference a session ID to create hypertext links to other pages that maintain the same session state by passing the session number. You can reference the session ID using the syntax:</p> <ul style="list-style-type: none"> • Short substitution string: <code>&SESSION</code>. • PL/SQL: <code>V('SESSION')</code> • Bind variable: <code>:APP_SESSION</code>
Request	<p>Sets the value of <code>REQUEST</code>. Each application button sets the value of <code>REQUEST</code> to the name of the button which enables accept processing to reference the name of the button when a user clicks it. You can reference <code>REQUEST</code> using the syntax:</p> <ul style="list-style-type: none"> • Substitution string: <code>&REQUEST</code>. • PL/SQL: <code>V('REQUEST')</code> • Bind variable: <code>:REQUEST</code>
Debug	<p>Displays application processing details. Valid values for the <code>DEBUG</code> flag include:</p> <ul style="list-style-type: none"> • YES. • <code>LEVELn</code> • NO <p>Setting this flag to <code>YES</code> displays details about application processing. Setting this flag to <code>LEVELn</code> (where <code>n</code> is between 1 and 9) controls the level of debug detail that displays. The value of <code>YES</code> equals <code>LEVEL4</code>.</p> <p>You can reference the Debug flag using the following syntax:</p> <ul style="list-style-type: none"> • Short substitution string: <code>&DEBUG</code>. • PL/SQL: <code>V('DEBUG')</code> • Bind variable: <code>:DEBUG</code> <p>See Also: "Debugging an Application"</p>

Table 3-1 (Cont.) f?p Syntax Arguments

Syntax	Description
ClearCache	<p>Clears the cache. This sets the value of items to null.</p> <p>To clear cached items on a single page, specify the numeric page number. To clear cached items on multiple pages, use a comma-separated list of page numbers. Clearing a page's cache also resets any stateful processes on the page. Individual or comma-separated values can also include collection names to be reset or the keyword <code>RP</code>, which resets region pagination on the requested page. The keyword <code>APP</code> clears cache for all pages and all application-level items in the current application and removes sort preferences for the current user. The keyword <code>SESSION</code> achieves the same result as the <code>APP</code> keyword, but clears items associated with all applications that have been used in the current session.</p> <p>See Also: "Clearing Session State"</p>
itemNamees	Comma-delimited list of item names used to set session state with a URL.
itemValues	<p>List of item values used to set session state within a URL. To pass a comma in an item value, enclose the characters with backslashes. For example:</p> <pre>\123,45\</pre> <p>Every character sequence except backslash comma (\,) can be enclosed with backslash.</p>
PrinterFriendly	<p>Determines if the page is being rendered in printer friendly mode. If <code>PrinterFriendly</code> is set to <code>Yes</code>, then the page is rendered in printer friendly mode. The value of <code>PrinterFriendly</code> can be used in rendering conditions to remove elements such as regions from the page to optimize printed output. You can reference the printer friendly preference by using the following syntax:</p> <pre>V('PRINTER_FRIENDLY')</pre> <p>When referenced, the page displays using a printer friendly template. The Application Express engine displays all text within HTML form fields as text. The printer friendly template does not need to have the <code>#FORM_OPEN#</code> or <code>#FORM_CLOSE#</code> tags. The objective is to be able to display information with few tables and in a format suitable for printing.</p>

3.7.2.3 Calling a Page Using an Application Alias or Page Alias

Use URL syntax to call a page using an application alias and/or page alias.

Application and page aliases must consist of valid Oracle identifiers, cannot contain any whitespace, and cannot be case-sensitive. The following example calls a page from within an application using an application alias and a page alias. This example runs the page `home` of the application `myapp` and uses the current session ID.

```
f?p=myapp:home:&APP_SESSION.
```

Application aliases must be unique within a workspace. If an application in a different workspace has the same application alias, use the `&c` argument to specify the workspace name. For example:

```
f?p=common_alias:home:&APP_SESSION.&c=WORKSPACE_A
```

3.7.2.4 Calling a Page from a Button URL

Use URL syntax to call a page from a button URL.

When you create a button, you can specify a URL to redirect to when the user clicks the button. This example runs page 6001 of application 6000 and uses the current session ID.

```
f?p=6000:6001:&APP_SESSION.
```

Note that this is only one approach to using a button. This method bypasses page submission and acts as a hyperlink on the page. You can also have a button click submit a page. In that approach, clicking the button submits the page for processing, allowing forms to be submitted and session state to be saved.



See Also:

"[Managing Buttons](#)" and "[APP_SESSION](#)"

3.7.3 Hiding the Session ID on Public Pages

Hide the session ID in a URL by making a page public.

By default, all pages require Authentication. However, if a page is public and the user has not signed in, the page URL will not display the session ID.



Tip:

For security reasons, Oracle recommends that administrators disable Rejoin Sessions unless they implement workspace isolation by configuring the Allow Hostname attribute at the workspace or instance-level. See "[About Isolating Workspaces](#)."

1. To specify a page as public:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. At the Application-level, edit the **Rejoin Session** attribute:
 - a. Click the **Edit Application Properties** button.
The Application Definition appears.
 - b. Click **Security**.
 - c. Under **Session Management**, set **Rejoin Sessions** to **Enabled for Public Sessions**.
 - d. Click **Apply Changes** to save your changes.
 4. At the page-level, edit the **Authentication** attribute:
 - a. View the page in Page Designer.

The Application Definition appears.

- b. In the Rendering tab, select the page name..
- c. Under Security, for Authentication, select **Page is Public**.
- d. Click **Apply Changes** to save your changes.



See Also:

- ["About Rejoin Sessions"](#)
- ["About Enabling Support for Bookmarks"](#)
- ["Session Management"](#)
- ["Configuring Rejoin Sessions for a Page "](#)
- ["Configuring Rejoin Sessions for an Instance" in *Oracle Application Express Administration Guide*](#)

3.8 Managing Session State Values

Manage session state to store and retrieve values for a user as the user navigates between different application pages.

When building interactive, data-driven web applications, the ability to access and manage session state values is critical. In Oracle Application Express, session state is automatically managed for every page and easily referenced in static HTML or logic controls such as processes or validations.

- [About Referencing Session State](#)
Reference item values stored in session state in regions, computations, processes, validations, and branches. An item can be a field, a text area, a password, a select list, or a check box.
- [About Setting Session State](#)
Set session state using form submissions, bind variables, computations, or f?p syntax.
- [Clearing Session State](#)
Clearing a cached value resets the value to null. You can clear the cached value for specific items, all items on a page, all pages in an application, or the current user session.
- [Referencing Session State Using Bind Variable Syntax](#)
Use bind variable syntax anywhere where you are using SQL or PL/SQL to reference session state of a specified item.
- [About Session Cloning](#)
Use session cloning to open a new browser window in an Oracle Application Express application and have it generate a new distinct session identifier and copy the session values from the original Application Express session to the new one.

**See Also:**

"[Understanding Session State Management](#)" and "[Referencing Item Values](#)"

3.8.1 About Referencing Session State

Reference item values stored in session state in regions, computations, processes, validations, and branches. An item can be a field, a text area, a password, a select list, or a check box.

The following table describes the supported syntax for referencing item values.

Table 3-2 Syntax for Referencing Item Values

Type	Syntax	Description
SQL	Standard item syntax: :MY_ITEM Syntax for items containing special characters: :"MY_ITEM"	For items whose names are no longer than 30 characters, precede the item name with a colon (:). Use this syntax for references within a SQL query and within PL/SQL. To reference page items containing special, multibyte, or unicode characters, wrap the page item name in double quotation marks.
PL/SQL	V('MY_ITEM')	Use PL/SQL syntax to reference an item value using the V function. You can use the shorthand, V function, in place of APEX_UTIL.GET_SESSION_STATE. Use this syntax when utilizing Oracle Application Express variables directly within an Oracle database object, such as a function, trigger, or Oracle Data Redaction policy. See Also: <i>Oracle Application Express API Reference</i>
PL/SQL	NV('MY_NUMERIC_ITEM')	Use standard PL/SQL syntax referencing the numeric item value using the NV function. You can use the shorthand, NV function, in place of APEX_UTIL.GET_NUMERIC_SESSION_STATE. See Also: <i>Oracle Application Express API Reference</i>
Static text (exact)	Standard item syntax: &MY_ITEM. Syntax for items containing special characters: &"MY_ITEM".	For static text or an exact substitution, use the convention &ITEM_NAME followed by a period (.). To reference page items containing special, multibyte, or unicode characters, wrap the page item name in double quotation marks.

3.8.2 About Setting Session State

Set session state using form submissions, bind variables, computations, or f?p syntax.

Methods for Setting Session State

You can set the value of a page item in your application and therefore set session state using the following methods:

- Form submission. See the next section.

- Bind variable. See "[Referencing Session State Using Bind Variable Syntax.](#)"
- Computation. See "[Understanding Application Computations.](#)"
- f?p syntax. See "[About Using f?p Syntax to Link Pages.](#)"

About Setting Session State with a Form Submission

When a user submits a page, the Application Express engine automatically stores values typed into fields (items) in session state. For example, suppose you have an application containing two pages. The first page of the application contains a form in which a user can enter a phone number. You defined this form by creating an item named `P1_PHONENO`. On the second page, you want to display the information the user enters in the form.

When the page is submitted, Oracle Application Express captures the value entered in the phone number field and stores the value for future use. On the second page, the phone number entered by the user can then be retrieved from session state using the name `P1_PHONE_NO` with the appropriate syntax from [Table 3-2](#).

About Controlling How Items Write Session State

You can control whether a page item writes its session state into persistent (disk) session state or just into memory by configuring the item attribute, **Maintain Session State**. Available Maintain Session State options include:

- **Per Request (Memory Only)** - Do not save state in the database. State is only available when processing the current request. When AJAX requests need to use an item, make sure to pass the item name using the Page Items To Submit attribute.
- **Per Session (Disk)** - Maintain for each session by storing the value in the database, to access it across requests.
- **Per User (Disk)** - Value is saved in a user attribute repository and it is also available for later APEX sessions.

Note:

When creating database items that work with a Form region (for example as part of a wizard), **Per Request (Memory Only)** is the default. **Per User (Disk)** is not available for these items.

See Also:

["Controlling How Page Items Write Session State"](#)

3.8.3 Clearing Session State

Clearing a cached value resets the value to null. You can clear the cached value for specific items, all items on a page, all pages in an application, or the current user session.

- [About Clearing Cache for an Item](#)
- [About Clearing Cache for All Page Items](#)
- [About Clearing Report Regions](#)
- [Clearing Cache for an Entire Application](#)
- [About Resetting an Application Completely](#)
- [About Clearing Cache for the Current User Session](#)

3.8.3.1 About Clearing Cache for an Item

Clearing cache for a single item resets the value of the item to null. For example, you might use this approach to make sure a specific item's value is null when a page is prepared for rendering.

Example 3-1 Example: Clearing Cache for an Item

The following example uses standard `f?p` syntax to clear the cache for an item. This example calls page 5 of application 100. Placing `MY_ITEM` in the `ClearCache` position of the `f?p` syntax resets the value of `MY_ITEM` to `NULL`.

```
f?p=100:5:&APP_SESSION.::NO:MY_ITEM
```

The following example resets the value of the items `THE_EMPNO` and `THE_DEPTNO`:

```
f?p=100:5:&APP_SESSION.::NO:THE_EMPNO,THE_DEPTNO
```

3.8.3.2 About Clearing Cache for All Page Items

Caching application items is an effective way to maintain session state. However, there are occasions when you may want to clear the cache for all items on a page. For example, suppose you needed to clear all fields on a page when a user clicks a link that creates a new order. By clearing the cache for an entire page, you set the value of all items on the page to null.

Example 3-2 Example: Clearing Cache for Two Pages and Resetting Pagination

This example clears the session cache for two pages and resets pagination.

```
f?p=6000:6003:&APP_SESSION.::NO:RP,6004,6014
```

This example:

- Runs page 6003 of application 6000 and uses the current session ID.
- Indicates to not show debug information (`NO`).
- Clears all values maintained by the current session's cache for items of pages 6004 and 6014.
- Resets region pagination (`RP`) on page 6003 (the requested page).

Example 3-3 Example: Clearing Cache on a Page and Passing an Item Value

This example shows how to implement an update form. It clears existing information and sets the item's value (typically a primary key).

```
f?p=6000:6003:&APP_SESSION.::NO:6003:MY_ITEM:1234
```

This example:

- Runs page 6003 of application 6000 and uses the current session ID
- Indicates to not show debug information (NO)
- Clears all values maintained by the current session's cache for items on page 6003
- Sets the session state of an item called MY_ITEM to the value 1234

Example 3-4 Example: Clearing Session Cache on a Page and Passing Values to Multiple Items

This example demonstrates how to implement an update form. It clears existing information, sets the item's value (typically a primary key), and passes values to multiple items.

```
f?p=6000:6004:&APP_SESSION.::NO:6003:MY_ITEM1,MY_ITEM2,MY_ITEM3:1234,,5678
```

This example:

- Runs page 6004 of application 6000 and uses the current session ID
- Clears the current session's cache for items on page 6003
- Indicates to not show debug information (NO)
- Sets the value of MY_ITEM1 to 1234, sets the value of MY_ITEM2 to null (indicated by the comma used as placeholder), and sets the value of MY_ITEM3 to 5678

3.8.3.3 About Clearing Report Regions

Report settings can be cached. Depending on the report types, different settings are cached. Use the following to clear report cache settings:

- RR - Resets interactive report, interactive grids, or classic report and also resets report pagination. If the target page contains interactive report or interactive grids, the report is returned to the default report settings specified by the developer or saved by the user. If the target page contains classic report, the report sorting resets to developer defined sorting.
- CR - This applies only to interactive report. CR clears interactive report and resets report pagination. This clears all of the session report settings such as control break, aggregate, flashback, chart, number of rows to display, filter, highlight, computation, group by, and pivot.
- RP - Resets interactive report or classic report pagination.

Example 3-5 Resetting Report Settings and Pagination

This example resets report settings and pagination of the target page report regions:

```
f?p=6000:6003:&APP_SESSION.::NO:RR
```

Note:

Starting with Oracle Application Express release 2.1, you do not need to define separate clear cache syntax to reset report and reset pagination. RR will handle both.

3.8.3.4 Clearing Cache for an Entire Application

This example clears the application's cache by using `f?p` syntax and creating a `Clear Cache` argument using the keyword `APP`.

```
f?p=App:Page:Session::NO:APP
```

3.8.3.5 About Resetting an Application Completely

Resetting the cache for an entire application does not restore the application to a completely reset state. For example, if an application includes on-new instance computations or on-new instance processes, the Application Express engine runs these computations and processes when the application session is created. Then, it processes the clear cache request and displays the requested page.

To reset an application completely without a session ID (if no cookie is used to track the session ID), you must request it using a URL without a session ID, or by calling `APEX_UTIL.CLEAR_APP_CACHE` from another application. If the session ID is tracked using a cookie, you must logout to reset the state.

3.8.3.6 About Clearing Cache for the Current User Session

Another approach to clearing an application's cache is to create a `Clear Cache` argument using the keyword `SESSION`. For example:

```
f?p=6000:6004:12507785108488427528::NO:SESSION
```

3.8.4 Referencing Session State Using Bind Variable Syntax

Use bind variable syntax anywhere where you are using SQL or PL/SQL to reference session state of a specified item.

- [About Using Bind Variable Syntax](#)
- [About Using Bind Variables in Regions Based on a SQL Query or LOV](#)
- [About Using Bind Variables in Regions Based on PL/SQL](#)

3.8.4.1 About Using Bind Variable Syntax

In the following example, the search string is a page item.

```
SELECT * FROM employees WHERE last_name like '%' || :SEARCH_STRING || '%'
```

If the region type is defined as SQL Query, you can reference the value using standard SQL bind variable syntax. Using bind variables ensures that parsed representations of SQL queries are reused by the database, optimizing memory usage by the server.

When using bind variable syntax, remember the following rules:

- Bind variable names must correspond to an item name.
- Bind variable names are not case-sensitive.
- Bind variable names cannot be longer than 30 characters (that is, they must be a valid Oracle identifier).

Although page item and application item names can be up to 255 characters, if you intend to use an application item within SQL using bind variable syntax, the item name must be 30 characters or less.

- The data type of bind variables is always `VARCHAR2`. When a bind variable semantically contains a datetime or numeric value, you must perform an explicit conversion to the appropriate data type. For example:

```
SELECT * FROM employees WHERE start_date < to_date(:DATE_STRING,  
'DD-MON-YYYY')
```

3.8.4.2 About Using Bind Variables in Regions Based on a SQL Query or LOV

If your region type is defined as a SQL Query, SQL Query (plsql function body returning SQL query), or list of values (LOV), you can reference session state using the following syntax:

```
:MY_ITEM
```

One common way to do this is to incorporate a session state variable in a `WHERE` clause. The following example shows how to bind the value of the item `THE_DEPTNO` into a region defined from a SQL Query.

```
SELECT last_name, job_id, salary  
FROM employees  
WHERE department_id = :THE_DEPTNO
```



See Also:

["About Regions"](#) for information about creating regions

3.8.4.3 About Using Bind Variables in Regions Based on PL/SQL

For region types, processes, computations, validations, conditions, and so on that are defined as PL/SQL dynamic content, regions are constructed using PL/SQL anonymous block syntax. In other words, the beginning and ending keywords are used to enclose the PL/SQL block. For example:

```
IF :P1_JOB IS NOT NULL THEN  
  INSERT INTO employees (employee_id, first_name, job_id)  
  VALUES (:P1_EMP_ID, :P1_NAME, :P1_JOB)  
end if;
```

In this example, the values of the `employee_id`, `first_name`, and `job_id` are populated by the values of `P1_EMP_ID`, `P1_NAME`, and `P1_JOB`.

3.8.5 About Session Cloning

Use session cloning to open a new browser window in an Oracle Application Express application and have it generate a new distinct session identifier and copy the session values from the original Application Express session to the new one.

In previous releases, opening multiple windows (or browser tabs) in the same Oracle Application Express application resulted in a number of issues. Typically, all the browser tabs shared the same session and session state which resulted in unpredictable and undesirable results.

To use session cloning, the developer must provide a method for end user to open a new browser tab and specify the `REQUEST` value of `APEX_CLONE_SESSION`. The following is an example URL:

```
f?p=&APP_ID. :&APP_PAGE_ID. :&APP_SESSION. :APEX_CLONE_SESSION
```

Best Practices When Using Session Cloning

When using this session cloning, developers should remember:

- The idle time associated with the Application Express session would be affected by any of the Application Express sessions, original or cloned ones.
- When a user logs out of one session (original or cloned), all other associated sessions will be logged out.
- The maximum session duration would be a function of the original Application Express session and when it was created.
- An administrative user can enable or disable this feature using the procedure:

```
apex_instance_admin.set_parameter(  
    p_parameter => 'CLONE_SESSION_ENABLED',  
    p_value     => 'Y');
```

See Also:

Oracle Application Express API Reference

3.9 Using Substitution Strings

Use substitution strings within templates, region source, or any attribute that specifies supported for substitutions to pass information and replace a character string with another value.

Note:

If an attribute supports substitutions, Page Designer help includes the section called, **Additional Information** which describes the supported substitution strings. See "[Viewing Help in Page Designer](#)."

- [About Using Substitution Strings](#)
- [Controlling Output Escaping in Substitution Strings](#)
- [About Determining Substitution String Usage within Templates](#)

- [Using Built-in Substitution Strings](#)

3.9.1 About Using Substitution Strings

You can use substitution strings in App Builder in the following ways:

- Include a substitution string within a template to reference component values
- Reference page or application items using `&ITEM.` syntax
- Use built-in substitution strings

Substitution Strings within Templates

Special substitution strings available within a template are denoted by the number symbol (#). For example:

```
#ABC#
```

Tip:

You can also use JavaScript API `apex.util.applyTemplate` to evaluate templates on the client side. See "[applyTemplate](#)" in *Oracle Application Express JavaScript API Reference*.

Substitution Strings for Page or Application Items

To reference page or application items using substitution variables:

1. Reference the page or application item in all capital letters.
2. Precede the item name with an ampersand (&).
3. Append a period (.) to the item name.

For example, you would refer to an application item named `F101_X` in a region, a region title, an item label, or in any of numerous other contexts in which static text is used, for example:

```
&F101_X.
```

Tip:

Notice the required trailing period. When the page is rendered, Application Express engine replaces the value the substitution string with the value of the item `F101_X`.

Substitution Strings for Interactive Grid, Cards, and Map Columns

To reference columns in an interactive grid, cards page, or map page using substitution variables:

1. Reference the column name in all capital letters.
2. Precede the column name with an ampersand (&).

3. Append a period (.) to the item name.

For example, to reference the interactive grid column `ENAME`:

```
&ENAME.
```

Substitution Strings for Other Report Columns

To reference columns in other reports using substitution variables:

1. Reference the column name in all capital letters.
2. Precede the column name with a pound sign (#).
3. Append a pound sign (#) to the item name.

For example, to reference the interactive or classic report column `ENAME`:

```
#ENAME#
```

Using Double Quotation Marks for Special Characters or Case Sensitivity

Enclose items or columns with double quotation marks if the name contains special characters or is case sensitive. For example:

```
&"ITEM-OR-COLUMN-NAME".
```

Use the following syntax:

```
&"<name>"[!<format>].
```

Where:

- "`<name>`" is an application item or page item or column name. If not quoted, then it must be in set A-Z-0-9_#\$
- "`<name>`" is `APP_TEXT$<message-name>`
Where `<message-name>` is an Application Express text message name.
- `<format>` is a predefined filter name: HTML, ATTR, JS, RAW, STRIPHTML as described in ["Controlling Output Escaping in Substitution Strings."](#)

3.9.2 Controlling Output Escaping in Substitution Strings

You can escape special characters in the substitution value by appending an exclamation mark (!) followed by a predefined filter name to a page or application item name, report column, or other substitution string. Output escaping is an important security technique to avoid Cross Site Scripting (XSS) attacks in the browser. Oracle Application Express already makes a best effort to automatically escape characters in a HTML or JavaScript context. With this extended syntax, developers have fine grained control over the output.

Available Escape Filters

Available escape filters include:

- HTML escapes reserved HTML characters, for example:

```
– Item:  
  &P1_DEPTNO!HTML.
```

- Interactive grid column:
`&ENAME!HTML.`
- Columns in other reports:
`#ENAME!HTML#`

 **See Also:**

"APEX_ESCAPE.HTML" in *Oracle Application Express API Reference*

- ATTR escapes reserved characters in a HTML attribute context, for example:
 - Interactive grid column:
`&ENAME!ATTR.`
 - Columns in other reports:
`#ENAME!ATTR#`

 **See Also:**

"APEX_ESCAPE.HTML_ATTRIBUTE" in *Oracle Application Express API Reference*

- JS escapes reserved characters in a JavaScript context, for example:
 - Item:
`&P1_DEPTNO!JS.`
 - Interactive grid column:
`&ENAME!JS.`
 - Columns in other reports:
`#ENAME!JS#`

 **Note:**

The JS escape filter is not supported by substitutions performed on the client.

 **See Also:**

"APEX_ESCAPE.JS_LITERAL" in *Oracle Application Express API Reference*

- RAW preserves the original item value and does not escape characters, for example:

- Item:
`&P1_DEPTNO!RAW.`
- Interactive grid column:
`&ENAME!RAW.`
- Columns in other reports:
`#ENAME!RAW#`
- STRIPHTML removes HTML tags from the output and escapes reserved HTML characters, for example:
 - Item:
`&P1_DEPTNO!STRIPHTML.`
 - Interactive grid column:
`&ENAME!STRIPHTML.`
 - Columns in other reports:
`#ENAME!STRIPHTML#`

3.9.3 About Determining Substitution String Usage within Templates

You can determine what template-specific substitution strings are supported in which templates by viewing the template definition. See "[Creating Custom Themes.](#)"

3.9.4 Using Built-in Substitution Strings

App Builder supports many built-in substitution strings. You can reference these substitution strings to achieve specific types of functionality.

 **Tip:**

Note that bind variable `:USER` has special meaning within the database. Also, the term **Direct PL/SQL** refers to PL/SQL that can be used in stored database objects such as procedures and functions.

- [APEX\\$ROW_NUM](#)
- [APEX\\$ROW_SELECTOR](#)
- [APEX\\$ROW_STATUS](#)
- [APP_ID](#)
- [APP_ALIAS](#)
- [APP_AJAX_X01, ... APP_AJAX_X10](#)
- [APP_BUILDER_SESSION](#)
- [APP_DATE_TIME_FORMAT](#)
- [APP_IMAGES](#)

- APP-NLS_DATE_FORMAT
- APP-NLS_TIMESTAMP_FORMAT
- APP-NLS_TIMESTAMP_TZ_FORMAT
- APP_PAGE_ALIAS
- APP_PAGE_ID
- APP_REGION_ID
- APP_REGION_STATIC_ID
- APP_REQUEST_DATA_HASH
- APP_SESSION
- APP_SESSION_VISIBLE
- APP_TITLE
- APP_UNIQUE_PAGE_ID
- APP_USER
- AUTHENTICATED_URL_PREFIX
- BROWSER_LANGUAGE
- CURRENT_PARENT_TAB_TEXT
- DEBUG
- HOME_LINK
- IMAGE_PREFIX
- JET_BASE_DIRECTORY
- JET_CSS_DIRECTORY
- JET_JS_DIRECTORY
- LOGIN_URL
- LOGOUT_URL
- APP_TEXT\$Message_Name, APP_TEXT\$Message_Name\$Lang
- PRINTER_FRIENDLY
- PROXY_SERVER
- PUBLIC_URL_PREFIX
- REQUEST
- Using REQUEST
- SCHEMA_OWNER
- SQLERRM
- SYSDATE_YYYYMMDD
- THEME_DB_IMAGES
- THEME_IMAGES
- WORKSPACE_IMAGES
- WORKSPACE_ID

**See Also:**

"Substitutions" and "Establishing User Identity Through Authentication"

3.9.4.1 APEX\$ROW_NUM

APEX\$ROW_NUM refers the currently processed row number of a submitted tabular form data. You can use this placeholder in validations, processes, and conditions associated with a tabular form to refer to the row number of the currently processed tabular form row.

Table 3-3 APEX\$ROW_NUM Syntax

Reference Type	Syntax
Bind variable	:APEX\$ROW_NUM
PL/SQL	V('APEX\$ROW_NUM')
Substitution string	&APEX\$ROW_NUM.

3.9.4.2 APEX\$ROW_SELECTOR

Use APEX\$ROW_SELECTOR in validations, processes, and conditions associated with a tabular form to refer to the row selector check box in a tabular form. This placeholder returns `x` if the tabular form row selector check box of the currently processed tabular form row is checked and `NULL` if it unchecked.

Table 3-4 APEX\$ROW_SELECTOR Syntax

Reference Type	Syntax
Bind variable	:APEX\$ROW_SELECTOR
PL/SQL	V('APEX\$ROW_SELECTOR')
Substitution string	&APEX\$ROW_SELECTOR.

3.9.4.3 APEX\$ROW_STATUS

Use APEX\$STATUS in validations, processes, and conditions associated with a tabular form to refer to the row status in a tabular form. This placeholder returns the status of `C` if created, `U` if updated, or `D` if deleted for the currently processed tabular form row.

Table 3-5 APEX\$ROW_STATUS Syntax

Reference Type	Syntax
Bind variable	:APEX\$ROW_STATUS
PL/SQL	V('APEX\$ROW_STATUS')
Substitution string	&APEX\$ROW_STATUS.

3.9.4.4 APP_ID

APP_ID identifies the application ID of the currently executing application.

Table 3-6 APP_ID Syntax

Reference Type	Syntax
Bind variable	:APP_ID
Direct PL/SQL	APEX_APPLICATION.G_FLOW_ID (A NUMBER)
PL/SQL	NV('APP_ID')
Substitution string	&APP_ID.
SYS_CONTEXT variable	SYS_CONTEXT('APEX\$SESSION', 'APP_ID')

Substitution String Reference Example

The following is an example of a substitution string reference:

```
f?p=&APP_ID.:40:&APP_SESSION.
```

SYS_CONTEXT Variable Example

The following is a SYS_CONTEXT variable example:

```
SELECT ... WHERE application_id = SYS_CONTEXT('APEX$SESSION', 'APP_ID')
```

Oracle Application Express sets up the APEX\$SESSION context when it starts to process an incoming request. For example, you can use the value of 'APP_ID' to access the current application ID in queries and Virtual Private Database (VPD) security policies that protect your table data.

3.9.4.5 APP_ALIAS

APP_ALIAS is an alphanumeric name for the current application. APP_ALIAS is different from the APP_ID in that the APP_ID must be unique over all workspaces and all applications hosted in one database. In contrast, APP_ALIAS must be unique within a workspace. For example, by using the same APP_ALIAS you can create the application, ABC, in two different workspaces. You can use APP_ALIAS almost anywhere APP_ID can be used. For example, f?p syntax can use an APP_ALIAS or an application ID as demonstrated in this example:

```
f?p=ABC:1:&APP_SESSION.
```

This example runs application ABC, page 1 using the current session.

Table 3-7 APP_ALIAS Syntax

Reference Type	Syntax
Bind variable	:APP_ALIAS
PL/SQL	V('APP_ALIAS')
Substitution string	&APP_ALIAS.

The following is an HTML example:

```
Click me to go to page 1 <a href="f?p=&APP_ALIAS.:1:&APP_SESSION."> of the current
application</a>
```

3.9.4.6 APP_AJAX_X01, ... APP_AJAX_X10

APP_AJAX_Xnn specifies the values of the APP_AJAX_X01, ... APP_AJAX_X10 URL parameters most recently passed to or set within the show or accept modules. You typically use these variables in On Demand AJAX processes.

Table 3-8 APP_AJAX_Xnn Syntax

Reference Type	Syntax
Bind variable	... :APP_AJAX_X01, ... :APP_AJAX_X10
PL/SQL	... v('APP_AJAX_X01'), ... v('APP_AJAX_X10')
Substitution string	... &APP_AJAX_X01., ... &APP_AJAX_X10.

See Also:

G_X01, ... G_X10 variables in the APEX_APPLICATION in Oracle Application Express API Reference

3.9.4.7 APP_BUILDER_SESSION

If the user is also logged in to the workspace as a developer, APP_BUILDER_SESSION contains the current session ID of the development environment. Otherwise, APP_BUILDER_SESSION is null.

Table 3-9 APP_BUILDER_SESSION Syntax

Reference Type	Syntax
Bind variable	:APP_BUILDER_SESSION
PL/SQL	V('APP_BUILDER_SESSION')
Substitution string	&APP_BUILDER_SESSION.

3.9.4.8 APP_DATE_TIME_FORMAT

APP_DATE_TIME_FORMAT is the application date time format of the application. This value reflects the format specified in the Application Date Time Format attribute of the Globalization settings of an application. If the Application Date Time Format is not set in an application, then a reference to APP_DATE_TIME_FORMAT returns the database session NLS date format and the NLS time format.

Table 3-10 APP_DATE_TIME_FORMAT Syntax

Reference Type	Syntax
Bind variable	:APP_DATE_TIME_FORMAT
PL/SQL	V('APP_DATE_TIME_FORMAT')
Substitution string	&APP_DATE_TIME_FORMAT.

3.9.4.9 APP_IMAGES

Use this substitution string to reference uploaded images, JavaScript, and cascading style sheets that are specific to a given application and are not shared over many applications. If you upload a file and make it specific to an application, then you must use this substitution string, or bind variable.

Table 3-11 APP_IMAGES Syntax

Reference Type	Syntax
Bind variable	:APP_IMAGES
Direct PL/SQL	Not available.
PL/SQL	V('APP_IMAGES')
Substitution string	&APP_IMAGES.
Template substitution	#APP_IMAGES#



See Also:

"IMAGE_PREFIX," "WORKSPACE_IMAGES," and "About Managing Images"

3.9.4.10 APP_NLS_DATE_FORMAT

APP_NLS_DATE_FORMAT is the application date format of the database session. This value reflects the format specified in the Application Date Format attribute of the Globalization settings of the application. However, if the Application Date Format is not set, then APP_NLS_DATE_FORMAT returns the NLS_DATE_FORMAT value of the database session at the start of the request to the Application Express engine.

Table 3-12 APP_NLS_DATE_FORMAT Syntax

Reference Type	Syntax
Bind variable	:APP_NLS_DATE_FORMAT
PL/SQL	V('APP_NLS_DATE_FORMAT')
Substitution string	&APP_NLS_DATE_FORMAT.

3.9.4.11 APP_NLS_TIMESTAMP_FORMAT

APP_NLS_TIMESTAMP_FORMAT is the application timestamp format of the database session. This value reflects the format specified in the Application Timestamp Format attribute of the Globalization settings of the application. However, if the Application Timestamp Format is not set, then APP_NLS_TIMESTAMP_FORMAT return the NLS_TIMESTAMP_FORMAT value of the database session at the start of the request to the Application Express engine.

Table 3-13 APP_NLS_TIMESTAMP_FORMAT Syntax

Reference Type	Syntax
Bind variable	:APP_NLS_TIMESTAMP_FORMAT
PL/SQL	V('APP_NLS_TIMESTAMP_FORMAT')
Substitution string	&APP_NLS_TIMESTAMP_FORMAT.

3.9.4.12 APP_NLS_TIMESTAMP_TZ_FORMAT

APP_NLS_TIMESTAMP_TZ_FORMAT is the application timestamp time zone format of the database session. This value reflects the format specified in the Application Timestamp Time Zone Format attribute of the Globalization settings of an application. However, if the Application Timestamp Time Zone Format is not set, then APP_NLS_TIMESTAMP_TZ_FORMAT returns the NLS_TIMESTAMP_TZ_FORMAT value of the database session at the start of the request to the Application Express engine.

Table 3-14 APP_NLS_TIMESTAMP_TZ_FORMAT Syntax

Reference Type	Syntax
Bind variable	:APP_NLS_TIMESTAMP_TZ_FORMAT
PL/SQL	V('APP_NLS_TIMESTAMP_TZ_FORMAT')
Substitution string	&APP_NLS_TIMESTAMP_TZ_FORMAT.

3.9.4.13 APP_PAGE_ALIAS

APP_PAGE_ALIAS is an alphanumeric name for the current application page. A page alias is not case-sensitive and it is an optional page attribute. APP_PAGE_ALIAS is unique within an application. You can use APP_PAGE_ALIAS almost anywhere APP_PAGE_ID can be used.

Table 3-15 APP_PAGE_ALIAS Syntax

Reference Type	Syntax
Bind variable	:APP_PAGE_ALIAS
PL/SQL	v('APP_PAGE_ALIAS')
Substitution string	&APP_PAGE_ALIAS.

The following is an HTML example:

The alias of the current page is: &APP_PAGE_ALIAS.

3.9.4.14 APP_PAGE_ID

APP_PAGE_ID is the current application page ID. For example, if your application was on page 3, then the result would be 3. Using this syntax is useful when writing application components that must work generically in multiple applications.

Table 3-16 APP_PAGE_ID Syntax

Reference Type	Syntax
Bind variable	:APP_PAGE_ID
PL/SQL	:APP_PAGE_ID
PL/SQL and Direct PL	NV('APP_PAGE_ID')
Substitution string	&APP_PAGE_ID.

The following is an example of a substitution string reference:

```
f?p=&APP_ID. :&APP_PAGE_ID. :&APP_SESSION.
```

3.9.4.15 APP_REGION_ID

APP_REGION_ID identifies the ID of the current executing region.

Table 3-17 APP_REGION_ID Syntax

Reference Type	Syntax
Bind variable	:APP_REGION_ID
PL/SQL	v('APP_REGION_ID')
Substitution string	&APP_REGION_ID.

3.9.4.16 APP_REGION_STATIC_ID

APP_REGION_STATIC_ID identifies the static ID of the current executing region. If no static ID has been entered by a developer, NULL is returned.

Table 3-18 APP_REGION_STATIC_ID Syntax

Reference Type	Syntax
Bind variable	:APP_REGION_STATIC_ID
PL/SQL	v('APP_REGION_STATIC_ID')
Substitution string	&APP_REGION_STATIC_ID.

3.9.4.17 APP_REQUEST_DATA_HASH

APP_REQUEST_DATA_HASH is a hash value of the request, item name, and item value parts in the URL. It is primarily useful to detect whether two browser requests passed different parameters to Oracle Application Express.

Table 3-19 APP_REQUEST_DATA_HASH Syntax

Reference Type	Syntax
Bind variable	:APP_REQUEST_DATA_HASH
PL/SQL	V('APP_REQUEST_DATA_HASH')
Substitution string	&APP_REQUEST_DATA_HASH.

3.9.4.18 APP_SESSION

APP_SESSION is the most commonly used built-in substitution strings. You can use this substitution string to create hypertext links between application pages that maintain a session state by passing the session number. Note that you can also use the substitution string SESSION in place of APP_SESSION.

Table 3-20 APP_SESSION Syntax

Reference Type	Syntax
Bind variable	:APP_SESSION
PL/SQL	V('APP_SESSION')
Short PL/SQL	V('SESSION')
Substitution string	&APP_SESSION.
SYS_CONTEXT variable	SYS_CONTEXT('APEX\$SESSION', 'APP_SESSION')

Consider the following examples:

- From within an HTML region:

```
<a href="f?p=100:5:&APP_SESSION.">click me</a>
```

- Using PL/SQL:

```
htf.anchor('f?p=100:5:'||V('APP_SESSION'),'click me');
```

- Using a SQL query:

```
SELECT htf.anchor('f?p=100:5:'||:APP_SESSION,'click me') FROM DUAL;
```

- Using the SYS_CONTEXT variable:

```
SELECT ... WHERE apex_session_id = SYS_CONTEXT('APEX$SESSION', 'APP_SESSION')
```

Oracle Application Express sets up the APEX\$SESSION context when it starts to process an incoming request. For example, you can use the value of 'APP_SESSION' to access the current application session in queries and VPD (Virtual Private Database) security policies that protect your table data.

3.9.4.19 APP_SESSION_VISIBLE

APP_SESSION_VISIBLE is similar to the built-in substitution APP_SESSION. Use this substitution string to create hypertext links between application pages that maintain a session state by passing the session number. APP_SESSION_VISIBLE always returns '0' when users are not authenticated to an application and they are using the Zero Session ID feature of Oracle Application Express.

Table 3-21 APP_SESSION_VISIBLE Syntax

Reference Type	Syntax
Bind variable	:APP_SESSION_VISIBLE
PL/SQL	V('APP_SESSION_VISIBLE')
Substitution string	&APP_SESSION_VISIBLE.

Consider the following examples:

- From within an HTML region:

```
<a href="f?p=100:5:&APP_SESSION_VISIBLE.">click me</a>
```

- Using PL/SQL:

```
sys.htf.anchor('f?p=100:5:'||V('APP_SESSION_VISIBLE'),'click me');
```

- Using a SQL query:

```
SELECT sys.htf.anchor('f?p=100:5:'||:APP_SESSION_VISIBLE,'clickme') FROM  
DUAL;
```

3.9.4.20 APP_TITLE

APP_TITLE is an alphanumeric title for the current application. The title is derived from an application substitution string called APP_TITLE. If not defined the Logo attribute will be used if it is of type text. The last fallback is the application name.

Table 3-22 APP_TITLE Syntax

Reference Type	Syntax
Bind variable	:APP_TITLE
PL/SQL	v('APP_TITLE')
Substitution string	&APP_TITLE.

The following is an HTML example:

```
The title of the current application is: &APP_TITLE!HTML.
```

3.9.4.21 APP_UNIQUE_PAGE_ID

APP_UNIQUE_PAGE_ID is an integer generated from an Oracle sequence which is unique for each page view. This number is used by applications to prevent duplicate page submissions and can be used for other purposes. For example, to make a

unique URL and avoid browser caching issues, you can embed this number in the request or debug column in calls to the `f` procedure.

Table 3-23 APP_UNIQUE_PAGE_ID Syntax

Reference Type	Syntax
Bind variable	:APP_UNIQUE_PAGE_ID
PL/SQL	V('APP_UNIQUE_PAGE_ID')
Substitution string	&APP_UNIQUE_PAGE_ID.

The following is an HTML example:

```
SELECT 'f?p=100:1:':APP_SESSION||':':APP_UNIQUE_PAGE_ID||
      ':::P1_EMPNO:'|employee_id,
      first_name,
      job_id
FROM employees
```

Note the use of the `APP_UNIQUE_PAGE_ID` in the request column. This makes this URL unique and may avoid excessive browser caching problems.

3.9.4.22 APP_USER

`APP_USER` is the current user running the application. Depending upon your authentication model, the value of the user is set differently. If the application is running using database authentication, then the value of the user is the same as the database pseudo column `USER`. If the application uses an authentication scheme that requires the user to authenticate, the value of `APP_USER` is set by the authentication scheme, usually to the user name used during authentication.

Table 3-24 APP_USER Syntax

Reference Type	Syntax
Bind variable	:APP_USER
PL/SQL	V('APP_USER')
Substitution string	&APP_USER.
SYS_CONTEXT variable	SYS_CONTEXT('APEX\$SESSION', 'APP_USER')

Consider the following examples:

- From within an HTML region:
Hello you are logged in as &APP_USER.
- Using PL/SQL:
`http.p('Hello you are logged in as'||V('APP_USER'));`
- As a bind variable:
`SELECT * FROM some_table WHERE user_id = :APP_USER`
- Using the `SYS_CONTEXT` variable:
`SELECT ... WHERE username = SYS_CONTEXT('APEX$SESSION', 'APP_USER')`

Oracle Application Express sets up the `APEX$SESSION` context when it starts to process an incoming request. For example, you can use the value of `'APP_USER'` to access the current application user in queries and VPD (Virtual Private Database) security policies that protect your table data.



See Also:

"[Authentication](#)" for information about the Public User attribute

3.9.4.23 AUTHENTICATED_URL_PREFIX

This application-level attribute identifies a valid authenticated prefix (that is, a logged in URL prefix). You can use a relative path or a full path beginning with `http`. This item is useful if your application can be run in both authenticated (logged in) and public (not logged in) modes. You can use `AUTHENTICATED_URL_PREFIX` to construct a link to an authenticated page. This item is most useful when using basic database authentication because changes to the URL can require authentication.

Table 3-25 AUTHENTICATED_URL_PREFIX Syntax

Reference Type	Syntax
Bind variable	:AUTHENTICATED_URL_PREFIX
PL/SQL	V('AUTHENTICATED_URL_PREFIX')
Substitution string	&AUTHENTICATED_URL_PREFIX.

3.9.4.24 BROWSER_LANGUAGE

`BROWSER_LANGUAGE` refers to the web browser's current language preference.

Table 3-26 BROWSER_LANGUAGE Syntax

Reference Type	Syntax
Bind variable	:BROWSER_LANGUAGE
Direct PL/SQL	APEX_APPLICATION.G_BROWSER_LANGUAGE
PL/SQL	V('BROWSER_LANGUAGE')
Substitution string	&BROWSER_LANGUAGE.

3.9.4.25 CURRENT_PARENT_TAB_TEXT

`CURRENT_PARENT_TAB_TEXT` is most useful in page templates, but is only relevant for applications that use two-level tabs (that is, parent and standard tabs). Use this string to reference the parent tab label. This substitution string enables you to repeat the currently selected parent tab within the page template.

Table 3-27 CURRENT_PARENT_TAB_TEXT Syntax

Reference Type	Syntax
Bind variable	Not Available.
Substitution string	&CURRENT_PARENT_TAB_TEXT.

3.9.4.26 DEBUG

Valid values for the `DEBUG` flag are `Yes` or `No`. Turning debug on shows details about application processing. If you write your own custom code, you may want to generate debug information only if the debug mode is set to `Yes`.

Table 3-28 DEBUG Syntax

Reference Type	Syntax
Bind variable	:DEBUG
Direct PL/SQL	APEX_APPLICATION.G_DEBUG
PL/SQL	V('DEBUG')
Substitution string	&DEBUG.

The following is an example of a substitution string reference that preserves the current value of `DEBUG`:

```
f?p=100:1:&APP_SESSION.::&DEBUG
```

3.9.4.27 HOME_LINK

`HOME_LINK` is the home page of an application. The Application Express engine redirects to this location if no page is given and if no alternative page is dictated by the authentication scheme's logic. You define the Home URL on the User Interface page, under **Attributes**.

Table 3-29 HOME_LINK Syntax

Reference Type	Syntax
Direct PL/SQL	APEX_APPLICATION.G_HOME_LINK
PL/SQL	V('HOME_LINK')
Template Reference	#HOME_LINK#
Substitution String	&HOME_LINK.



See Also:

"Editing User Interface Attributes" and "Attributes"

3.9.4.28 IMAGE_PREFIX

The value of `IMAGE_PREFIX` determines the virtual path the web server uses to point to the images directory distributed with Oracle Application Express. To reference uploaded images, use `WORKSPACE_IMAGES` and `APP_IMAGES`.

Table 3-30 `IMAGE_PREFIX` Syntax

Reference Type	Syntax
Bind variable	: <code>IMAGE_PREFIX</code>
Direct PL/SQL	<code>APEX_APPLICATION.G_IMAGE_PREFIX</code>
PL/SQL	<code>V('IMAGE_PREFIX')</code>
Substitution string	<code>&IMAGE_PREFIX.</code>
Template Substitution	<code>#IMAGE_PREFIX#</code>



See Also:

- ["APP_IMAGES"](#)
- ["WORKSPACE_IMAGES"](#)
- ["Editing the Application Definition"](#)

3.9.4.29 JET_BASE_DIRECTORY

Use the `JET_BASE_DIRECTORY` substitution string to reference the base directory of the Oracle JavaScript Extension Toolkit (JET) which ships with Oracle Application Express. Supported syntax for referencing `JET_BASE_DIRECTORY` :

```
#JET_BASE_DIRECTORY#
```

3.9.4.30 JET_CSS_DIRECTORY

Use the `JET_CSS_DIRECTORY` substitution string to reference the base directory of the Oracle JavaScript Extension Toolkit (JET) which ships with Oracle Application Express. Supported syntax for referencing `JET_CSS_DIRECTORY`:

```
#JET_CSS_DIRECTORY#
```

3.9.4.31 JET_JS_DIRECTORY

Use the `JET_JS_DIRECTORY` substitution string to reference the JavaScript directory of the Oracle JavaScript Extension Toolkit (JET) components which ships with Oracle Application Express. Supported syntax for referencing `JET_JS_DIRECTORY`:

```
#JET_JS_DIRECTORY#
```

3.9.4.32 LOGIN_URL

Use `LOGIN_URL` to display a link to a login page for users that are not currently logged in.



See Also:

"[Authentication](#)" and "[Security Page](#)"

Table 3-31 LOGIN_URL Syntax

Reference Type	Syntax
Bind variable	:LOGIN_URL
Direct PL/SQL	APEX_APPLICATION.G_LOGIN_URL
PL/SQL	V('LOGIN_URL')
Substitution string	&LOGIN_URL.
Template Substitution	#LOGIN_URL#

3.9.4.33 LOGOUT_URL

`LOGOUT_URL` is an application-level attribute used to identify the logout URL. This is a URL that navigates the user to a logout page or optionally directly logs out a user. To create a logout navigation bar entry, add a trailing period to `&LOGOUT_URL` (`&LOGOUT_URL.`). If you are coding a page template, use `#LOGOUT_URL#`.

Table 3-32 LOGOUT_URL Syntax

Reference Type	Syntax
Bind variable	:LOGOUT_URL
PL/SQL	V('LOGOUT_URL')
Substitution string	&LOGOUT_URL.
Template substitution	#LOGOUT_URL#

3.9.4.34 APP_TEXT\$Message_Name, APP_TEXT\$Message_Name\$Lang

With `APP_TEXT$Message_Name`, `APP_TEXT$Message_Name$Lang` built-in substitution, you can access application defined or system defined text messages, like `APEX_LANG.MESSAGE`. `Message_Name` is the name of the text message, `Message_Name` has to be a valid identifier (A-Z, 0-9, \$, #, _). The optional `$Lang` parameter can be used to access a specific translation, `$Lang` defaults to the current language for the page request.

Table 3-33 APP_TEXT\$Message_Name, APP_TEXT\$Message_Name\$Lang Syntax

Reference Type	Syntax
Bind variable	:APP_TEXT\$Message_Name , :APP_TEXT\$Message_Name\$Lang

Table 3-33 (Cont.) APP_TEXT\$Message_Name, APP_TEXT\$Message_Name\$Lang Syntax

Reference Type	Syntax
PL/SQL	V('APP_TEXT\$Message_Name') , V('APP_TEXT\$Message_Name\$Lang')
Substitution string	&APP_TEXT\$Message_Name. , &APP_TEXT\$Message_Name\$Lang.

The following is an example for the default and the French text message MY_MESSAGE, using HTML escaping:

```
Default text: &APP_TEXT$MY_MESSAGE!HTML.
Pardon my French: &APP_TEXT$MY_MESSAGE$FR!HTML.
```

3.9.4.35 PRINTER_FRIENDLY

The value of PRINTER_FRIENDLY determines if the Application Express engine is running in print view mode. This setting can be referenced in conditions to eliminate elements not desired in a printed document from a page.

Table 3-34 PRINTER_FRIENDLY Syntax

Reference Type	Syntax
Direct PL/SQL	APEX_APPLICATION.G_PRINTER_FRIENDLY (VARCHAR2 DATATYPE)
PL/SQL	V('PRINTER_FRIENDLY')
Substitution string	&PRINTER_FRIENDLY.

3.9.4.36 PROXY_SERVER

PROXY_SERVER is an application attribute. The attribute may be used by regions whose source comes from a URL. The following is the correct syntax for a direct PL/SQL reference used when you are writing PL/SQL to access remote web servers from within the database (for example, when using the utl_http package shipped with the database).

```
APEX_APPLICATION.G_PROXY_SERVER
```

3.9.4.37 PUBLIC_URL_PREFIX

PUBLIC_URL_PREFIX is an application-level attribute that identifies a URL to toggle out of a logged in mode to a public view.

Table 3-35 PUBLIC_URL_PREFIX Syntax

Reference Type	Syntax
Bind variable	:PUBLIC_URL_PREFIX
PL/SQL	V('PUBLIC_URL_PREFIX')

Table 3-35 (Cont.) PUBLIC_URL_PREFIX Syntax

Reference Type	Syntax
Substitution string	&PUBLIC_URL_PREFIX.
Template substitution	#PUBLIC_URL_PREFIX#

3.9.4.38 REQUEST

Each application button sets the value of `REQUEST` to the name of the button or to the request value attribute associated with the button, enabling accept processing to reference the name of the button when a user clicks it. In the `f?p` syntax, `REQUEST` may be set using the fourth argument.

`REQUEST` is typically referenced during Accept processing (that is, the processing that occurs when you post a page).

Table 3-36 REQUEST Syntax

Reference Type	Syntax
Bind variable	:REQUEST
Direct PL/SQL	APEX_APPLICATION.G_REQUEST
PL/SQL	V('REQUEST')
Substitution string	&REQUEST.

**See Also:**

["Using REQUEST"](#)

3.9.4.39 Using REQUEST

`REQUEST` is typically referenced during Accept processing (that is, the processing that occurs when you post a page). This section describes additional information about how to use the `REQUEST` substitution string.

- [About Scope and Value of REQUEST for Posted Pages](#)
- [About the When Button Pressed Attribute](#)
- [About Referencing REQUEST Using Declarative Conditions](#)
- [About Using REQUEST for Show Processing](#)
- [About Using BRANCH_TO_PAGE_ACCEPT](#)

 **See Also:**
"REQUEST "

3.9.4.39.1 About Scope and Value of REQUEST for Posted Pages

When you post a page, you initiate Accept processing. Accept processing consists of computations, validations, processes, and branches. The value of `REQUEST` is available during each phase of the Accept processing. Once an application branches to a different page then `REQUEST` is set to `NULL`.

The value of `REQUEST` is the name of the button the user clicks, or the name of the tab the user selects. For example, suppose you have a button with a name of `CHANGE`, and a label `Apply Change`. When a user clicks the button, the value of `REQUEST` is `CHANGE`.

3.9.4.39.2 About the When Button Pressed Attribute

Validations, processes, and branches have a When Button Pressed attribute. This attribute displays as a select list and contains the names of buttons that exist on the current page. If you make a selection from When Button Pressed, you associate the button's `REQUEST` value with the validation, process, or branch.

When you use a button to submit a page, the `REQUEST` value is passed to the page. The Accept processing logic evaluates each validation, process, and branch that uses a When Button Pressed attribute to determine whether the component should run (or fire). When one of these components runs, do not assume that a user actually clicked the associated button and caused the page to be submitted. Keep in mind, that another button using the same request value may have submitted the page. Similarly, JavaScript on the page can also submit the page and pass in a request value.

3.9.4.39.3 About Referencing REQUEST Using Declarative Conditions

Many developers reference `REQUEST` using conditions. For example, you may want to reset pagination when a user clicks **Go** on a report page. You can reset pagination by creating an on-submit page process. The page process can be made conditional using the condition `Request = Expression 1`.

To conditionalize an on-submit page process:

1. Under Condition, select the condition type **Request = Expression 1**.
2. In Expression 1, enter **GO**.

3.9.4.39.4 About Using REQUEST for Show Processing

You can also use `REQUEST` for Show processing when navigating to a page using `f?p` syntax. For example:

```
f?p=100:1:&APP_SESSION.:GO
```

Remember that the fourth argument in the `f?p` syntax is `REQUEST`. This example goes to application 100, page 1 for the current session, and sets the value of `REQUEST` to `GO`. Any process or region can reference the value of `REQUEST` using Show processing.

The following is a similar example using PL/SQL:

```
IF V ('REQUEST') = 'GO' THEN
    http.p('hello');
END IF;
```

Note that `http.p('hello')` is a call to a PL/SQL Web Toolkit package to print the specified text string.



See Also:

Oracle Database Development Guide

3.9.4.39.5 About Using BRANCH_TO_PAGE_ACCEPT

You can use a special request `BRANCH_TO_PAGE_ACCEPT` for Show processing to automatically submit the page. For example:

```
f?p=100:1:&APP_SESSION.:BRANCH_TO_PAGE_ACCEPT|SAVE:::P1_DATA:value
```

Using `BRANCH_TO_PAGE_ACCEPT` is the same as navigating to page 1, entering a value into the item `P1_DATA`, and clicking a button that submits the page with a `SAVE` request.

3.9.4.40 SCHEMA OWNER

If you are generating calls to applications from within your PL/SQL code, you must reference the owner of the Oracle Application Express schema. The following describes the correct syntax for a direct PL/SQL reference:

```
APEX_APPLICATION.G_FLOW_SCHEMA_OWNER
```

You may also use `#FLOW_OWNER#` to reference this value in SQL queries and PL/SQL (for example, in a region or a process).

3.9.4.41 SQLERRM

`SQLERRM` is a template substitution only available in the Applications Region Error Message. Supported syntax for a region template substitution reference:

```
#SQLERRM#
```

3.9.4.42 SYSDATE_YYYYMMDD

`SYSDATE_YYYYMMDD` represents the current date on the database server, with the `YYYYMMDD` format mask applied. You may use this value instead of repeated calls to the `SYSDATE()` function. The following list describes the supported syntax for referencing `SYSDATE_YYYYMMDD`.

- Bind variable
`:SYSDATE_YYYYMMDD`
- PL/SQL
`V('SYSDATE_YYYYMMDD')`
- Direct PL/SQL

```
APEX_APPLICATION.G_SYSDATE (DATE DATATYPE)
```

Table 3-37 SYSDATE_YYYYMMDD Syntax

Reference Type	Syntax
Bind variable	:SYSDATE_YYYYMMDD
Direct PL/SQL	APEX_APPLICATION.G_SYSDATE (DATE DATATYPE)
PL/SQL	V('SYSDATE_YYYYMMDD')

3.9.4.43 THEME_DB_IMAGES

Use the `THEME_DB_IMAGES` substitution string to always reference files which are stored with your theme definition in the database, regardless of the "File Prefix" setting of your theme. Supported syntax for a template substitution:

```
#THEME_DB_IMAGES#
```

3.9.4.44 THEME_IMAGES

Use the `THEME_IMAGES` substitution string to reference files which are stored with your theme definition. Supported syntax for a template substitution:

```
#THEME_IMAGES#
```

3.9.4.45 WORKSPACE_IMAGES

Use this substitution string to reference uploaded images, JavaScript, and cascading style sheets that are shared over many applications within a workspace.

Table 3-38 WORKSPACE_IMAGES Syntax

Reference Type	Syntax
Bind variable	:WORKSPACE_IMAGES
Direct PL/SQL	Not available
PL/SQL	V('WORKSPACE_IMAGES')
Substitution string	&WORKSPACE_IMAGES.
Template substitution	#WORKSPACE_IMAGES#



See Also:

"APP_IMAGES" and "IMAGE_PREFIX"

3.9.4.46 WORKSPACE_ID

Use this substitution string to reference the workspace ID.

Table 3-39 WORKSPACE_ID Syntax

Reference Type	Syntax
Bind variable	:WORKSPACE_ID
PL/SQL	V('WORKSPACE_ID')
Substitution string	&WORKSPACE_ID.
SYS_CONTEXT variable	SELECT ... WHERE workspace_id = SYS_CONTEXT('APEX\$SESSION', 'WORKSPACE_ID')

Consider the following examples:

- From within an HTML region:

```
Hello your workspace id is &WORKSPACE_ID.
```

- Using PL/SQL:

```
http.p('Hello your workspace id is '||V('WORKSPACE_ID'));
```

- Using a bind variable:

```
SELECT * FROM some_table WHERE workspace_id = :WORKSPACE_ID
```

- Using the SYS_CONTEXT variable:

```
SELECT ... WHERE workspace_id = SYS_CONTEXT('APEX$SESSION', 'WORKSPACE_ID')
```

Oracle Application Express sets up the APEX\$SESSION context when it starts to process an incoming request. For example, you can use the value of 'WORKSPACE_ID' to access the current workspace ID value in queries and VPD (Virtual Private Database) security policies that protect your table data.

3.10 Using Template Directives

Use template directives to control how attributes that support substitution strings are processed.

Template directives are only supported by specific attributes of the cards and interactive grid regions. These directives are processed as part of client side substitutions. To determine if an attribute supports template directives, Page Designer Help includes the text "Supports Template Directives." See [apex.util.applyTemplate](#) in *Oracle Application Express JavaScript API Reference* for more details on directive syntax.



Note:

Syntax descriptions text in square brackets is optional. You do not actually type the square brackets. Upper case text represents something as described in the description.

- [If Condition Directives](#)
- [Case Condition Directives](#)
- [Loop Directives](#)

3.10.1 If Condition Directives

Syntax

```
{if [!]NAME/}  
TRUE_TEMPLATE_TEXT  
{elseif [!]NAME2/}  
ELSE_TRUE_TEMPLATE_TEXT  
{else/}  
FALSE_TEMPLATE_TEXT  
{endif/}
```

Use the `if` directive to conditionally show text based on if an item or column has a value. The `NAME` is an item or column name. If the value of the column or item is true then the following text is output. The value is false if it is an empty string or 'F', 'N', or '0'. Any value that is not false is true. If the `NAME` is preceded by exclamation point (!) then the following text is output if the value is false rather than true.

There can be zero or more `elseif` directives. The `else` directive is optional. The text after the first `if` or `elseif` directive that is true is output. If no `if` or `elseif` is true then the text after the `else` directive, if any, is output.

Example

A cards report contains a column named `DESCRIPTION`. The following HTML Expression attribute will display the description if it is not null (empty string) and "No description." otherwise.

```
{if DESCRIPTION/}&DESCRIPTION.{else/}No description.{endif/}
```

3.10.2 Case Condition Directives

Syntax

```
{case NAME/}  
{when STRING1/}  
TEMPLATE_TEXT1  
{when STRING2/}  
TEMPLATE_TEXT2  
{otherwise/}  
TEMPLATE_TEXT  
{endcase/}
```

Use the `case` directive to show text based on the value of an item or column. The `NAME` is an item or column name. The value is compared with the strings after each `when` directive and if they are equal then the following text is output. If no `when` directive matches then the text after the `otherwise` directive, if there is one, is output. The value and each string is trimmed of leading and trailing spaces before comparison. The comparison is case sensitive.

Example

This example using the sample `EMP` table displays the compensation differently depending on the `JOB`. For sales people it shows both the salary and commission. For the president it shows "--" rather than salary and for all other jobs it shows just the salary.

```
{case JOB/}
{when SALESMAN/}
&SAL. (&COMM.)
{when PRESIDENT/}
--
{otherwise/}
&SAL.
{endcase/}
```

3.10.3 Loop Directives

Syntax

```
{loop ["SEP"] NAME/}
TEMPLATE_TEXT
{endloop/}
```

Use the `loop` directive to repeat text once for each item in a multi-value (character delimited) item or column value. The `NAME` is an item or column name that has multiple values separated by the character given by `SEP`. The default separator is ":". If `SEP` is more than one character it is treated as a regular expression.

The template text within the loop can use these substitution symbols:

- `APEX$ITEM` - This is the value of the current item in the list.
- `APEX$I` - This is 1 based index of the current item in the list.

Example

The following example takes a column called `TAGS` that contains a comma (,) separated list of tags such as "apples,cherries,pears" and turns it into an HTML list that can be nicely styled with CSS.

```
<ul class="tags">{loop "," TAGS/}
  <li class="tag-item">&APEX$ITEM.</li>
{endloop/}</ul>
```

4

Managing Team Development

Use Team Development to track and manage issues in a conversational fashion. You can create templates to provide users with starter text for issues and comments. You can apply labels and label groups, assign issue owners, and set milestones.

- [Getting Started with Team Development](#)
Access Team Development, complete the setup process, and learn about the Team Development toolbar.
- [Creating and Updating Issues](#)
Create and update issues by either updating issues one at a time, or performing bulk updates of multiple issues at once.
- [Viewing Your User Profile](#)
Click the Notifications icon on the Team Development toolbar view and manage your own notifications and view all issues you own.
- [Managing Labels](#)
Create and update label groups and labels to classify issues.
- [Managing Milestones](#)
Create and update issues milestones to track events.
- [Managing Templates](#)
Create and update templates for issues and issue comments.
- [Using Team Development Utilities](#)
Use Utilities page to manage deleted issues, manage templates, milestones, and labels, view uploaded files, purge data, reassign issues to another user, reassign issue owners, remove a milestone or label from all issues, and manage user notifications.
- [Managing Feedback](#)
Feedback provides a mechanism for end users to post general comments for application administrators and developers.

4.1 Getting Started with Team Development

Access Team Development, complete the setup process, and learn about the Team Development toolbar.

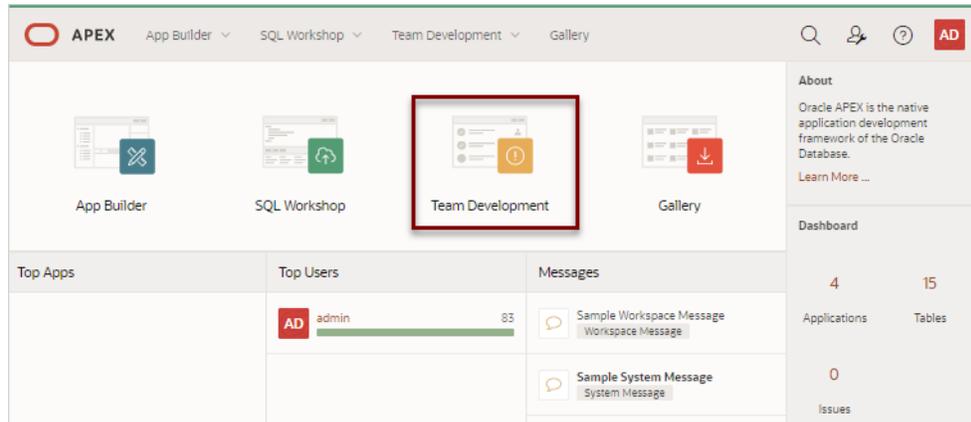
- [Accessing Team Development](#)
Access Team Development by clicking the Team Development menu, or by clicking the Team Development icon on the Workspace home page.
- [Setting Up Team Development](#)
Complete the setup process by installing sample labels, sample templates, sample milestones, and selecting a default language.
- [Team Development Toolbar](#)
Use the toolbar at the top of the most Team Development pages to link to notifications, jump to other pages, or create a new issue.

4.1.1 Accessing Team Development

Access Team Development by clicking the Team Development menu, or by clicking the Team Development icon on the Workspace home page.

You can access Team Development in two ways:

- Click the **Team Development** menu at the top of most pages in Oracle Application Express.
- On the Workspace home page, click the **Team Development** icon.



The Issues page appears.

 **See Also:**
"Issues Page"

4.1.2 Setting Up Team Development

Complete the setup process by installing sample labels, sample templates, sample milestones, and selecting a default language.

When you access Team Development for the first time in a new workspace, a welcome screen appears. Oracle recommends you follow the on-screen instructions and completing the setup process.

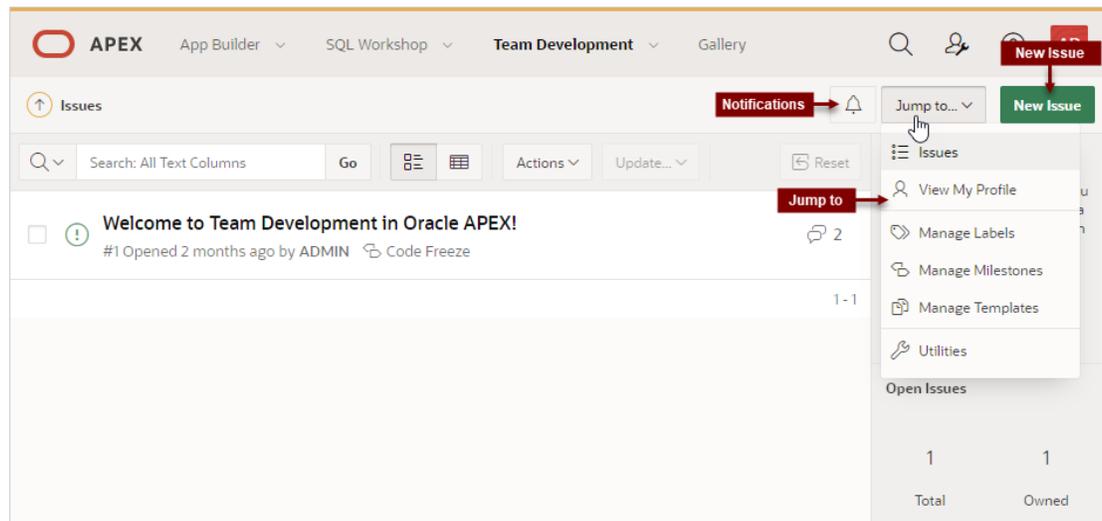
1. To setup Team Development:
 1. Access Team Development.
The Team Development Welcome page appears.
 2. For Install Sample Labels, Install Sample Templates, and Install Sample Milestones, select **Yes**.
 3. From Sample Data Language, select a language.
 4. Click **Complete Setup**.

The Issues page appears.

4.1.3 Team Development Toolbar

Use the toolbar at the top of the most Team Development pages to link to notifications, jump to other pages, or create a new issue.

Team Development Toolbar



The Team Development toolbar contains the following controls:

- **Notifications** - Links the Notifications page where you can view or clear notifications for all issues which you own or are monitoring. See "[Viewing Your Notifications](#)."
- **Jump to...** - Access other Team Development pages. Available links include:
 - **Issues** - Links to the Issues page. See "[Issues Page](#)."
 - **View My Profile** - Links to the User Profile page where you can view a report of all issues your own or are monitoring. See "[Viewing Your Issues](#)."
 - **Manage Labels** - Links to the Labels page. Use labels and label groups to classify issues. See "[Managing Labels](#)."
 - **Manage Milestones** - Links to the Milestones page. Create milestones to track events. See "[Managing Milestones](#)."
 - **Manage Templates** - Links to the Templates page. Templates provide starter text for issues and issue comments. See "[Managing Templates](#)."
 - **Utilities** - Links to the Team Development Utilities page. See "[Using Team Development Utilities](#)."

4.2 Creating and Updating Issues

Create and update issues by either updating issues one at a time, or performing bulk updates of multiple issues at once.

- [Issues Page](#)
Use the Issues page to view issues.
- [Creating an Issue](#)
Create new issues on the Issues page by clicking the New Issue button.

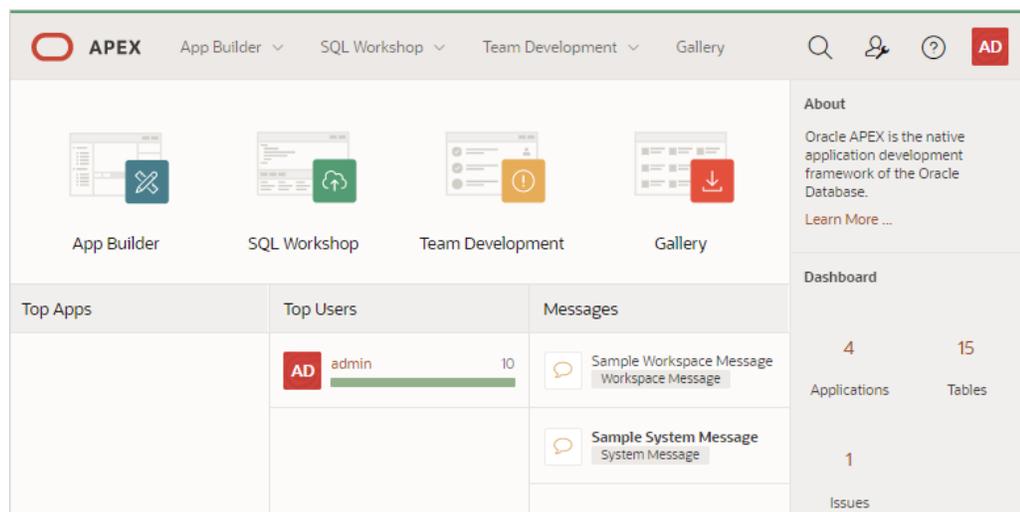
- [Updating Multiple Issues at Once](#)
Update status, assignees, labels, and milestones for multiple issues at once by selecting the issues on the Issues page and then selecting options from the Update menu.
- [Updating an Issue](#)
Update an issue viewing the Issue Details and then updating the Issue Timeline.

4.2.1 Issues Page

Use the Issues page to view issues.

The Issues page displays all issues being tracked in Team Development.

Navigation Bar



A navigation bar displays at the top of the Issues page and contains the following controls.

- **Select columns to search** - This control features a menu with a magnifying glass. Click this menu to narrow your search to only specific columns. To search all columns, select **All Text Columns**.
- **Search: All Text Columns** - Enter case insensitive search criteria (wildcard characters are implied) and click **Go**.
- **Go** button - Executes a search or applies a filter.
- **View icons**. Use these icons to toggle between two views:
 - **Cards** (default) - Displays issue details as card.
 - **Grid** - Displays issues in an interactive grid report.

To view issue details, click the issue title. To update status, assignees, labels, or milestones in either view, select the issue and then appropriate option on the Update menu.

- **Actions** menu - Use the Actions menu to customize the report.
- **Update**. Update multiple issues at once by selecting them and then selecting an option from the Actions menu. Update menu options include:
 - **Status** - Apply a status (**Open** or **Closed**) to all selected issues.

- **Assignees** - Add or remove assignees for all selected issues.
- **Labels** - Assign or remove labels for all selected issues.
- **Milestones** - Assign or remove milestones for all selected issues.

Tip:

To view or edit an issue (including adding issue comments), click issue title.

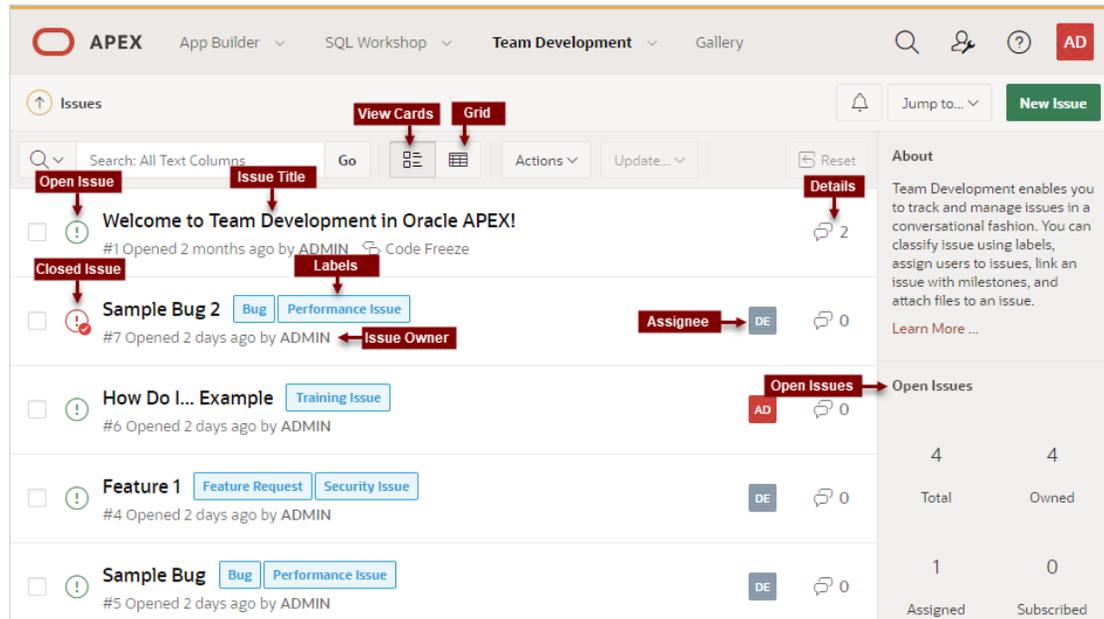
- **Reset** - Click the **Reset** button to remove any customizations, such as filters or sorting. Select this option to reload the report definition from the server.

See Also:

"Team Development Toolbar"

List of Issues

Issues appear next and can be viewed as Cards or as an interactive grid. Click the **View Cards** and **Grid** icons to change the display. This example shows **View Cards**.



Key features of the Cards view include:

- **Issue Title** - Click the issue title to view and update details.
- **Open Issue/Closed Issue** icons - Displays the status of the issue. The **Open Issue** icon appears as a green circle around an exclamation point. The **Closed Issue** icon displays as a red circle around an exclamation point and a check mark.
- **Issue Owner** - Displays beneath the issue title.
- **Labels** - Assigned labels display to the right of the issue title. The color indicates the associated label group.

- **Assignee** - The assignees of an issue appear to the right of the labels.
- **Issue Details** - Click the Comment icon/number on the far right to link to the Issue Details. The number indicates the number of issue comments.

Open Issues and Feedback Regions

Summary regions display on the right-side of the page. The **Open Issues** summary region includes the following:

- **Total** - Total issues in the workspace.
- **Owned** - Total issues owned by the current user.
- **Assigned** - Total issues assigned to the current user.
- **Subscribed** - Total issues to which the current user subscribes.

The **Feedback** summary region displays on the bottom right of the page and includes the following:

- **Total** - Total feedback entries.
- **Open** - Total open feedback entries.

See Also:

- ["Creating and Updating Issues"](#)
- ["Team Development Toolbar"](#)
- ["Managing Feedback"](#)

4.2.2 Creating an Issue

Create new issues on the Issues page by clicking the New Issue button.

Tip:

To create a new issue, you must select a template. Templates provide starter text for issues and issue comments. Use the sample templates provided when you completed Team Development setup, or create your own. See ["Managing Templates."](#)

1. To create an issue:
 1. Click the **Team Development** menu.
 2. On the Issues page, click **New Issue**.
 3. In the New Issues dialog:
 - a. Select a template, or select **Continue without a template**. Templates provide users with starter text for issues and comments.
 - b. Title - Enter a descriptive title.

- c. Issue Text - Enter a description of the issue. Use the Markdown tools above the field to add formatting.
 - d. To preview the HTML, click **Preview**.
 4. Click **Create Issue**.

 **See Also:**

- ["Adding Issue Comments or Attaching a File"](#)
- ["Managing Templates"](#)

4.2.3 Updating Multiple Issues at Once

Update status, assignees, labels, and milestones for multiple issues at once by selecting the issues on the Issues page and then selecting options from the Update menu.

1. To update multiple issues at once:
 1. Click the **Team Development** menu.

The Issues page appears.
 2. Select the issues to update by clicking the check box to the left the issue title.
 3. To update status:
 - a. From the Update menu, select **Status**.
 - b. Status - Select a new status (that is, **Open** or **Closed**).
 - c. Click **Apply Changes**.
 4. To update assignees:
 - a. From the Update menu, select **Assignees**.
 - b. For each assignee, select **Assign** or **Remove**.
 - c. Click **Apply Changes**.
 5. To update labels:
 - a. From the Update menu, select **Labels**.
 - b. For each label, select **Assign** or **Remove**.
 - c. Click **Apply Changes**.
 6. To update milestones:
 - a. From the Update menu, select **Milestones**.
 - b. For each milestone, select **Assign** or **Remove**.
 - c. Click **Apply Changes**.

4.2.4 Updating an Issue

Update an issue viewing the Issue Details and then updating the Issue Timeline.

Only an issue owner or an administrator can update an issue title or description, or delete an issue.

- [Issue Details Page](#)
Use the Issue Details page to update issues.
- [Updating the Issue Title](#)
View an issue and then update the issue title.
- [Updating the Issue Description](#)
View an issue and update the issue description (also known as the Issue Text).
- [Managing Comments](#)
Add or edit issue comments on the Issue Details page.
- [Setting Assignees](#)
View an issue and then set assignees.
- [Setting Labels](#)
View an issue and then set labels.
- [Setting Milestones](#)
View an issue and then set milestones.
- [Associating an Issue with an App and Page](#)
View an issue and then associate it with an application and page.
- [Marking an Issue as Duplicate](#)
View an issue and then mark it as duplicate.
- [Closing an Issue](#)
Close an issue on the Issues Details page.
- [Managing Deleted Issues](#)
Issue owners or administrators can delete an issue on the Issue Details page. Manage deleted issue (that is, delete them forever or reinstate them) by navigating to Utilities, Manage Deleted Issues.

4.2.4.1 Issue Details Page

Use the Issue Details page to update issues.

Issues Timeline

The screenshot displays the Oracle Jira Issue Details page for an issue titled "New Feature". The issue is owned by "ADMIN" and was opened 2 minutes ago. The main content area is divided into sections: "Feature Summary" (with a bullet point about providing a general overview), "Context" (with a bullet point about relating the request to a specific situation), and "Preferred Solution" (with a bullet point about providing a clear description). Below these sections is the "Issue Timeline", which shows two events: "admin assigned developer and developer2 to this issue 2 minutes ago" and "admin added Enhancement Request and Critical to this issue 2 minutes ago". At the bottom of the timeline is the "Add Comment" section, which includes a rich text editor with various formatting tools and a "Preview" button. On the right side of the page, there is a sidebar with sections for "About", "Assignees" (listing developer and developer2), "Labels" (listing Enhancement Request and Critical), "Milestones", and "Notifications".

The Issue Details page contains an **Issue Timeline**. Updates to the Issue Timeline are called **events**. Newer events display at the top of the timeline. The Issue Timeline is divided into the following sections:

- **Issue Title** - Displays at the top of the page.
- **Issue Text** field - The text that describes the issue.
- **Events** - Each update to the Issue Timeline is logged as an event. Events displays after the Issue Text.
- **Add Comment** - Displays at the bottom of the Issue Timeline. Use this field to record comments about the issue. The Add Comment region includes formatting tools, enables you to select a Response Template, and Preview the text.

Issue Details Controls

General controls on the Issue Details page include:

- **Jump to Latest** - Links to the Add Comment section at the bottom of the page.
- **Actions** - Use Actions menu options to update the issue. Actions menu options include:
 - **Edit Title**
 - **Edit Issue Text**
 - **Set Assignees**
 - **Set Labels**
 - **Set Milestones**
 - **Associate App or Page**
 - **Mark as Duplicate**
 - **Delete Issue**
 - **Close Issue**

Note:

Only an issue owner or an administrator can update an issue title or description, or delete an issue.

- **Show Actions** - Shortcut menu containing two options: **Edit** and **Delete Issue**. **Edit** functions the same as **Edit Issue Text** on the Actions menu.
- **Set Assignees** - Shortcut menu in the right region that functions the same as **Set Assignees** on the Actions menu.

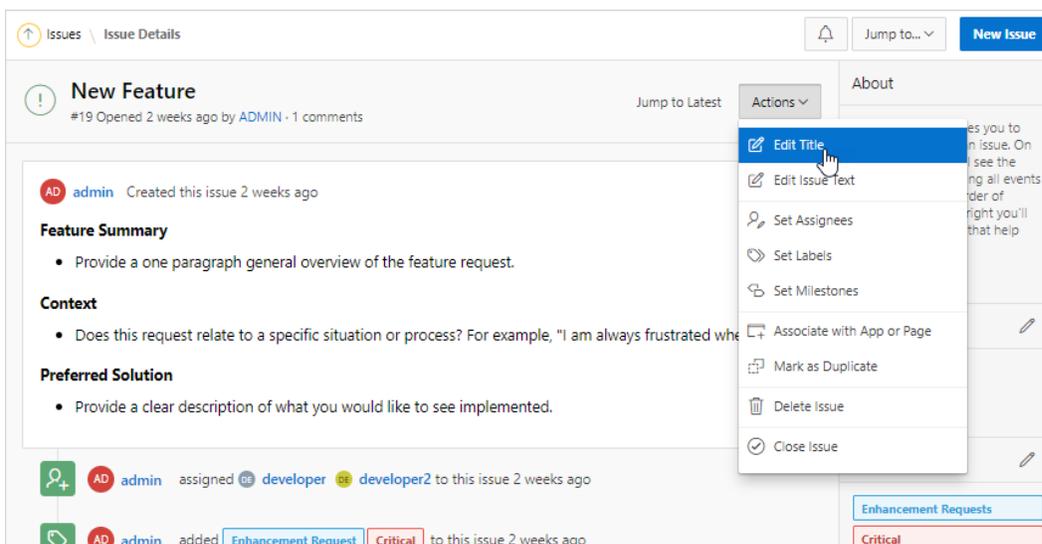
- **Set Labels** - Shortcut menu in the right region that functions the same as **Set Labels** on the Actions menu.
- **Set Milestones** - Shortcut menu in the right region that functions the same as **Set Milestones** on the Actions menu.
- **Notifications** - Enable **Subscribe** to receive notifications regarding updates to the current issue.
- **Attachments** - Click **Attachments** to view attachments associated with this issue.

4.2.4.2 Updating the Issue Title

View an issue and then update the issue title.

Only an issue owner or an administrator can update an issue title.

1. To update the issue title:
 1. View the issue:
 - a. Click the **Team Development** menu.
 - b. Click the issue title.
The Issue Details page appears.
 2. From the **Actions** menu, select **Edit Title**.



3. In Edit Issue Title dialog:
 - a. Issue Title - Update the title.
 - b. Click **Apply Changes**.

4.2.4.3 Updating the Issue Description

View an issue and update the issue description (also known as the Issue Text).

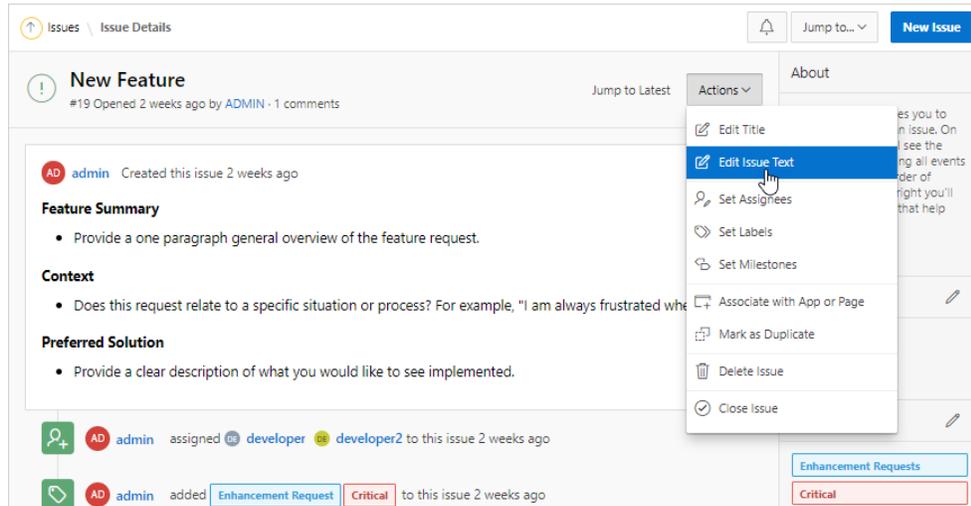
Only an issue owner or an administrator can update an issue description (or text).

1. To update the Issue Text:
 1. View the issue:

- a. Click the **Team Development** menu.
- b. Click the issue title.

The Issue Details page appears. You can update an Issue Text by either selecting **Edit Issue Text** from the Actions menu, or by clicking **Show Actions, Edit**.

2. From the **Actions** menu, select **Edit Issue Text**.



3. In the Edit Issue dialog:
 - a. Update the description of the issue. Use the Markdown tools above the field to add formatting.
 - b. Click **Preview** to preview the HTML.
 - c. Click **Apply Changes**.

4.2.4.4 Managing Comments

Add or edit issue comments on the Issue Details page.

- [Adding Issue Comments or Attaching a File](#)
View an issue and then add comments.
- [Editing Issue Comments](#)
View an issue to edit, hide, or delete existing comments.

4.2.4.4.1 Adding Issue Comments or Attaching a File

View an issue and then add comments.

1. To add issue comments:
 1. View the issue:
 - a. Click the **Team Development** menu.
 - b. Click the issue title.
The Issue Details page appears.
 2. Scroll down to **Add Comment**.

 **Tip:**

You can also click the **Jump to Latest** button adjacent to the issue title

3. Enter a comment. Under **Add Comment**:
 - a. Select a Response Template - Select a template if appropriate.
 - b. Enter comments in the field provided.
 - c. To add formatting (such as bold or italic), click the icons in the toolbar. To preview the rendered HTML, click the **Preview** button.
4. Attach a file. Under **Add Comment**, click **Attach Files**.

 **Tip:**

The **Attach Files** icon does not appear unless you have enabled the workspace-level attribute, **Enable Issue File Repository**.

5. To save your changes:
 - If the issue is open:
 - Click **Comment** to save your changes.
 - Click **Comment and Close** to save your changes and close the issue.
 - If the issue is closed:
 - Click **Comment** to save your changes.
 - Click **Comment and Close** to save your changes and close the issue.

 **See Also:**

- ["Closing an Issue"](#)
- ["Configuring Team Development in an Existing Workspace"](#) in *Oracle Application Express Administration Guide*

4.2.4.4.2 Editing Issue Comments

View an issue to edit, hide, or delete existing comments.

1. To edit issue comments:
 1. View the issue:
 - a. Click the **Team Development** menu.
 - b. Click the issue title.

The Issue Details page appears.
 2. Scroll down to the comment.

3. Find the **Show actions** menu which resembles three stacked circles. Click the **Show actions** menu and select one of the following:
 - **Edit** - Only available for administrators or the comment creator.
 - **Hide/Unhide** - Only available for administrators.
 - **Delete** - Only available for administrators or the comment creator.
4. To save your changes, click **Apply**.
5. To exit without saving your changes, click the **Close** icon (that is, the "X" enclosed with a circle) in the upper right.

 **See Also:**
"Closing an Issue"

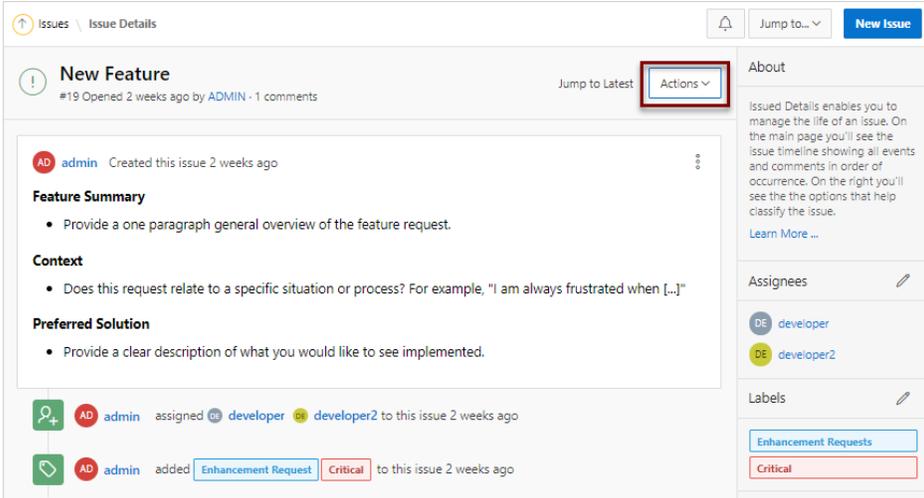
4.2.4.5 Setting Assignees

View an issue and then set assignees.

Assignees are users in the Oracle Application Express workspace. To create new assignee, a workspace administrator or Instance administrator must create new user.

1. To set assignees:
 1. View the issue:
 - a. Click the **Team Development** menu.
 - b. Click the issue title.

The Issue Details page appears.



The screenshot displays the 'Issue Details' page for a 'New Feature' issue. At the top right, there is a navigation bar with 'Jump to...', a bell icon, and a 'New Issue' button. Below this, the issue title 'New Feature' is shown with a 'Jump to Latest' link and an 'Actions' dropdown menu, which is highlighted with a red box. The main content area contains the issue description, including a 'Feature Summary', 'Context', and 'Preferred Solution'. At the bottom of the main content, there is a section for 'Assignees' showing two users: 'developer' and 'developer2'. Below the assignees, there is a 'Labels' section with two labels: 'Enhancement Request' and 'Critical'.

2. From the **Actions** menu, select **Set Assignees**.
You can also click the **Set Assignees** icon on far right side of the page.
3. In the Assignees dialog:
 - a. Select assignees to add to the issue.

b. Click **Apply Changes**.

A new event is added to the Event Timeline and the new assignees display under **Assignees** in the far right region.

 **See Also:**

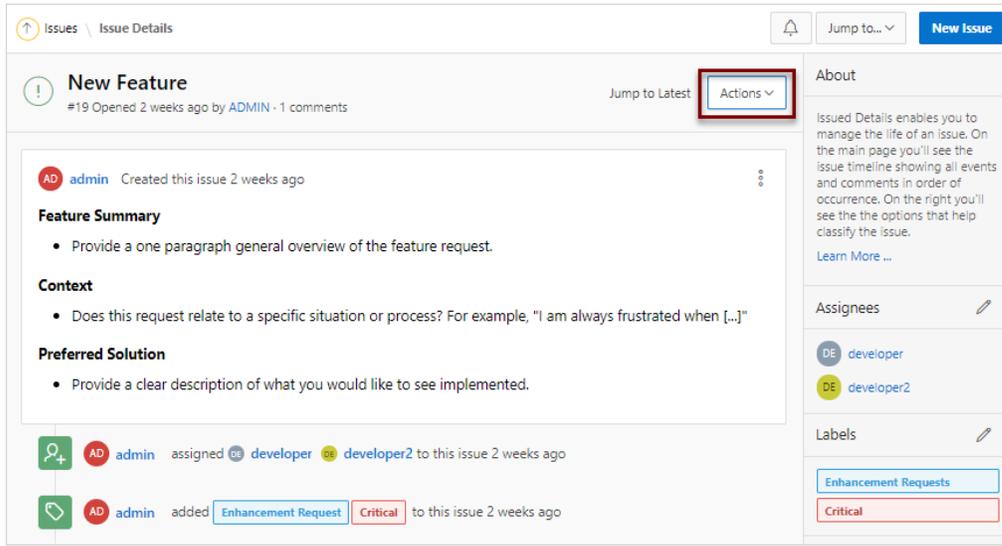
"Managing Users in a Workspace" and Managing Users Across an Application Express Instance in *Oracle Application Express Administration Guide*

4.2.4.6 Setting Labels

View an issue and then set labels.

1. To set labels:
 1. View the issue.
 - a. Click the **Team Development** menu.
 - b. Click the issue title.

The Issue Details page appears.



The screenshot shows the Oracle APEX Issue Details page for a "New Feature" issue. The issue is titled "New Feature" and was opened 2 weeks ago by ADMIN. The issue details include a "Feature Summary" (Provide a one paragraph general overview of the feature request), "Context" (Does this request relate to a specific situation or process? For example, "I am always frustrated when [...]"), and "Preferred Solution" (Provide a clear description of what you would like to see implemented). The issue is assigned to "developer" and "developer2". The "Labels" section on the right sidebar shows "Enhancement Requests" and "Critical" labels selected. The "Actions" menu is highlighted with a red box.

2. From the **Actions** menu, select **Set Labels**.

You can also click the **Set Labels** icon on far right side of the page.

3. In the Labels dialog:
 - a. Select labels to add to the issue.
 - b. Click **Apply Changes**.

A new event is added to the Event Timeline and the new labels display under **Labels** in the far right region.

 **See Also:**
"Managing Labels"

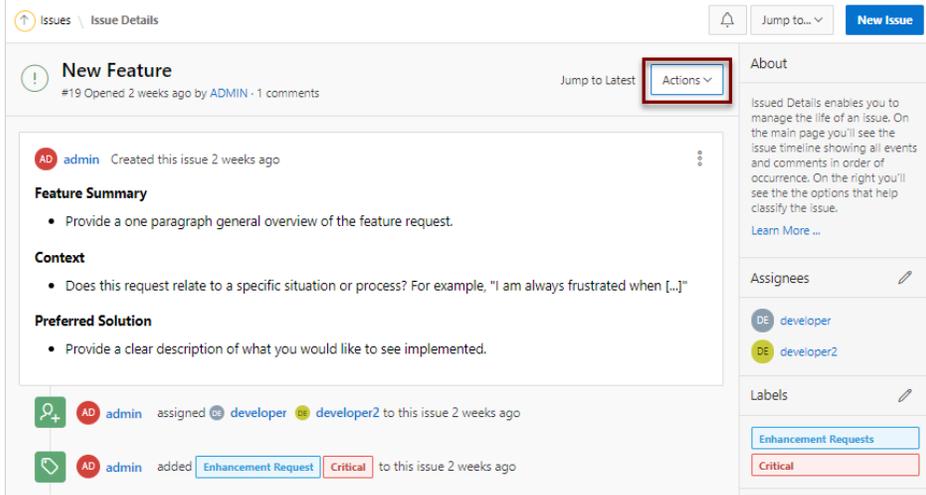
4.2.4.7 Setting Milestones

View an issue and then set milestones.

Use Milestones to track events. You can assign one or more milestones to an event.

1. To set milestones:
 1. View the issue:
 - a. Click the **Team Development** menu.
 - b. Click the issue title.

The Issue Details page appears.



The screenshot shows the Oracle Jira 'New Feature' issue details page. The 'Actions' menu is highlighted with a red box. The page displays the issue title 'New Feature', a summary, context, and preferred solution. The right sidebar contains sections for 'About', 'Assignees', and 'Labels'.

2. From the **Actions** menu, select **Set Milestones**.
You can also click the **Set Milestones** icon on far right side of the page.
3. In the Milestones dialog:
 - a. Select milestones to add to the issue.
 - b. Optionally select **Show Closed Milestones**.
 - c. Click **Apply Changes**.

A new event is added to the Event Timeline and the new milestones display under **Milestones** in the far right region. The color of the milestone indicates the following:

- Red - The milestones date is in the past.
- Yellow - The milestones date is within two weeks.
- Green - The milestones date is more than two weeks 2 weeks in the future.



See Also:

["Managing Milestones"](#)

4.2.4.8 Associating an Issue with an App and Page

View an issue and then associate it with an application and page.

1. To associate an issue with an application and page:
 1. View the issue:
 - a. Click the **Team Development** menu.
 - b. Click the issue title.
The Issue Details page appears.
 2. From the **Actions** menu, select **Associate with App and Page**.
 3. In the Associate App/Page dialog:
 - a. Application & Page Search - Select an application
 - b. Page - Select a page.
 - c. Comments - Enter any comments.
 - d. Click **Apply**.

A new event is added to the Event Timeline.

4.2.4.9 Marking an Issue as Duplicate

View an issue and then mark it as duplicate.

1. To mark an issue as duplicate:
 1. View the issue:
 - a. Click the **Team Development** menu.
 - b. Click the issue title.
The Issue Details page appears.
 2. From the **Actions** menu, select **Mark as Duplicate**.
 3. In the Mark Duplicate dialog:
 - a. Duplicate Issue - Select the duplicate issue.
 - b. Click **Apply**.

A new event is added to the Event Timeline identified by a an icon which resembles two green pages.

4.2.4.10 Closing an Issue

Close an issue on the Issues Details page.

- [Closing an Issue](#)
View an issue and then close it.

- [Viewing or Reopening a Closed Issue](#)
View or reopen a closed issue on the Issues page.

4.2.4.10.1 Closing an Issue

View an issue and then close it.

1. To close an issue:
 1. View the issue:
 - a. Click the **Team Development** menu.
 - b. Click the issue title.

The Issue Details page appears.
 2. From the **Actions** menu, select **Close Issue**.

The icon adjacent to the issue title changes from green to red and contains a red check mark. In addition, a new event is added to the Event Timeline which reads:

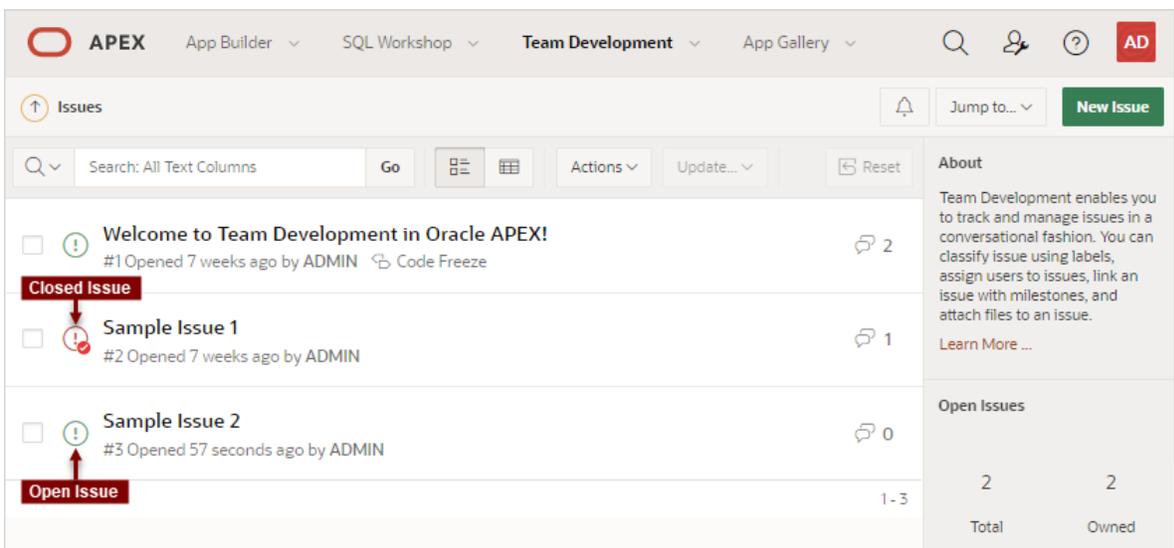
```
set status for this issue to CLOSED Now
```

4.2.4.10.2 Viewing or Reopening a Closed Issue

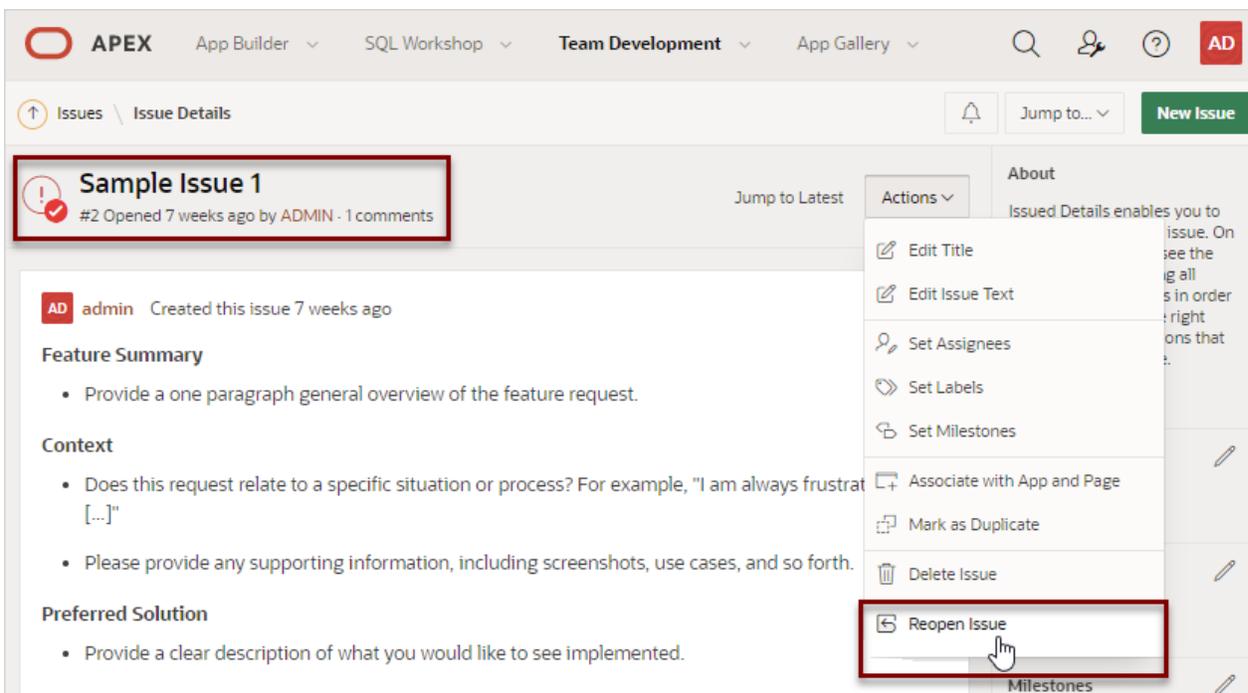
View or reopen a closed issue on the Issues page.

1. To view or reopen a closed issue:
 1. Click the **Team Development** menu.

The Issues page appears. Open issues have a green icon and closed issues have a red icon and check mark.



2. Find the closed issue and click the issue title.
The Issue Details page appears.
3. From the **Actions** menu, select **Reopen Issue**.



The icon adjacent to the issue title changes from red to green and the red check mark disappears.

A new event is added to the Event Timeline which reads:

```
set status for this issue to OPEN Now
```

4.2.4.11 Managing Deleted Issues

Issue owners or administrators can delete an issue on the Issue Details page. Manage deleted issue (that is, delete them forever or reinstate them) by navigating to Utilities, Manage Deleted Issues.

- [Deleting an Issue](#)
Issue owners or administrators can delete an issue.
- [Reinstating Deleted Issues](#)
Reinstate deleted issues on the Manage Deleted Issues Page.
- [Permanently Remove Deleted Issues](#)
Permanently remove deleted issues on the Manage Deleted Issues page.

4.2.4.11.1 Deleting an Issue

Issue owners or administrators can delete an issue.

1. To delete an issue:
1. View the issue:
 - a. **Team Development** menu.
 - b. Click the issue title.

The Issue Details page appears.

2. From the **Actions** menu, select **Delete Issue**.

A confirmation page appears asking if you are sure you want to delete the issue.

3. On the confirmation page, click **OK**.

4.2.4.11.2 Reinstating Deleted Issues

Reinstate deleted issues on the Manage Deleted Issues Page.

1. To reinstate a deleted issue:
 1. From the **Team Development** menu, select **Utilities**.
 2. Click **Manage Deleted Issues**.
 3. Select the issue.
 4. From the **Update** menu, select **Reinstate Selected**.

Confirm your selection, and click **Apply**.

4.2.4.11.3 Permanently Remove Deleted Issues

Permanently remove deleted issues on the Manage Deleted Issues page.

1. To permanently remove deleted issues:
 1. From the **Team Development** menu, select **Utilities**.
 2. Click **Manage Deleted Issues**.
 3. Select the issue.
 4. To permanently delete selected issue:
 - a. Select the issues to be removed.
 - b. From the **Update** menu, select **Permanently Delete Selected**.

Confirm your selection, and click **Apply**.

5. To purge all deleted issues, click **Purge All**.

4.3 Viewing Your User Profile

Click the Notifications icon on the Team Development toolbar view and manage your own notifications and view all issues you own.

- [Viewing Your Issues](#)
View the User Profile, Issue page to view a report of all issues you own or are monitoring.
- [Viewing Your Notifications](#)
View and manage your notifications on the Notifications page.

4.3.1 Viewing Your Issues

View the User Profile, Issue page to view a report of all issues you own or are monitoring.

1. To view issues you own:

1. Click the **Team Development** menu.
2. On the Issues page, click the **Notifications** icon on the toolbar at the top of the page. The User Profile, Notifications page appears displaying notifications.
3. Click the **Issues** tab. The Issues page appears displaying all issues you own or are monitoring.
4. To view an issue, click the issue title.
5. To configure the type and frequency of your notifications, click **Notification Preferences**.

 **See Also:**

- ["Editing Your Own Notification Preferences"](#)

4.3.2 Viewing Your Notifications

View and manage your notifications on the Notifications page.

Whenever a users interacts with an issue, Team Development creates an event. For example, an **event** can be creating issue or involve updating the issue. **Notifications** are a record of these events.

1. To view your own user notifications:
 1. Click the **Team Development** menu.
 2. On the Issues page, click the **Notifications** icon on the toolbar at the top of the page. The User Profile, Notifications page appears displaying notifications for all issues you own or are monitoring.
 3. To delete all notifications, click **Clear Notifications**
 4. To configure the type and frequency of your notifications, click **Notification Preferences**.

 **See Also:**

- ["Editing Your Own Notification Preferences"](#)

4.4 Managing Labels

Create and update label groups and labels to classify issues.

If you completed the setup process, you can view sample labels and label groups by going to **Team Development, Utilities, Manage Labels**.

- [About Labels Groups and Labels](#)
Use label groups and the associated labels to classify issues.

- [Creating Label Groups](#)
Create label groups clicking Create on the Labels page.
- [Editing Label Groups](#)
Edit label groups on the Manage Labels page.
- [Adding Labels](#)
Create labels on the Manage Labels page.
- [Editing or Deleting Labels](#)
Edit labels on the Manage Labels page.

**See Also:**

["Setting Labels"](#)

4.4.1 About Labels Groups and Labels

Use label groups and the associated labels to classify issues.

Label Groups and Labels

Labels are organized into label groups and enable you to classify issues. For example, the Label Group **Level of Effort** could contain the labels **Easy Fix**, **Moderate Effort**, and **Large Development Effort**.

Each **label group** has an identifying color to enable you to quickly identify labels associated with the same group. You can define label group as exclusive or non-exclusive. In an **exclusive** label groups, only one label from the group may be assigned to an issue at a time. Applying another label from the same exclusive group removes any current label from that group. In a **non-exclusive** label group, you can assign multiple labels to an issue from the same label group.

Sample Label Groups and Labels

The following are two sample label groups and labels included in Team Development when you complete the setup process and install Sample Labels:

- Importance (Label Group)
 - Critical (Label)
 - Important (Label)
 - Normal (Label)
 - Backlog (Label)
 - Will Not Address (Label)

This Label Group is **exclusive** meaning that only one label can be applied to an issue.
- Functional Area (Label Group)
 - Bug (Label)
 - Enhancement Request (Label)
 - Feature Request (Label)

- Security Issue (Label)
- Performance Issue (Label)
- Documentation Issue (Label)
- Training Issue (Label)

This Label Group is **non-exclusive** meaning that only one label can be applied to an issue.

If you completed the setup process, you can view the other sample label groups and labels by clicking the **Team Development** menu and selecting **Labels**. To view the labels within a label group, click a label group name.

**Tip:**

You also access Labels page from the Utilities page. Click the **Team Development** menu and select **Utilities** and then **Manage Labels**.

4.4.2 Creating Label Groups

Create label groups clicking Create on the Labels page.

1. To create a label group:
 1. Click the **Team Development** menu and then select **Labels**.
The Labels page appears.
 2. On the Labels page, click **Create**.
 3. In Create/Edit Label Group dialog:
 - a. Group Name - Enter a unique name for the label group.
 - b. Group Label Color - Select a color to display all labels within the group.
 - c. Values are Exclusive - Determines if the values of the group are exclusively assigned to an issue. Options include:
 - **On** - Only one label from the group can be assigned to an issue at any given time.
 - **Off** - Multiple labels from the same group may be assigned to an issue.
 - d. **Group Description** - Enter a description of the group.
 4. Click **Create**.

4.4.3 Editing Label Groups

Edit label groups on the Manage Labels page.

Use label groups to classify labels.

1. To edit a label group:
 1. Click the **Team Development** menu and then select **Labels**..
The Labels page appears.

Note that each a label group has an identifying color making it and the associated labels easier to identify.

2. On the Labels page, select the label group name.
The Manage Labels page appears, displaying labels in the current group.
3. Click **Edit Group**.
The Create/Edit Label Group dialog appears.
4. To edit the label group, edit the following attributes:
 - a. Group Name - Enter a unique name for the label group.
 - b. Group Label Color - Select a color to display all labels within the group.
 - c. Values are Exclusive - Determines if the values of the group are exclusively assigned to an issue. Options include:
 - **On** - Only one label from the group can be assigned to an issue at any given time.
 - **Off** - Multiple labels from the same group may be assigned to an issue.
 - d. **Group Description** - Enter a description of the group.
 - e. Click **Apply Changes**.
5. To delete the label group, click **Delete** in the Create/Edit Label Group dialog.

4.4.4 Adding Labels

Create labels on the Manage Labels page.

1. To add a new label to a label group:
 1. Click the **Team Development** menu and then select **Labels**.
 2. On the Labels page, select the label group name.
The Manage Labels page appears, displaying labels in the current group.
 3. On the Manage Labels page, click **Add Row**.
A new row appears.
 4. In the new row, enter the **Sequence**, **Label Name**, **Label Slug**, and **Label Desc**.
 5. Click **Save**.

4.4.5 Editing or Deleting Labels

Edit labels on the Manage Labels page.

1. To edit existing labels:
 1. Click the **Team Development** menu and then select **Labels**.
 2. On the Labels page, select the label group name.
The Manage Labels page appears, displaying an editable interactive grid of labels in the current group.
 3. To edit a single cell:
 - a. Double-click the cell you want to edit.

4.5.1 Creating Milestones

Create milestones by clicking Create on the Milestones page.

1. To create a milestone:
 1. Click the **Team Development** menu and then select **Milestones**.
 2. On the Milestones page, click **Create Milestone**.
 3. On the Milestone page:
 - a. Milestone Name - Enter a unique name for the milestone.
 - b. Slug - A unique string identifier for the milestone that will be used in URLs.
 - c. Date - Select a date for the milestone.
 - d. Milestone Status - Select **Open** or **Closed**.
 - e. **Description** - Enter a description of the milestone.
 4. Click **Create**.

4.5.2 Editing and Deleting Milestones

Edit or delete an existing milestone by selecting the milestone name on the Milestones page.

1. To edit or delete a milestone:
 1. Click the **Team Development** menu and then select **Milestones**.
The Milestones page appears.
 2. To edit a milestone:
 - a. On the Milestones page, click the milestone name.
 - b. Click **Edit Milestone**.
 - c. On the Milestone page:
 - Milestone Name - Enter a unique name for the milestone.
 - Slug - A unique string identifier for the milestone that will be used in URLs.
 - Date - Select a date for the milestone.
 - Milestone Status - Select **Open** or **Closed**.
 - Description - Enter a description of the milestone.
 - d. Click **Apply Changes**.
 3. To delete a milestone:
 - a. On the Milestones page, click the milestone name.
 - b. Click **Edit Milestone**.
 - c. Click **Delete**.
 - d. In the confirmation dialog, confirm the deletion by clicking **OK**.

4.6 Managing Templates

Create and update templates for issues and issue comments.

Templates enable you to provide users with starter text for issues and comments. Once you create a new template, you can select it when you create a new issue or add a comment.

If you completed the setup process, you can view sample template by going to **Team Development, Utilities, Manage Templates**.

- [Creating Issue Templates](#)
Create an issue template by clicking Create on the Templates page.
- [Editing or Deleting Issue Templates](#)
Edit existing templates by selecting the template title on the Templates page.

4.6.1 Creating Issue Templates

Create an issue template by clicking Create on the Templates page.

The text of a template defines the outline of what a user should enter.

1. To create an issue template:
 1. Click the **Team Development** menu and then select **Manage Templates**.
 2. On the Templates page, click **Create Template**.
 3. On Edit Template page:
 - a. Template Name - Enter a unique name for the template.
 - b. Template Description - Describe the purpose of template, including what it should be used for.
 - c. Template Type - Select a template type:
 - **Issue** - Select **Issue** when creating a new issue from scratch.
 - **Response** - Select **Response** when entering a comment.
 - d. Enter the template text and provide an outline of what a user should enter.
Use the Markdown tools above the field to add formatting. Click **Preview** to preview the HTML.
 4. Click **Create**.

4.6.2 Editing or Deleting Issue Templates

Edit existing templates by selecting the template title on the Templates page.

1. To edit or delete a template:
 1. Click the **Team Development** menu and then select **Manage Templates**.
 2. On the Templates page, click the template name.
 3. Click **Edit Template**.
The Edit Template page appears.
 4. Edit the template attributes:

- a. Template Name - Enter a unique name for the template.
 - b. Template Description - Describe the purpose of template, including what it should be used for.
 - c. Template Type - Select a template type:
 - d. Enter the template in the field provided. To add formatting (such as bold or italic), click the icons in the toolbar. To preview the rendered HTML, click the **Preview** button.
 - e. Click **Apply Changes**.
5. To delete the template:
 - a. Click **Delete**.
 - b. In the confirmation dialog, confirm your selection and click **OK**.

4.7 Using Team Development Utilities

Use Utilities page to manage deleted issues, manage templates, milestones, and labels, view uploaded files, purge data, reassign issues to another user, reassign issue owners, remove a milestone or label from all issues, and manage user notifications.

- [Team Development Utilities](#)
Access the Utilities page by selecting Team Development, Utilities.
- [Managing Uploaded Files](#)
View and delete uploaded files attached to issues in the workspace.
- [Purging Data](#)
Users with administrator privileges can purge data for selected components.
- [Reassigning Issues to Another Assignee](#)
Users with administrator privileges can reassign issues from one assignee to another for all issues, or only issues having an Open status.
- [Reassigning the Issue Owner](#)
Users with administrator privileges can reassign the issue owner.
- [Removing a Milestone for All Issues](#)
Users with administrator privileges can remove a specific milestone from all issues.
- [Removing Labels for All Issues](#)
Users with administrator privileges can remove specific labels for all issues.
- [Managing Notification Preferences](#)
Enables administrators to manage notification preferences.

4.7.1 Team Development Utilities

Access the Utilities page by selecting Team Development, Utilities.

User with administrator rights can see the following links on the Utilities page:

- **Manage Deleted Issues** - Purge or reinstate issues that have been deleted. See "[Managing Deleted Issues](#)."
- **Manage Templates** - Manage templates for issues and comments. See "[Managing Templates](#)."

- **Manage Milestones** - Create and update issues milestones used to track events. See "[Managing Milestones](#)."
- **Manage Labels** - Manage Label Groups and Label used to classify issues. See "[Managing Labels](#)."
- **View Files** - View and delete uploaded files attached to issues in the workspace. See "[Managing Uploaded Files](#)."
- **Purge Data** - Purge all data for selected components. See "[Purging Data](#)."
- **Update Assignments** - Perform bulk reassignment of issues to a given user. See "[Reassigning Issues to Another Assignee](#)."
- **Reassign Owner** - Perform bulk reassignment of issue owners to a given user. See "[Reassigning the Issue Owner](#)."
- **Remove Milestone from All Issues** - Remove a milestone from all issues. See "[Removing a Milestone for All Issues](#)."
- **Remove Labels from all Issues** - Remove a label from all issues. See "[Removing Labels for All Issues](#)."
- **Manage User Notifications Preferences** - Manage issue notification preferences of all users within the workspace. See "[Managing Notification Preferences](#)."

4.7.2 Managing Uploaded Files

View and delete uploaded files attached to issues in the workspace.

The Issues Files page displays a report of uploaded files. Each file displays on a separate row and includes the file name, associated issue, file size, date the file was added, and the associated user.

1. To view and delete uploaded files:
 1. From the **Team Development** menu, select **Utilities**.
 2. Click **View Files**.
The Issues Files page appears.
 3. On the Issues Files page you can:
 - **Download the File** - Under Name, click the file name.
 - **Link to the Issue** - Click the **Issue Title** to link to the Issue Details page.
 - **Delete the File** (Administrators only) - Select the file and click **Delete Checked**.

4.7.3 Purging Data

Users with administrator privileges can purge data for selected components.

WARNING:

Purging data removes all the data for the selected component.

1. To purge data:

1. From the **Team Development** menu, select **Utilities**.
2. Click **Purge Data**.
3. On the Purge Data page you can:
 - a. Select the components for which you wish to purge data.
 - b. Click **Delete**.

4.7.4 Reassigning Issues to Another Assignee

Users with administrator privileges can reassign issues from one assignee to another for all issues, or only issues having an Open status.

1. To reassign issues:
 1. From the **Team Development** menu, select **Utilities**.
 2. Click **Update Assignees**.
The Update Assignees page appears.
 3. On Update Assignee:
 - a. Change From - Select current assignee that you wish to reassign. Users marked as **Orphan** are current assignees whose related Application Express user has been removed.
 - b. Change To - Select the new assignee.
 - c. For Open Issues Only? - Choose whether assignments should be changed for Open issues only, or for all issues.
 4. Click **Next**.
A report appears detailing the issues to be reassigned.
 5. Click **Change Assignee**.

4.7.5 Reassigning the Issue Owner

Users with administrator privileges can reassign the issue owner.

1. To reassign the issue owner:
 1. From the **Team Development** menu, select **Utilities**.
 2. Click **Reassign Owner**.
The Reassign Owner page appears.
 3. On Reassign Owner:
 - a. Change From - Select current owner that you wish to reassign. Users marked as **Orphan** are current assignees whose related Application Express user has been removed.
 - b. Change To - Select the new owner.
 - c. For Open Issues Only? - Choose whether assignments should be changed for Open issues only, or for all issues.
 4. Click **Next**.
A report appears detailing the issues to be reassigned.

5. Click **Change Owner**.

4.7.6 Removing a Milestone for All Issues

Users with administrator privileges can remove a specific milestone from all issues.

1. To remove a specific milestone from all issues:
 1. From the **Team Development** menu, select **Utilities**.
 2. Click **Remove Milestone from All Issues**.
The Remove Milestone page appears.
 3. On Remove Milestone:
 - a. **Milestone** - Select the milestone that you wish to disassociate from the selected issues.
 - b. **For Open Issues Only?** - Choose whether the disassociation should occur for Open issues only, or for all issues.
 4. Click **Next**.
A report appears detailing the issues to be reassigned.
 5. Click **Remove Milestone**.

4.7.7 Removing Labels for All Issues

Users with administrator privileges can remove specific labels for all issues.

1. To remove specific labels for all issues:
 1. From the **Team Development** menu, select **Utilities**.
 2. Click **Remove Labels from All Issues**.
The Remove Labels page appears.
 3. On Remove Labels:
 - a. **Label** - Select the Label or Label Group to be removed.
 - b. **For Open Issues Only?** - Choose whether Labels should be removed for Open issues only, or for all issues.
 4. Click **Next**.
A report appears detailing the issues to be reassigned.
 5. Click **Remove Labels**.

4.7.8 Managing Notification Preferences

Enables administrators to manage notification preferences.

Whenever a user interacts with an issue, Team Development creates an event. For example, an **event** can be creating an issue, closing an issue, or adding a comment. **Notifications** are a record of these events. Users can view their own notifications on the **User Profile, Notification** page. Administrators can configure user notification preferences by going to **Utilities, Manage User Notification Preferences**.

- [Editing Your Own Notification Preferences](#)
Edit your own notification preferences.

- [Adding User Notification Preferences](#)
Users with administrator privileges can add notification preferences for any user.
- [Editing Notification Preferences for Other Users](#)
Users with administrator privileges can edit notification preferences for other users.

4.7.8.1 Editing Your Own Notification Preferences

Edit your own notification preferences.

1. To edit your notification preferences:
 1. Click the **Team Development** menu.
 2. On the Issues page, click the **Notifications** icon.
The Notifications page appears displaying notifications for all issues you own or are monitoring.
 3. Click **Notification Preferences** to specify which notifications you would like to receive.
The Notification Preferences dialog appears.
 4. On Notification Preferences:
 - a. For **Receives Emails?** - Choose whether the user receives emails for subscribed events.
 - b. **Frequency** - If the user has opted to receive emails, this setting determines how often emails are sent. Select a Frequency:
 - Immediately
 - Hourly Summary
 - Daily Summary
 - c. **Receive Notifications When** - Select the types of notifications the user is interested in.
If the user is receiving emails, the selected notifications are sent at the selected Frequency. If the user has opted not to receive emails, notifications are viewable using the user's profile page.
 5. Click **Save Settings**.

4.7.8.2 Adding User Notification Preferences

Users with administrator privileges can add notification preferences for any user.

1. To add user notification preferences for any user:
 1. From the **Team Development** menu, select **Utilities**.
 2. Click **Manage User Notification Preferences**.
The Manage Notification Preferences page appears.
 3. To add a new notification, click **Add Preference for User**.
 4. On Manage Notification Preference:

- a. Add User - Indicates the user whose notification preferences are being added. Only users who do not already have notification preferences set will appear in this list.
 - b. For Receives Emails? - Choose whether the user receives emails for subscribed events.
 - c. Frequency - If the user has opted to receive emails, this setting determines how often emails are sent. Select a Frequency:
 - Immediately
 - Hourly Summary
 - Daily Summary
 - d. Receive Notifications - Select the types of notifications the user is interested in.
If the user is receiving emails, the selected notifications are sent at the selected Frequency. If the user has opted not to receive emails, notifications are viewable using the user's profile page.
5. Click **Save Settings**.

4.7.8.3 Editing Notification Preferences for Other Users

Users with administrator privileges can edit notification preferences for other users.

1. To user notification preferences for other users:
 1. From the **Team Development** menu, select **Utilities**.
 2. Click **Manage User Notification Preferences**.
The Manage Notification Preferences page appears.
 3. Select a user to edit.
 4. On Manage Notification Preference:
 - a. Edit User - Displays the current user.
 - b. For Receives Emails? - Choose whether the user receives emails for subscribed events.
 - c. Frequency - If the user has opted to receive emails, this setting determines how often emails are sent. Select a Frequency:
 - Immediately
 - Hourly Summary
 - Daily Summary
 - d. Receive Notifications When - Select the types of notifications the user is interested in.
If the user is receiving emails, the selected notifications are sent at the selected Frequency. If the user has opted not to receive emails, notifications are viewable using the user's profile page.
5. Click **Save Settings**.

4.8 Managing Feedback

Feedback provides a mechanism for end users to post general comments for application administrators and developers.

- [About Feedback](#)
Adding Feedback enables you to gather and track real-time comments, enhancement requests, and bugs from application users. Feedback enhances communication between the user community and the application owners.
- [Adding Feedback Using the Create Application Wizard](#)
Add a Feedback page when running the Create Application Wizard.
- [Adding Feedback Using the Create Page Wizard](#)
Use the Create Page Wizard to add Feedback to an existing application.
- [Submitting Feedback Within a Running Application](#)
Users can submit feedback by clicking the Feedback navigation bar icon in the upper right of a running application.
- [Reviewing Feedback Within an Application](#)
View feedback within a running application by clicking User Feedback on the Administration page.
- [Configuring Feedback to Support Attachments](#)
Configure feedback to add support for attachments.
- [Tracking Feedback](#)
Track all feedback within a workspace on the Feedback page.

4.8.1 About Feedback

Adding Feedback enables you to gather and track real-time comments, enhancement requests, and bugs from application users. Feedback enhances communication between the user community and the application owners.

Feedback provides a mechanism for end users to post general comments for application administrators and developers. The posts include useful session state information to help developers determine where the end user sent the feedback from. Providing such an easy feedback loop enhances communication between the user community and the application owners, which leads to greatly improved end user satisfaction.

Creating Feedback:

- Adds a Feedback navigation bar icon in the running application which users can click to leave feedback.
- Creates an report for viewing and triaging feedback.
- Captures the application name, page ID and name , feedback comments, date and time, and user information.

Choosing How to Add Feedback

You can create a Feedback page automatically using a wizard when you create a new application, or by adding a page to an existing application. In both the Create Application Wizard and the Create Page Wizard, you simply select the Feature, **Feedback**.

How Customers Submit Feedback

Users can submit feedback by clicking the **Feedback** navigation bar icon in the upper right of a running application. In the Feedback window, they can rate their user experience by selecting an emoji, entering feedback comments, or uploading files.

Viewing Feedback within an Application

Administrators and developers can track and manage Feedback at the application-level, by running the application and accessing Feedback region on the Administration page. To control whether users can upload attachments, click **Feedback Settings**. To view feedback entries, select **User Feedback** to view the Manage Feedback report.

Tracking Feedback in Team Development

Administrators and developers can track all feedback within a workspace in Team Development, Feedback. Each feedback entry tracks the application and page ID and name, displays any feedback comments. Administrators and developers can assign a status and create an issue.

4.8.2 Adding Feedback Using the Create Application Wizard

Add a Feedback page when running the Create Application Wizard.

To create a database application which includes a Feedback page:

1. On the Workspace home page, click the **App Builder** icon.
2. Click the **Create** button.
3. Click **Application**.
4. For Name, enter the name used to identify the application to developers.
5. For Appearance, accept the default Theme Style and menu layout (Vita, Side Menu), or change it by clicking the **Set Appearance** icon adjacent to the Appearance field.
6. To add a new page (such as a blank page, calendar, chart, form, report, and so on) click **Add Page** and select the desired page type.
7. Under Features, select **Feedback**.
8. Under Settings, specify settings used to generate this application. To learn more about an attribute, click the Help icon adjacent to **Settings**.
9. Click **Create Application**.



See Also::

["Understanding Page Types, Features, and Settings"](#)

4.8.3 Adding Feedback Using the Create Page Wizard

Use the Create Page Wizard to add Feedback to an existing application.



Tip:

This section describes how to create a feedback by running the Create Page Wizard from the Application home page. You can also run this wizard in Page Designer by clicking the **Create** menu and selecting **Page**.

To add a feedback page:

1. On the Workspace home page, click **App Builder**.
2. Select an application.
The Application home page appears.
3. Click the **Create Page** button.
4. For Create a Page:
 - a. Page Type -Select **Feature** and then **Feedback**.

 **Tip:**

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

The Create Feedback Page appears.

- b. Click **Next**.
5. On the Create Feedback Pages:
 - a. Starting Page Number - Enter an unused starting page number. This feature will create multiple pages starting with the number specified.
 - b. Page Group - Identify the name of the page group to associate with this page. Page groups help developers manage the pages within an application. To use an existing page group, select the name from the list.
 - c. Build Option - The listed build option(s) to be created to support this feature.
 - d. Include in Navigation Bar - Select **On** to create a navigation bar entry within the current application to invoke your new feedback page.
 - e. Navigation Bar Label - Enter the name of the new navigation bar entry used to access the new feedback page.
 - f. Administration Page Preference - Specify the administration page to which a list will be added for this feature.
Options include:
 - **Create a new page**
 - **Identify an existing page**Depending upon your selection, the UI changes.
 - g. Follow the on-screen instructions.
6. Click **Create**.

4.8.4 Submitting Feedback Within a Running Application

Users can submit feedback by clicking the Feedback navigation bar icon in the upper right of a running application.

To submit feedback managed with the application:

1. Run the application for which you want to submit feedback.
2. Click the **Feedback** navigation bar icon in the upper right corner.
A Feedback window appears.
3. In Feedback:
 - a. Experience - Select an emoji that reflects your user experience (**Positive**, **Neutral**, or **Negative**).
 - b. Feedback - Enter a comment.
 - c. Attachment - Click **Choose File** to upload an attachment.

 **Tip:**

Administrators can enable and disable attachments by selecting **Administration** and editing **Feedback Settings**.

4. Click **Submit Feedback**.

4.8.5 Reviewing Feedback Within an Application

View feedback within a running application by clicking User Feedback on the Administration page.

To view feedback within an application:

1. Run the application.
2. Click **Administration** in the left navigation bar.
3. Click **User Feedback**.
The Manage Feedback page displays an interactive report.
4. Click the Edit icon adjacent to the entry you wish to view.
5. On the Feedback page
 - a. Review the user feedback.
 - b. Response - Respond to the feedback.
 - c. Status - Select one of the following:
 - **No Action**
 - **Acknowledged**
 - **Open**
 - **Closed**
6. To delete the feedback, click **Delete**.
7. To save your changes, click **Apply Changes**.

4.8.6 Configuring Feedback to Support Attachments

Configure feedback to add support for attachments.



Note:

For this feature to work, an administrator must set **Enable Feedback File Repository** to **Yes** for the workspace. See "Configuring Team Development in an Existing Workspace" in *Oracle Application Express Administration Guide*.

Developer and administrators can also configure Feedback Settings to enable support for attachments.

To configure Feedback Settings:

1. Run the application.
2. Click **Administration** in the left navigation bar.
3. Click **Feedback Settings** .
Feedback Settings appears.
4. For Enable Attachments, select **On** to enable users to upload attachments or **Off** to disable this functionality.
5. To save your changes, click **Apply Changes**.

4.8.7 Tracking Feedback

Track all feedback within a workspace on the Feedback page.

Administrators and developers can track all feedback within a workspace in Team Development. Each feedback entry tracks the application and page ID and name, user, user email, and user comments. Administrators and developers can review the feedback, assign a type, create an issue and assign a status.

- [Viewing the Feedback Dashboard](#)
- [Viewing the Feedback Report](#)
- [Viewing Feedback by Filing User](#)
- [Viewing the Feedback Calendar](#)

4.8.7.1 Viewing the Feedback Dashboard

To access the Feedback report:

1. Click the **Team Development** menu and select **Feedback**.
The Feedback Dashboard appears.
2. Click the **Report** tab.
The Feedback Dashboard appears.

3. To link from the Feedback Dashboard:
 - **Open Feedback, Feedback Users, or Feedback Entries** - Click the number enclosed by a circle to link to the appropriate page or report.
 - **By Status, By Application, or By Filer** - Lists feedback details. Click the link to view more details.
 - **Summary** - Summaries feedback entries. Click the number above to summary entry to link the appropriate report or page.

4.8.7.2 Viewing the Feedback Report

To access the Feedback report:

1. Click the **Team Development** menu and select **Feedback**.
The Feedback Dashboard appears.
2. Click the **Report** tab.
The Feedback Report appears.
To customize the report, use the Actions menu in Search bar at the top of the page. Click **Reset** return the report to the default view.
3. Select a number in the Feedback column.
The View/Edit Feedback dialog appears.
4. On View/Edit Feedback:
 - a. Review the user feedback.
 - b. Type - Classify the feedback. Select one of the following:
 - **General Comment**
 - **Enhancement Request**
 - **Bug**
 - c. Disposition - Select one of the following:
 - **Log as Bug**
 - **Log as To Do**
 - **Log as Feature**
 - **Log as Issue**
5. For Status, select a status of the feedback entry:
 - **0. No Status**
 - **1. Acknowledged**
 - **2. Additional information requested**
 - **3. Open Processing Feedback**
 - **4. Closed**
6. To delete a feedback entry, click **Delete**.
7. To save your changes, click **Apply Changes**.

4.8.7.3 Viewing Feedback by Filing User

To view feedback by filing user:

1. Click the **Team Development** menu and select **Feedback**.

The Feedback Dashboard appears.

2. Click the **By Filing User** tab.

The By Filing User report appears.

To customize the report, use the Actions menu in Search bar at the top of the page. Click **Reset** return the report to the default view.

3. To view the feedback, click the user in **Filing User** column.

4.8.7.4 Viewing the Feedback Calendar

To view the Feedback Calendar:

1. Click the **Team Development** menu and select **Feedback**.

The Feedback Dashboard appears.

2. Click the **Calendar** tab.

The Calendar appears.

5

Creating Database Applications

A database application is a collection of pages linked together using navigation menus, tabs, buttons, or hypertext links. Application pages share a common session state and authentication.

To create a database application, a developer runs wizards to declaratively assemble pages and navigation. Individual pages are organized using containers called **regions**. Once created, developers can modify an application by editing application attributes and add new pages using the Create Page Wizard. Developers can further manage the development process by creating page groups, locking and unlocking pages, adding developer and application comments, and accessing a variety of application, page, and cross page utilities and reports.

- [About the Create Application Wizard](#)
To create an Oracle Application Express application, a developer runs the Create Application Wizard.
- [Creating a Database Application Based on a Table or Query](#)
Run the Create Application Wizard and select **New Application** to create a database application containing multiple pages based on a table you select, or by providing a valid SQL query.
- [Understanding Page Types, Features, and Settings](#)
Use the Create an Application page in the Create Application Wizard to define different types of page, select application Features, and configure the Settings used to generate the application .
- [Creating a Database Application from a File](#)
Run the Create Application Wizard and select **From a File** to upload a file and then create an application on the uploaded data.
- [Using Application Blueprints](#)
View an application blueprint and directly edit the application definition in JSON format.
- [Copying a Database Application](#)
Create a copy of an existing application.
- [Creating Applications for Mobile Devices](#)
Build applications for mobile devices with mobile-specific design patterns that can provide an optimal user experience for small screens.
- [Deleting an Application](#)
You can delete an application from the Application home page, or while editing application attributes.
- [Managing Application Attributes](#)
Application attributes (also known as the Application Definition) control the behavior of an entire application and are divided into the categories: Definition, Security, Globalization, and User Interface.
- [Adding Developer Comments](#)
Add comments to an application, a page, or a group of pages using the Developer Comment, Bug, or To Do button. You can use developer comments to communicate application changes, report issues, or record developer suggestions.

- [Using the Find Icon](#)
The Find icon resembles a flashlight and displays on many pages in App Builder including Application home page, Shared Components, and the Edit Application Definition. Click the Find icon to search for items, pages, queries, tables, PL/SQL code, or images, view debug reports, view session state, and view errors.
- [Adding Database Application Comments](#)
Use Application Comments to describe an application or track developers involved in the application development.
- [Managing Application Groups](#)
Organize applications by assigning them to application groups. To use application groups, first create a group and then assign applications to it.
- [Using Application Utilities](#)
Access the Utilities page to view useful application summaries and reports.
- [Using Workspace Utilities](#)
Use the Workspace Utilities page to access App Builder Defaults, REST Enabled SQL Services, Remote Servers, Application Groups, Web Credentials, Workspace Themes, Export, Application Express Views, and Manage Backups.

5.1 About the Create Application Wizard

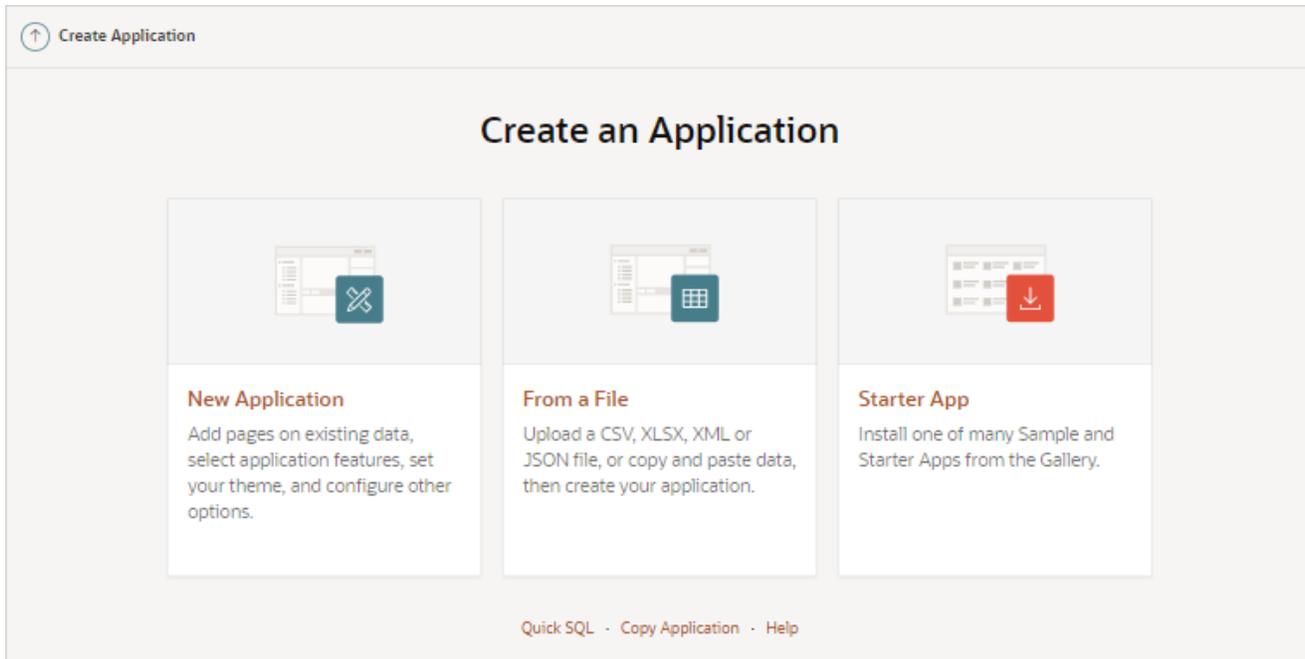
To create an Oracle Application Express application, a developer runs the Create Application Wizard.

To run the Create Application Wizard, click the **Create** button on the App Builder home page.



Tip:

The first time you access the App Builder home page, grey box labeled **Create a New App** appears. Clicking **Create New App** is a shortcut to accessing the Create Application Wizard.



When you run the Create Application Wizard, the wizard prompts you to choose the type of application you want to create. Options include:

- **New Application.** Create a fully functional database application based on tables you select or by providing a valid SQL. You can add pages that include various components including calendars, cards, charts, dashboards, forms, interactive grids, master detail or editable grids, and reports. Add application-level features such as an Application About page, role-based user authentication, end user activity reports, configuration options to enable or disable specific functionality, a feedback mechanism to gather end users comment, and a Customize button to enable end users to choose their own theme style
- **From a File.** Upload a CSV, XLSX, XML, or JSON file, or copy and paste data and then create your application.
- **Starter App.** Links to the Gallery. The Gallery enables you to access to Starter Apps, Sample Apps, and plug-ins available in the [Oracle APEX GitHub Repository](#). Follow the on-screen instructions.
- **Quick SQL.** Generate the SQL required to create a relational data model from an indented text document. Quick SQL is designed to reduce the time and effort required to create SQL tables, triggers, and index structures.
- **Copy Application.** Create a copy of an existing application.
- **Help.** Links to a discussion of this page in Oracle Help Center.

 **See Also:**

- ["Using the Create Application Wizard"](#)
- ["Creating a Database Application from a File"](#)
- ["Using Quick SQL" in *Oracle Application Express SQL Workshop Guide*](#)
- ["Copying a Database Application"](#)

5.2 Creating a Database Application Based on a Table or Query

Run the Create Application Wizard and select **New Application** to create a database application containing multiple pages based on a table you select, or by providing a valid SQL query.

- [Running the Create Application Wizard in App Builder](#)
Run the Create Application Wizard in App Builder from either the App Builder menu, or by clicking the Create button on the App Builder home page.
- [Using the Create Application Wizard](#)
Use the Create Application Wizard to create a database application containing multiple pages based on the tables you select, or by providing valid SQL queries.

5.2.1 Running the Create Application Wizard in App Builder

Run the Create Application Wizard in App Builder from either the App Builder menu, or by clicking the Create button on the App Builder home page.

1. You can run the Create Application Wizard in App Builder in two ways:
1. Access the Create Application Wizard:
 - From the App Builder menu:
 - Click the **App Builder** menu at the top of the page and click **Create**.
 - On the Create an Application page, click **New Application**.
 - From the App Builder home page:
 - On the Workspace home page, click the **App Builder** icon.
 - Click the **Create** button.
 - On the Create an Application page, click **New Application**.
2. Use the Create Application Wizard.

 **See Also:**

- ["Using the Create Application Wizard"](#)

5.2.2 Using the Create Application Wizard

Use the Create Application Wizard to create a database application containing multiple pages based on the tables you select, or by providing valid SQL queries.

1. To use the Create Application Wizard:
1. Access the Create Application Wizard.
The Create an Application page appears.

2. For Name, enter the name used to identify the application to developers.
3. For Appearance, accept the default or click **Set Appearance** to change it.

In the Appearance dialog, configure the following:

- **Theme Style** - Select the default theme style used to display the application.

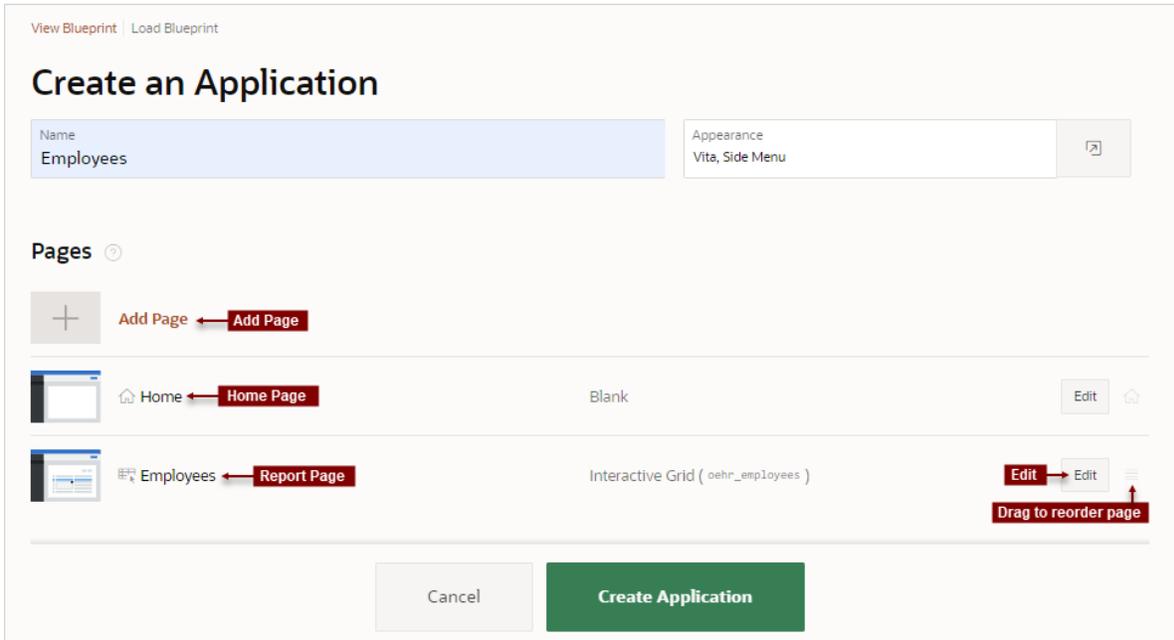
Tip:

You can change the style to another pre-defined style, or modify it post generation. To change the style run the application and then click **Theme Roller** in the Developer toolbar.

- **Navigation** - Select a type of navigation menu. Options include:
 - **Side Menu** - Renders a navigation tree on the side of the screen that can be collapsed when not in use.
 - **Top Menu** - Renders the navigation as a menu bar in the application header.
 - **Mega Menu** - Renders the navigation in an collapsible floating panel that displays all navigation items at once.
- **Application Icon** - Click **Choose New Icon** to change the icon. Your selection displays on the home page of the application.

- Click **Save Changes**.
4. To add a page, click **Add Page** and select the desired page type. The user interface changes based on the selected page type.

Pages you create display under **Pages**.



You can edit existing pages as follows:

- **Change the page order.** To change the order in which pages appear in your application, click and hold the **Drag to reorder page** icon and drag and drop it to a new location in the list.
The Home page always displays first and cannot be reordered. For administrative pages, the page order dictates the order they appear in the Application Administration list on the Administration page.
 - **Edit a page.** To edit a page click **Edit**. In the dialog, edit the attributes and click **Save Changes**.
 - **Delete a page.** To delete a page, click **Edit** and the click **Delete**.
5. For Features, select features to include with your application.

Features provide application-level functionality and can only be added once per application. To learn more, see Help. Click the Check All button to select all features.

6. For Settings:

- a. Application ID - Enter a unique, numeric identifier for your application. This field contains an automatically generated identifier by default. Application IDs between 3000 to 9000 are reserved for internal use by Oracle Application Express.
- b. Schema - Select the database schema which stores the database objects you want to use in this application. Each application obtains its privileges by parsing all SQL as a specific database schema.
- c. Languages - The primary language used in the app. To change the primary language, click the **Select Languages** icon.
- d. Authentication - Select how you want users to authenticate into your application..
- e. Advanced Settings - Click the icon adjacent to the Advanced Settings to edit the application definition settings and preferences and security and globalization attributes. To learn more, see Help.
- f. User Interface Defaults - Click the icon to apply User Interface Defaults to this application.

7. Click **Create Application**.

 **See Also:**

- ["Available Page Types in the Create Application Wizard"](#)
- ["Available Features in the Create Application Wizard"](#)
- ["Available Settings in the Create Application Wizard"](#)
- ["Managing Navigation Menus"](#)

5.3 Understanding Page Types, Features, and Settings

Use the Create an Application page in the Create Application Wizard to define different types of page, select application Features, and configure the Settings used to generate the application .

- [About Creating a New Database Application](#)
Use the Create Application Wizard to design and quickly create Oracle Application Express applications.
- [Available Page Types in the Create Application Wizard](#)
Learn about available page types when running the Create Application Wizard.
- [Available Features in the Create Application Wizard](#)
Learn about available features when running the Create Application Wizard. Features provide application-level functionality and can only be added once per application.
- [Available Settings in the Create Application Wizard](#)
Learn about Settings available when running the Create Application Wizard. Settings are used in the generation of the application and include the application ID, the database schema, Advanced Settings (such as the application definition, security, and globalization attributes), and application authentication.
- [About Removing Features Created with the Create Application Wizard](#)
Remove features created with a wizard using build options.

 **See Also:**

- ["Using the Create Application Wizard"](#)
- ["Creating Applications for Mobile Devices"](#)

5.3.1 About Creating a New Database Application

Use the Create Application Wizard to design and quickly create Oracle Application Express applications.

Creating a new database application with the Create Application Wizard is a multiple step process. Once you specify the application name and appearance, you add pages. Database applications can contain multiple pages that include various components such as calendars, cards, charts, dashboards, forms, interactive grids, master detail or

editable grids, and reports. Once created, you can edit the page names, alter the page order, and delete them.

Features provide application-level functionality and can only be added once per application. Available features include an Application About page, role-based user authentication, end user activity reports, configuration options to enable or disable specific functionality, a feedback mechanism to gather end users comment, and a Customize button to enable end users to choose their own theme style.

Then, you configure **Settings**. Settings are used in the generation of the application and include the application ID, the database schema, Advanced Settings (such as the application definition, security, and globalization attributes), and application authentication.

After you create an application using the Create Application Wizard, you can modify pages and add additional pages using the Create Page Wizard.



See Also:

["Managing Pages in a Database Application"](#)

5.3.2 Available Page Types in the Create Application Wizard

Learn about available page types when running the Create Application Wizard.

Available Page Types

Table 5-1 Create Application Wizard - Available Page Types

Page Type	Description	To Learn More
Blank	Create a blank page as a placeholder. Once you create the application, you can create regions on the page in Page Designer.	See online Help when creating this page.
Calendar	Generates a calendar with monthly, weekly, and daily views.	See Creating Calendars
Cards	A cards page consists of individual boxes, which resemble index cards, laid out on a page. Each card displays three pieces of information: Card Title, Description Column, and Additional Text Column. First, you select a table or view on which to build the page. Second, you select the Card Title, Description Column, and Additional Text Column.	See: <ul style="list-style-type: none"> Example Cards Page Creating a Cards Page Using the Create Application Wizard <p>Note: The SQL query for a cards page includes special aliases such as CARD_MODIFIERS and CARD_LINK. To link a card to a new page, you must update CARD_LINK in the underlying SQL query to point to the appropriate target. See Using Actions to Link from a Cards Page.</p>
Chart	Create a page which displays a chart. Supported chart types include area, bar, line, or pie.	See: <ul style="list-style-type: none"> Creating Charts Creating a Chart Using the Create Application Wizard

Table 5-1 (Cont.) Create Application Wizard - Available Page Types

Page Type	Description	To Learn More
Dashboard	Create a dashboard page with up to four charts. Supported chart types include area, bar, line, or pie.	See: <ul style="list-style-type: none"> • Creating Charts • Creating a Dashboard Page Using the Create Application Wizard
Faceted Search	Creates a faceted search region and report. First, you select a report type (Report or Cards). Second, you select the Table or View on which to build the faceted search region and report. If you select a Table , facets are auto discovered using APEX Data Dictionary Cache. If you select a View , facets are not auto-discovered. Developers can create the faceted report page based on a View, but the only Search facets included are searchable VARCHAR2 columns.	See: <ul style="list-style-type: none"> • Example Faceted Search • Managing Faceted Search
Form	Create a page containing a form which enables end users to maintain data. Select the table on which to build the form and specify whether or not to include a report.	See Developing Forms
Interactive Grid	An interactive grid presents users a set of data in a searchable, customizable report. Functionally, an interactive grid includes most customization capabilities available in interactive reports plus the ability to rearrange the report interactively using the mouse. First, you select a page source (that is, Table or View or SQL Query). Second, you determine if the interactive grid is editable by selecting Allow Editing or Read Only . If you select Allow Editing , users can add to, modify, and refresh the data set directly on the page. Functionally, an interactive grid includes most customization capabilities available in interactive reports plus the ability to rearrange the report interactively using the mouse or keyboard. You choose a table on which to build the interactive grid.	See: <ul style="list-style-type: none"> • Example Interactive Grid • Creating an Interactive Grid Using the Create Application Wizard • Managing Interactive Grids
Interactive Report	Creates a page that contains the formatted result of a SQL query. First, you select a page source (that is, Table or View or SQL Query). Second, you select a report type, Interactive Report . To include a form page for creating or updating records, select Include Form . Select Include Form to include a form page for creating or updating records. If the report is based on table which has a foreign key constraints to another table, the developer can also define Lookup Columns. Use Lookup Columns to replace identifiers with a display column, such as showing the department name instead of the department number.	See: <ul style="list-style-type: none"> • Example Interactive Report • Creating an Interactive Report Using the Create Application Wizard • Managing Interactive Reports

Table 5-1 (Cont.) Create Application Wizard - Available Page Types

Page Type	Description	To Learn More
Map	<p>The map component consists of a background map and spatial geometry objects (or layers) sourced from data in a local table. Supported spatial geometry objects (or layers) include: Points, Lines, Polygons, Heat Map, or Extruded Polygons. Spatial geometry objects can be either:</p> <ul style="list-style-type: none"> • Geometry Column - Supported datatypes include SDO_GEOMETRY, VARCHAR2, or CLOB. VARCHAR2 and CLOB columns must contain geometry information in GeoJSON format. • Two Numeric Columns - These columns must contain longitude and latitude values. This option only applies to Point and Heat Map layers. 	See Creating Maps
Master Detail	<p>A master detail reflects a one-to-many relationship between two tables in a database. Master detail forms enable users to insert, update, and delete values from two tables or views. Master Detail options include:</p> <ul style="list-style-type: none"> • Side by Side - Create a single page master detail utilizing side by side layout and report regions with modal edit windows. The left side contains a master list to navigate to the master record. The right side contains the selected master record and the associated detail report. • Stacked - Creates a single page master detail with editable interactive grids. Users select a row in the master grid to update the detail grids. 	See Creating Master Detail Forms
Wizard	<p>Create a collection of pages to be used as a wizard. Generally wizards are used for entering data across multiple steps.</p>	See online Help when creating this page.
Multiple Reports	<p>Creates multiple report pages containing an interactive report with form. For each page, you choose a table on which to build the interactive report with form. Click Edit to change the default options (such as providing a custom SQL Query), specifying another report type (such as, selecting Classic Report instead of Interactive Report). Select Include Form to include a form page for creating or updating records.</p>	<p>See:</p> <ul style="list-style-type: none"> • Example Classic Report • Managing Classic Reports
Classic Report	<p>Expand the Additional Pages region to view this option. Creates a page that contains the formatted result of a SQL query. You choose a table on which to build a report, or provide a custom SQL SELECT statement or a PL/SQL function returning a SQL SELECT statement. You then choose the report type Classic Report. Select Include Form to include a form page for creating or updating records.</p>	<p>See:</p> <ul style="list-style-type: none"> • Example Classic Report • Creating a Classic Report Using the Create Application Wizard • Managing Classic Reports
Timeline	<p>Expand the Additional Pages region to view this option. Create a page which displays a timeline. Especially useful for displaying updates.</p>	See online Help when creating this page.

5.3.3 Available Features in the Create Application Wizard

Learn about available features when running the Create Application Wizard. Features provide application-level functionality and can only be added once per application.

This table lists available Features when running the Create Application Wizard.

Table 5-2 Create Application Wizard — Features

Page Type	Description	To Learn More
About Page	Include an About page in the application which displays the application description.	See online Help when creating feature.
Access Control	Incorporate role based user authentication within your application. Users can be defined as Administrators, Contributors, or Readers. You can then readily define different access to different roles for various components throughout your application, such as pages, menu entries, regions, columns, items, buttons and so forth.	See " Controlling Access to Applications, Pages, and Page Components "
Activity Reporting	Include numerous reports on user activity for your application such as the most active users, the most used pages, the performance of pages, and errors raised. Includes the following: <ul style="list-style-type: none"> • Top Users report • Application Error Log report • Page Performance, activity and performance by page • Application activity by page report • Page Views detail report • Automations Log (if the application contains automations) 	Not applicable.
Configuration Options	Enables application administrators to enable or disable specific functionality within the application. This feature is useful if you select features that need additional development effort before they can be used by end users. This feature can also be expanded to application-specific features. If developers define additional build options and associate them with specific functionality throughout the application, then they can be added to the configuration settings for administrators. For example, within the <i>Customer Tracker</i> productivity app, administrators can turn on or off such features as Contacts, Data Loading, Geography, and more.	Not applicable.

Table 5-2 (Cont.) Create Application Wizard — Features

Page Type	Description	To Learn More
Feedback	<p>Feedback provides a mechanism for end users to post general comments for application administrators and developers. The posts include useful session state information to help developers determine where the end user sent the feedback from.</p> <p>Creating Feedback:</p> <ul style="list-style-type: none"> • Creates a Navigation bar icon which users can click to leave feedback. • Creates a report for viewing and updating feedback. • Captures the application and page ID, feedback comments, date and time, and user information. 	See " Managing Feedback "
Theme Style Selection	<p>Enables administrators to select a default color scheme (theme style) for the application. Administrators determine whether end users can choose their own theme style by enabling and disabling Allow End Users to choose Theme Style is enabled.</p> <p>If enabled, end users simply click on the Customize link at the bottom of the home page and select from the available theme styles. For example, users with visual impairment may prefer to utilize the Vista theme style which has a much higher color contrast</p>	Not applicable.

**See Also:**

["About Removing Features Created with the Create Application Wizard"](#)

5.3.4 Available Settings in the Create Application Wizard

Learn about Settings available when running the Create Application Wizard. Settings are used in the generation of the application and include the application ID, the database schema, Advanced Settings (such as the application definition, security, and globalization attributes), and application authentication.

This table lists available Settings when running the Create Application Wizard.

Table 5-3 Create Application Wizard — Settings

Page Type	Description	To Learn More
Application ID	Unique, numeric identifier for your application. This field contains an automatically generated identifier by default.	Not applicable.

Table 5-3 (Cont.) Create Application Wizard — Settings

Page Type	Description	To Learn More
Schema	Select the database schema which stores the database objects you want to use in this application.	Not applicable.
Language	Select the primary language for this application.	Not applicable.
Authentication	Select how you want users to authenticate into your application.	See " Establishing User Identity Through Authentication "

Table 5-3 (Cont.) Create Application Wizard — Settings

Page Type	Description	To Learn More
Advanced Settings	<p>Set additional definition, security, and globalization settings. These settings can be applied when creating the application and can be edited post application creation.</p> <p>Tip: To learn more about these attributes, see field-level Help.</p> <p>User Interface Attributes:</p> <ul style="list-style-type: none"> • Apply User Interface Defaults - Select On to have attribute defaults based on existing User Interface Defaults defined within this workspace. • Copy from Existing Apps - Select On to have attribute defaults to be based on existing Form pages, based on the same table, in current applications defined within this workspace. • Table Prefixes - Enter table prefixes currently used by existing database tables on which pages are based. These prefixes may be different from the framework table prefix (for database objects created by this application when generated). <p>Description:</p> <ul style="list-style-type: none"> • Short Description - Enter text to be displayed as a subtitle, under the application name on the home page. • Description - Enter text to be displayed on the About This Application page, accessed from the help icon in the navigation bar. <p>Settings:</p> <ul style="list-style-type: none"> • Add "Built with APEX" to Footer - When set to On, Oracle Application Express adds the text "Built with Love using Oracle APEX" to the footer of every page. • Version - Enter the application version. The version is displayed by default on the bottom of each page. • Logging - Determines whether or not user activity is recorded in the activity log. When set to On, every page view is logged, enabling an administrator to monitor user activity for each application. Disabling logging may be advisable for high volume applications.. Note: You can only modify this attribute if the feature configuration Application Activity Logging in Oracle Application Express Internal Administration is set to Use Application Setting. • Debugging - Determines whether debug mode can be enabled using the browser. On enables the application to enable debug mode using the browser at runtime. Off 	Not applicable.

Table 5-3 (Cont.) Create Application Wizard — Settings

Page Type	Description	To Learn More
	<p>disables the application from enabling in debug from the browser.</p> <p>Debug can be enabled programmatically regardless of this debug setting. If the application is run from the Application Express development environment, debugging can always be enabled.</p> <p>Security:</p> <ul style="list-style-type: none"> • Deep Linking - Enables or prevents deep linking to an application. <p>If On, the URL to a specific page ultimately redirects there, possibly after the user has to logged in. If Off, the URL does not contain a valid session ID, Application Express redirects to the application's home page.</p> <ul style="list-style-type: none"> • Maximum session length in seconds - Defines how long (in seconds) sessions can exist and be used by this application. • Maximum session idle time in seconds - Defines the time between the last page request and the next page request. <p>Globalization:</p> <ul style="list-style-type: none"> • Document Direction - Set document direction left-to-right or right-to-left. • Date Format - Determines the date format to be used in the application. • Date Time Format - Specify the date time format to be used in the application. • Timestamp Format - Determines the timestamp format to be used in the application. • Timestamp with Timezone Format - Determines the timestamp with time zone format to be used in the application. 	
User Interface Defaults	Set defaults for user interface settings, such as rows per page, and add list of values definitions. These settings are used when generating components within the application.	See "Oracle Application Express SQL Workshop Guide"

5.3.5 About Removing Features Created with the Create Application Wizard

Remove features created with a wizard using build options.

When you add a feature using a wizard, the wizard creates one or more pages and other components and processes to seamlessly integrate it into your application. Each feature is associated with a build option which contains one or more components. You use the associated build option to enable, disable, or permanently remove features.

Using Build Options to Include or Exclude Features

Build options have two possible values: **Include** and **Exclude**. If you select the build option status of **Include**, then the Application Express engine considers the associated components (in this case features) as part of the application definition at runtime. Conversely, if you specify the build options status as **Exclude**, then the Application Express engine treats it and any associated components as if it did not exist.

Removing Features Permanently

You remove features by first removing the components associated with the build option and then deleting the build option.



See Also:

- ["Including or Excluding Build Options"](#)
- ["Deleting Build Options and Associated Components"](#)

5.4 Creating a Database Application from a File

Run the Create Application Wizard and select **From a File** to upload a file and then create an application on the uploaded data.

- [About Creating an Application from a File](#)
Upload a CSV, XLSX, XML, TXT, or JSON file, or copy and paste CSV data and then create your application.
- [Creating an Application by Uploading File](#)
Upload a file to the database and then create an application based on the new table.
- [Creating an Application by Copying and Pasting from a File](#)
Copy and paste column delimited data from a CSV file, or selecting a sample and then create an application based on the new table.

5.4.1 About Creating an Application from a File

Upload a CSV, XLSX, XML, TXT, or JSON file, or copy and paste CSV data and then create your application.

When you run the Create Application Wizard and select **From a File**, the Load Data Wizard appears. On the Load Data , you can choose to:

- **Upload a File.** Select this option to load data from a CSV, XLSX, XML, TXT or JSON file.
- **Copy and Paste.** Select this option to copy and paste column delimited data. You have the option of selecting a sample data set from the **Select Sample** list.

Once you load data into the database table, the wizard provides an option to Continue to the Create Application Wizard. When you continue, a report with form and dashboard pages based on the new table display under **Pages**. You then finish the application creation process by naming the application.



See Also:

"Loading Data" in *Oracle Application Express SQL Workshop Guide*

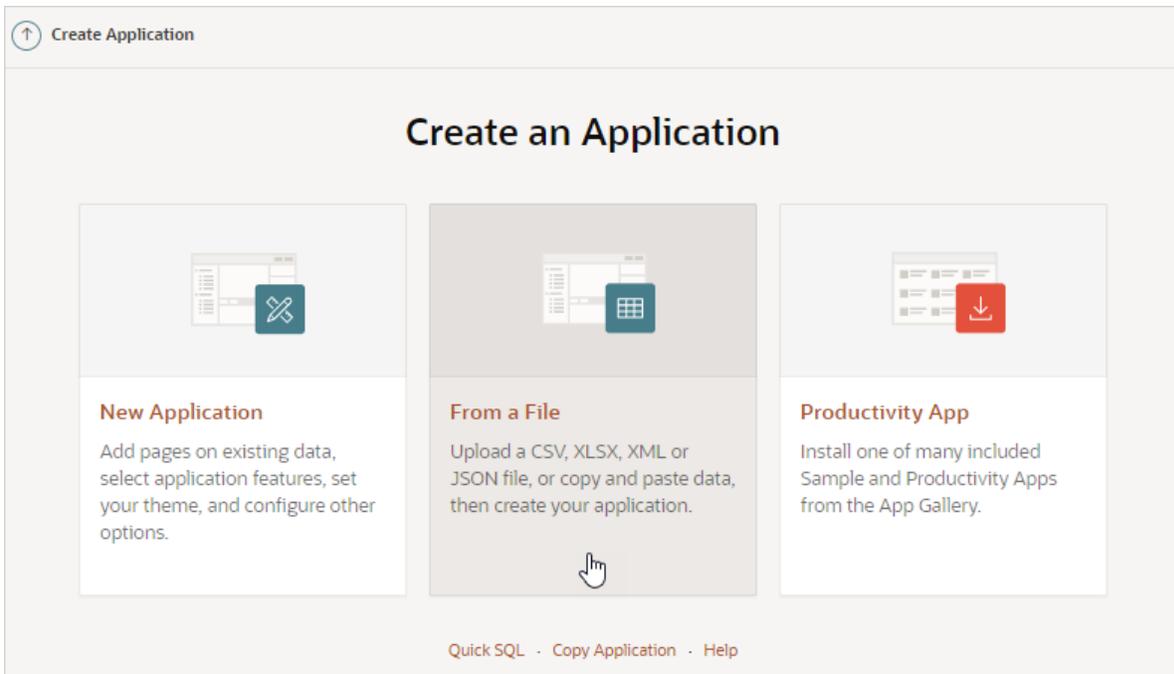
5.4.2 Creating an Application by Uploading File

Upload a file to the database and then create an application based on the new table.

To create an application from a file:

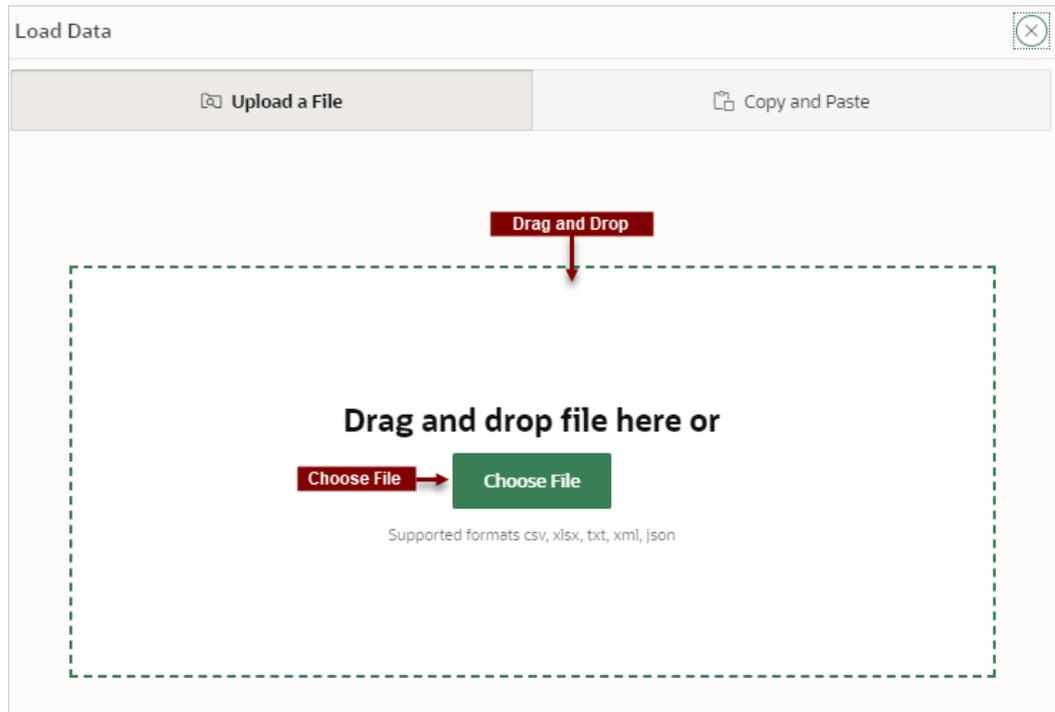
1. On the Workspace home page, click the **App Builder** icon.
2. Click the **Create** button.

The Create Application Wizard appears.



3. Click **From a File**.

The Load Data page appears with the **Upload a File** tab selected.



4. In the **Upload a File** tab, you have two options:
- **Drag and Drop** - Drag and drop the file to the region in the center of the page.
 - **Choose File** - Click **Choose File** and then navigate to and select the file.

The Load Data page appears containing the sections **Where do you want to load this data?**, **Settings**, **Preview**. Note that the Load Data page that appears differs slightly depending upon the selected file type.

Load Data
✕

Where do you want to load this data?

Load To New Table Existing Table

* Table Owner EXAMPLE ?

* Table Name ?

Primary Keys SYS_GUID Identity Column ?

Use Column Data Types ?

Settings

Column Headers ? First line contains headers

Column Delimiter ? , ; | # tab

Enclosed By ? None " '

File Encoding ? Unicode UTF-8 v

Preview

i Parsed first 126 rows to sample the column types. The preview below only displays the first 9 columns and 5 rows. To view the full preview and configure data load settings, please click **Preview** button. Preview ↗

1	Project	Milestone	Name	Description	Assignee	Start Date	End Date	Cost	Is Complete
2	Configure Web Environment	"	Identify Server Requirements	Determine which databases will be used to install Web development tool for Development, QA, and Production. Also specify which Web Listeners will be used for the three environments.	Tameka Hall	10/13/2019	10/14/2019	2,000	Y

<
Cancel
Load Data

5. Under **Where do you want to load this data?**, select where to load the data. What appears next depends upon your selection.
6. To load data to a new table:
 - a. Load To - Select **New Table**.
 - b. Table Owner - Select the database schema.
 - c. Table Name - Identify the table name you would like to create. By default, all table names are converted to upper case.
 - d. Error Table Name - Identify the error table name you would like to save errors during data load. By default, all table names are converted to upper case. If data load succeeds without any error, this error table is dropped automatically.
 - e. Primary Keys - Select how to set the primary key. Options include **SYS_GUID** or **Identity Column**. To learn more, see field-level Help.
 - f. Use Column Data Types - Select to use the column types parsed from the file. If un-checked, the table columns will be created as VARCHAR2(4000).
7. To load data to an existing table:
 - a. Load To - Select **Existing Table**.
 - b. Table Owner - Select the database schema.
 - c. Table Name - Select the database table to load data.

A message appears indicating the number of columns mapped to the target table.

- d. Click **Configure** to configure any remaining columns. On Configure, under Column Mapping:
 - Rows to Sample - Select the maximum number of rows to be used to sample column types.
 - Treat as Null - The entered case insensitive value will be treated as NULL. For example, "tbd", "n/a", "unknown", "-".
 - Column Mapping - Configure any additional attributes.
 - Click **Save Changes**.
 - e. Error Table Name - Identify the error table name where you would like to save errors during data load. By default, all table names are converted to upper case. If data load succeeds without any errors, this error table is dropped automatically.
 - f. Update Method - Options include:
 - **Append** - If data already exists in the table, the wizard appends the new rows into the table. If data does not exist, the new rows are simply loaded.
 - **Replace** - The entire table is replaced by deleting the table first and then loading the new rows into the table.
8. Under Settings:
 - a. Column Headers - Select this option if your data contains column names in the first row.
 - b. Column Delimiter - Select a column delimiter character (if CSV or TXT file).
 - c. Enclosed By - Select a column enclosed by character (if CSV or TXT file). This character delimitates the starting and ending boundary of a data value. If you specify a delimiter character, the wizard ignores white space occurring before the starting and ending boundary of a data value.
 - d. File Encoding (if applicable) - Choose the character set in which the file is encoded.
 9. **Preview** displays a sample of columns and rows. The exact number varies based on the type of file. Click one of the following tabs:
 - **Preview** - Displays a sample of columns and rows. The exact number varies based on the type of file.
 - **Column Mapping** - Enables you to configure any remaining columns:
 - Rows to Sample - Select the maximum number of rows to be used to sample column types.
 - Treat as Null - The entered case insensitive value will be treated as NULL. For example, "tbd", "n/a", "unknown", "-".
 - Column Mapping - Configure any additional attributes.
 - Click **Save Changes**.

10. Click **Load Data**.

A confirmation page appears indicating the table and rows have been created. You have the following options:

- **View Table** - Click **View Table** to exit from the current wizard and opens Object Browser so you can view the newly created table.
- **Continue to the Create Application Wizard** - Click **Continue to the Create Application Wizard** to load the Create Application Wizard.

Note that if all rows fail to load, this button does not display.

11. Click **Continue to Create Application Wizard.**

The Create an Application page in the Create Application Wizard appears. Report with form and dashboard pages based on the new table display under **Pages**. From here, you can edit page name or create additional pages based on the imported data.

12. Complete the Create Application Wizard.



See Also:

- ["Using the Create Application Wizard"](#)
- ["Available Page Types in the Create Application Wizard"](#)
- ["Available Features in the Create Application Wizard"](#)
- ["Available Settings in the Create Application Wizard"](#)

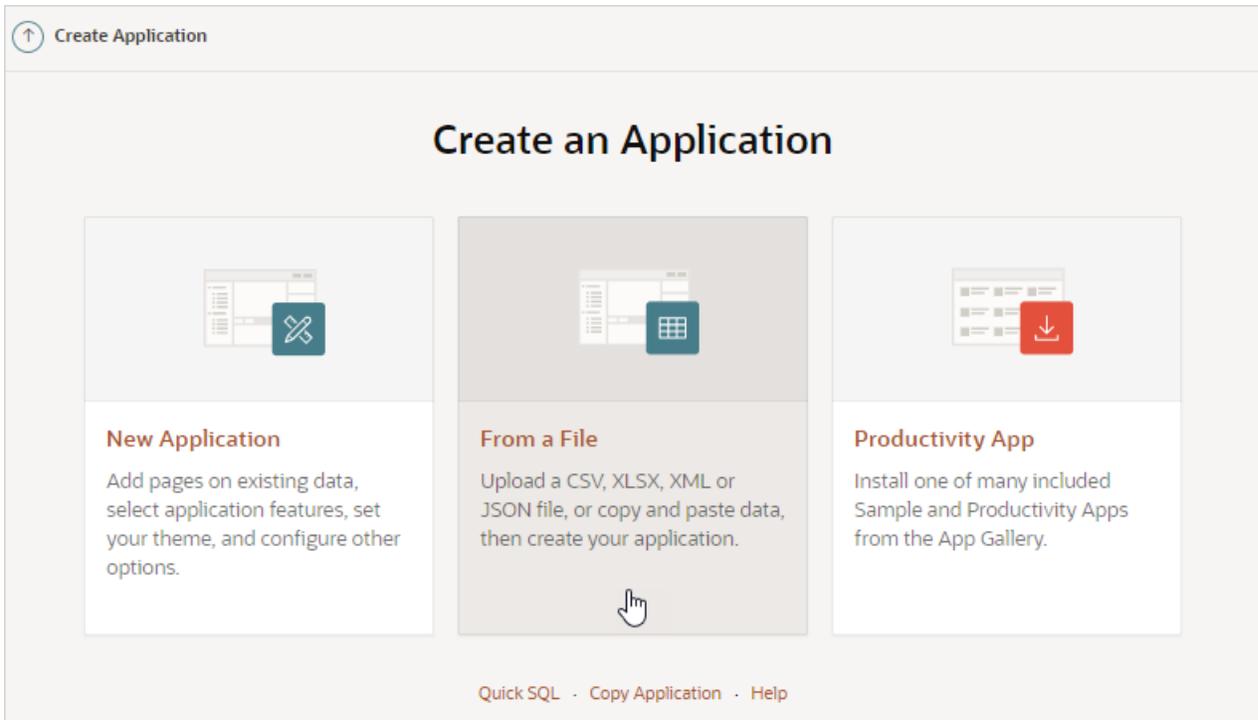
5.4.3 Creating an Application by Copying and Pasting from a File

Copy and paste column delimited data from a CSV file, or selecting a sample and then create an application based on the new table.

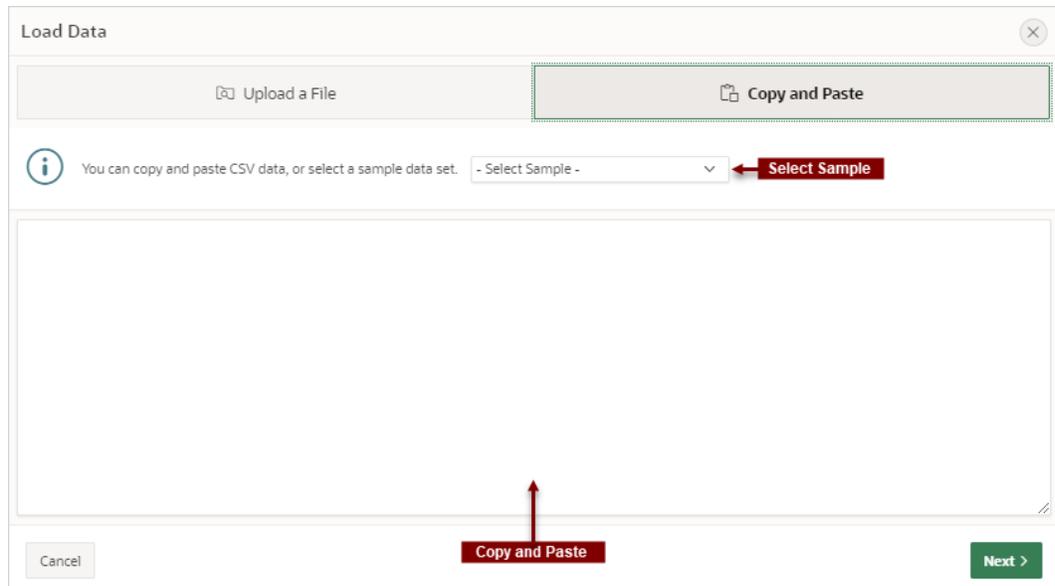
To create an application by copying and pasting column delimited data from a CSV file, or selecting a sample:

1. On the Workspace home page, click the **App Builder** icon.
2. Click the **Create** button.

The Create Application Wizard appears.



3. Click **From a File**.
The Load Data page appears
4. Select the **Copy and Paste** tab.



5. To load data, do one of the following:
 - **Select a Sample** - Select a sample database from the **Select Sample** list.
 - **Copy and Paste** - Copy and paste CSV data.
6. Click **Next**
The Load Data page appears.

Load Data
✕

Pasted Data

Where do you want to load this data?

Load To: New Table Existing Table

* Table Owner: EXAMPLE ⌵ ?

* Table Name: ⌵ ?

Primary Keys: SYS_GUID Identity Column ?

Use Column Data Types ?

Settings

Column Headers ? First line contains headers

Column Delimiter ? , ; | # tab

Enclosed By ? None " '

File Encoding ? Unicode UTF-8 ⌵

Preview

i Parsed first 74 rows to sample the column types. The preview below only displays the first 8 columns and 5 rows. To view the full preview and configure data load settings, please click [Preview](#) button. Preview ↗

1	Project	Task Name	Start Date	End Date	Status	Assigned To	Cost	Budget
2	ACME Web Configuration	Identify server requirements	17-May-20	18-May-20	Closed	John Watson	100	200
3	Maintain Support Systems	HR software upgrades	17-May-20	14-Jul-20	On-Hold	Pam King	8000	7000
4	Maintain Support Systems	Apply Billing System updates	17-May-20	18-Jul-20	On-Hold	Russ Sanders	9500	7000

<
Cancel
Load Data

7. Under **Where do you want to load this data?**, select where to load the data. What appears next, depends upon your selection.
8. To load data to a new table:
 - a. Load To - Select **New Table**.
 - b. Table Owner - Select the database schema.
 - c. Table Name - Identify the table name you would like to create. By default, all table names are converted to upper case.
 - d. Error Table Name - Identify the error table name you would like to save errors during data load. By default, all table names are converted to upper case. If data load succeeds without any error, this error table is dropped automatically.
 - e. Primary Keys - Select how to set the primary key. Options include **SYS_GUID** or **Identity Column**. To learn more, see field-level Help.
 - f. Use Column Data Types - Select to use the column types parsed from the file. If un-checked, the table columns will be created as VARCHAR2(4000).
9. To load data to an existing table:
 - a. Load To - Select **Existing Table**.
 - b. Table Owner - Select the database schema.

- c. Table Name - Select the database table to load data into.
A message appears indicating the number of columns that are mapped.
 - d. Click **Configure** to configure any remaining columns. On Configure, under Column Mapping:
 - Rows to Sample - Select the maximum number of rows to be used to sample column types.
 - Treat as Null - The entered case insensitive value will be treated as NULL. For example, "tbd", "n/a", "unknown", "-".
 - Column Mapping - Configure any additional attributes.
 - Click **Save Changes**.
 - e. Error Table Name - Identify the error table name you would like to save errors during data load. By default, all table names are converted to upper case. If data load succeeds without any error, this error table is dropped automatically.
 - f. Update Method - Options include:
 - **Append** - If data already exists in the table, the wizard appends the new rows into the table. If data does not exist, the new rows are simply loaded.
 - **Replace** - The entire table is replaced by deleting the table first and then loading the new rows into the table.
10. Under Settings:
- a. Column Headers - Enable **First Line Contains** if your data contains column names in the first row.
 - b. Column Delimiter - Select a column delimiter character.
 - c. Enclosed By - Select a column enclosed by character . This character delimitates the starting and ending boundary of a data value. If you specify a delimiter character, the wizard ignores white space occurring before the starting and ending boundary of a data value.
 - d. File Encoding - Choose the character set in which the file is encoded.
11. **Preview** displays a sample of columns and rows. The exact number varies based on the type of file. Click one of the following tabs:
- **Preview** displays a sample of columns and rows. The exact number varies based on the type of file.
 - **Column Mapping** enables you to configure any remaining columns:
 - Rows to Sample - Select the maximum number of rows to be used to sample column types.
 - Treat as Null - The entered case insensitive value will be treated as NULL. For example, "tbd", "n/a", "unknown", "-".
 - Column Mapping - Configure any additional attributes.
 - Click **Save Changes**.
12. Click **Load Data**.
- A confirmation page appears indicating the table and rows have been created. You have the following options:
- **View Table** - Exits from the current wizard and opens Object Browser so you can view the newly created table.

- **Continue to the Create Application Wizard**

13. Click **Continue to Create Application Wizard**.

The Create an Application page in the Create Application Wizard appears. Report with form and dashboard pages based on the new table display under **Pages**. From here you can edit page name or create additional pages based on the imported data.

14. Complete the Create Application Wizard.

 **Note:**

- "Using the Create Application Wizard"
- "Available Page Types in the Create Application Wizard"
- "Available Features in the Create Application Wizard"
- "Available Settings in the Create Application Wizard"

5.5 Using Application Blueprints

View an application blueprint and directly edit the application definition in JSON format.

- [What Is an Application Blueprint?](#)
- [Viewing an Application Blueprint](#)
- [Loading an Application Blueprint](#)

 **See Also:**

To learn more about JSON, see <https://www.json.org/>

5.5.1 What Is an Application Blueprint?

You can view the application blueprint by running the Create Application Wizard and clicking the **View Blueprint** link at the top of the Create Application Wizard. The Application Blueprint window transforms and displays the current application definition as a JSON document. Edit the document to update application properties and then click **Apply Blueprint** to change the current application details.

If you need to create a large number of similar pages you can copy the relevant JSON code for one page, paste it numerous times, and then make small adjustments to the JSON. This approach can be significantly quicker than manually clicking the **Add Page** button for each page in the wizard.

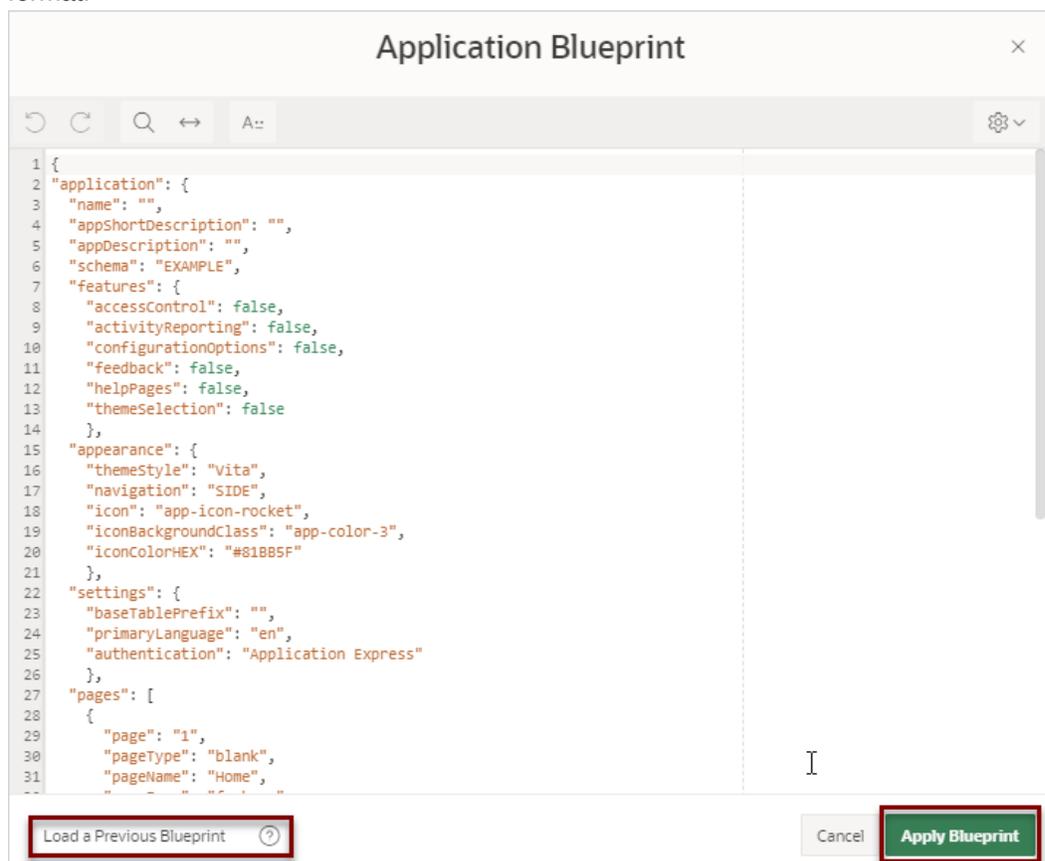
You can also replace the blueprint with the definition from a previously generated application. Click **Load a Previous Blueprint** to replace the blueprint with the definition from a previously generated application. This approach is a simple way to

iterate the application design by adding additional pages, changing the features, or tweaking the settings, before generating the application again.

5.5.2 Viewing an Application Blueprint

1. To view an application blueprint:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Click the **Create** button.
 3. Click **New Application**.
 4. At the top of the page, click the **View Blueprint** link.

The Application Blueprint window appears displaying the application definition in JSON format.



5. To edit the document:
 - a. Update application definition.

The following buttons display at the top of the Script Editor:

- **Undo - Ctrl+Z** — Removes, or undoes, the most recent line edit made in the Script Editor.
- **Redo - Ctrl+Y** — Repeats the most recent line edit made in the Script Editor.
- **Find - Ctrl+F** — **Find** resembles a magnifying glass. Click **Find** to perform a basic search.
- **Replace - Ctrl+Shift+F** — **Replace** resembles a two-sided arrow. Click **Replace** to search and replace existing code.

- b. Click **Apply Blueprint** to change the current application definition.
6. To replace the blueprint with the definition from a previously generated application:
 - a. Click **Load Previous Blueprint**.
 - b. In Load Blueprint, locate the blueprint and click **Select**.
 - c. Click **Apply Blueprint** to change the current application details.

5.5.3 Loading an Application Blueprint

1. To view an application blueprint:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Click the **Create** button.
 3. Click **New Application**.
 4. At the top of the page, click the **Load Blueprint** link.

The Load Blueprint window appears.

Load Blueprint					✕	
Name	Page count	Features	Created	Load	✕	
 Projects Cards Page	2	0	5 minutes ago	Load	✕	
 Projects	2	0	21 minutes ago	Load	✕	
 Demonstration - Projects 2	2	0	4 days ago	Load	✕	
 Demonstration - Projects Application	2	0	4 days ago	Load	✕	
 Projects Cards Page	2	0	4 days ago	Load	✕	

5. On Load Blueprint, you can:
 - **Load a new blueprint.** Locate the blueprint to load and click **Select**.
 - **Delete a blueprint.** Click the **Delete Blue** icon.

5.6 Copying a Database Application

Create a copy of an existing application.

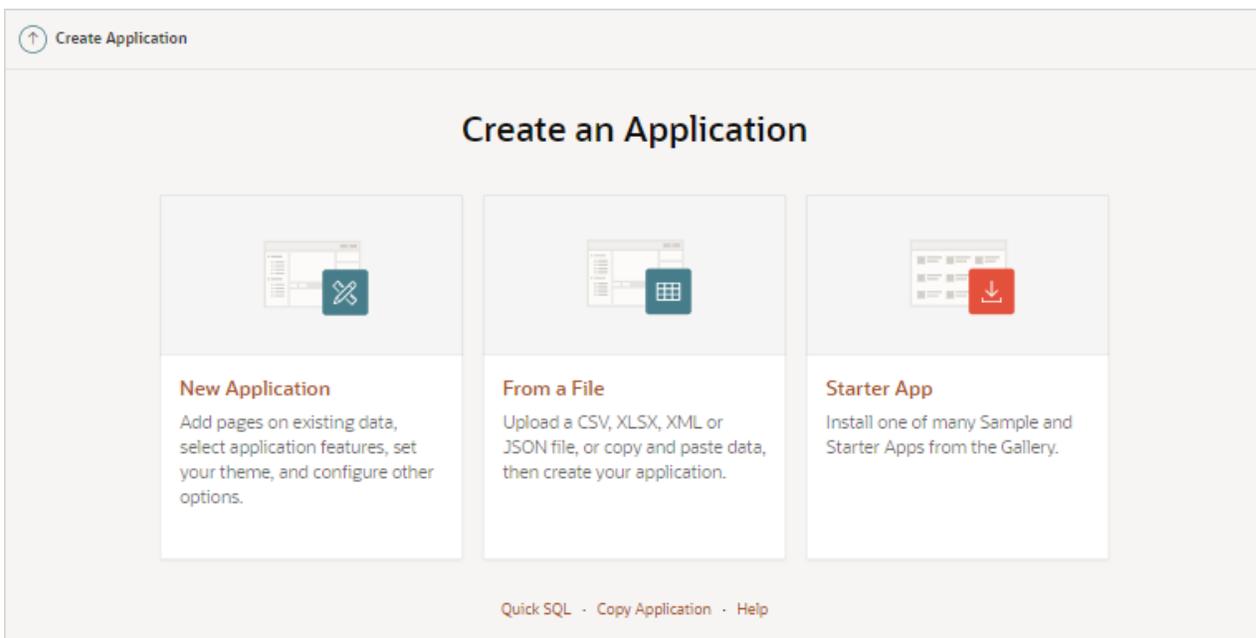
Create a copy of an existing application by running the Create Application Wizard and selecting the **Copy Application** link, or by selecting the application and then **Copy this Application** from the Tasks list on the Application home page.

- [Copying a Database Application by Running the Create Application Wizard](#)
- [Copying an Application from the Application Home Page](#)

5.6.1 Copying a Database Application by Running the Create Application Wizard

1. To copy application by running the Create Application Wizard:
1. On the Workspace home page, click the **App Builder** icon.
2. Click the **Create** button.

The Create Application Wizard appears.



3. Select the **Copy Application** link at the bottom of the window and click **Next**.
4. For Identify Copy Target:
 - a. Copy From - Select the name of the application to copy.
 - b. Copy To - Enter a short descriptive name for the application to distinguish the new application in select lists and reports.
 - c. New Application ID - Specify an integer value that identifies the application. The application ID must be unique within your Application Express instance. Application IDs in the range of 3000 to 9000 are reserved for internal use by Application Express
 - d. Copy Supporting Object Definitions - You can copy supporting object definitions, configuration options, and scripts with your application. Select **On** to include database object definitions, image definitions, and seed data SQL statements encapsulated in a single file. Select **Off** to not include supporting object definitions.
5. Confirm your selection and click **Create Application**.

5.6.2 Copying an Application from the Application Home Page

1. To copy a database application from the Application home page:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application to copy.
The Application home page appears.
3. From the Tasks list, click **Copy this Application**.
4. For Identify Copy Target:
 - a. New Application ID - Enter a unique integer value to identify the application. Application IDs between 3000 to 9000 are reserved for internal use.
 - b. New Application Name - Enter a short descriptive name for the application to distinguish the new application in select lists and reports.
 - c. Copy Supporting Object Definitions - Copy supporting object definitions, configuration options, and scripts with your application.. Options include:
 - **On** - Include database object definitions, image definitions, and seed data SQL statements encapsulated in a single file.
 - **Off** - Do not include supporting object definitions.
 - d. Click **Next**.
5. Click **Copy Application**.

5.7 Creating Applications for Mobile Devices

Build applications for mobile devices with mobile-specific design patterns that can provide an optimal user experience for small screens.

- [About Mobile Application Design](#)
- [About Mobile Support](#)
- [Creating Mobile Applications](#)

5.7.1 About Mobile Application Design

Mobile applications developed with Oracle Application Express are browser-based applications that run inside the browser on the mobile device. Therefore, these applications must have a connection in order to communicate with the Oracle Database and cannot operate in a disconnected environment.

5.7.2 About Mobile Support

Advantages of the Universal Theme

Universal Theme - 42 (Universal Theme) enables developers to build modern web applications without requiring extensive knowledge of HTML, CSS, or JavaScript

Key advantages of the Universal Theme include:

- **Responsive Design** - Designed to work just as well on small screen devices (such as smartphones and tablets) as it does on larger screen devices (including laptops and desktops). The UI components in Universal Theme work across varying screen resolutions while maintaining the same or similar functionality. In addition, Universal Theme takes full advantage of ultra high screen resolutions by

utilizing vector graphics where possible, and relying upon CSS3 features for UI styling.

- **Versatile User Interface** - Provides all the components and building blocks necessary to build practically any type of business application user interface. To browse all of the components provided with Universal Theme go to the *Universal Theme* application at <https://apex.oracle.com/ut> and select **Components**.
- **Easy Customization** - Effortlessly customize and fully control the look and feel of your applications without becoming an expert in UI design, HTML, CSS, or JavaScript. Using Theme Roller and Template Options, you can easily customize your application to fit your company's brand and customize the look and feel of various components using Template Options.

About Migrating Existing jQuery Mobile Apps to the Universal Theme

jQuery Mobile and the jQuery Mobile User Interface used in previous releases has been desupported. If you have an existing mobile application that uses the jQuery Mobile User Interface, you must migrate your existing application to the Universal Theme.

Tip:

To learn more about migrating existing applications to the Universal Theme, go to the *Universal Theme* application at <https://apex.oracle.com/ut> and select **Migration Guide**.

Reports Optimized for Mobile Environments

Although the Universal Theme is optimized to work well on mobile devices, not all components are mobile friendly. For example, interactive reports and interactive grids do not work well in mobile environments. When creating reports for mobile devices, Oracle recommends the following report types:

- **List View**
Features a responsive design to display data and provide easy navigation on Smartphones. Creates a page that contains the formatted result of a SQL query. You choose a table on which to build the List view and select a database column to be used for the List view entry.
- **Column Toggle Report**
Creates a responsive report designed for mobile applications and Smartphones. By default, column toggle reports are created with all columns set to the same priority. However, the developer can edit the report column attributes and rank columns by importance. Columns with a lesser priority (larger number) are hidden at narrower screen widths. The report includes a Columns button which enables end users to select which columns they want to view.
- **Reflow Report**
Creates a responsive report designed for mobile applications and Smartphones. When there is not enough space available to display the report horizontally, the report responds by collapsing the table columns into a vertical value pairs layout where each column displays on a separate row.

 **See Also:**

- "About Switching the Active Theme"
- "Understanding Template Options"
- "Using Theme Styles"

5.7.3 Creating Mobile Applications

1. To create a mobile application:
1. Create a new application by running the Create Application Wizard. See "Using the Create Application Wizard."
2. Run the Create Page Wizard and add mobile pages. See "Adding a New Page to an Application."

 **Tip:**

To learn more about the Universal Theme and mobile-friendly design, go to the *Universal Theme* application at <https://apex.oracle.com/ut>.

5.8 Deleting an Application

You can delete an application from the Application home page, or while editing application attributes.

When you delete an application, you are prompted whether to remove the application definition and/or drop supporting objects.

- [Deleting an Application from the Application Home Page](#)
- [Deleting an Application from the Edit Application Definition Page](#)

 **See Also:**

"Deinstalling Supporting Objects"

5.8.1 Deleting an Application from the Application Home Page

To delete an application from App Builder:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
The Application home page appears.

3. On the Application home appears, verify the application ID and name at the top of the page.
4. On the Tasks list, click **Delete this Application**.
5. When prompted, click **Permanently Delete Now**.

5.8.2 Deleting an Application from the Edit Application Definition Page

To delete an application from the Edit Application Definition page:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click the **Edit Application Properties** button to the right of the application name.
The Edit Application Definition page appears.
4. Verify the application ID and name.
5. Click **Delete** at the top of the page.
6. When prompted, click **Permanently Delete Now**.



See Also:

["Editing the Application Definition"](#)

5.9 Managing Application Attributes

Application attributes (also known as the Application Definition) control the behavior of an entire application and are divided into the categories: Definition, Security, Globalization, and User Interface.

Once you create an application, you can review and update all application attributes on the Edit Application Definition page.



Tip:

["How to Create a Custom Application"](#) for information on using the Supporting Objects utility to create a custom application.

- [Editing the Application Definition](#)
Use the application Definition page to change general application attributes such as the application name, version number, and control various properties and behaviors (such as logging, debugging, feedback, compatibility mode, application availability, error handling, and substitution strings).
- [Configuring Security Attributes](#)
Configure security for all pages in an application on the Security page. Security attributes are divided into the categories: Authentication, Authorization, Session Management, Session State Protection, Browser Security, and Database Session.

- [Configuring Globalization Attributes](#)
Configure attributes on the Edit Globalization Attributes to configure application globalization options. In App Builder you can develop applications that can run concurrently in different languages.
- [Editing User Interface Attributes](#)
Use the User Interface page to determines the default characteristics of the application and optimize the display.

5.9.1 Editing the Application Definition

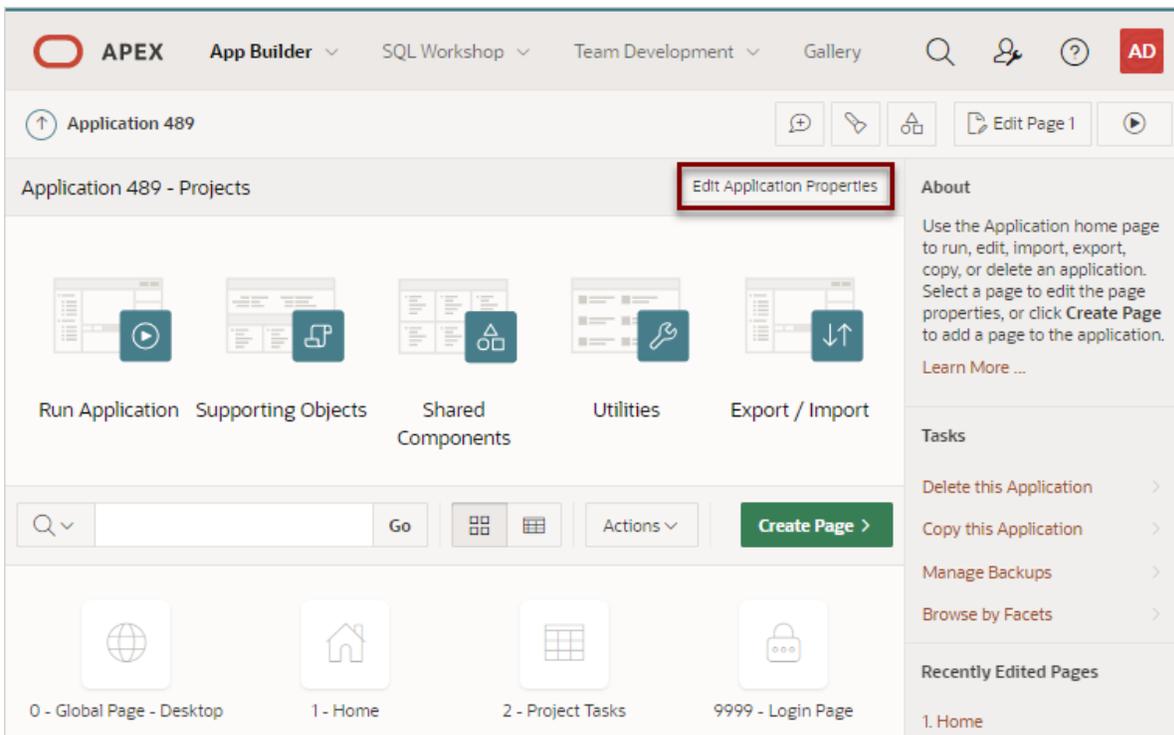
Use the application Definition page to change general application attributes such as the application name, version number, and control various properties and behaviors (such as logging, debugging, feedback, compatibility mode, application availability, error handling, and substitution strings).

- [Accessing the Definition Page](#)
- [Application Definition Page](#)

5.9.1.1 Accessing the Definition Page

1. To access the Definition page:
1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.

The Application home page appears.



3. From Application home page, you can access the Definition page in two ways:
 - Click the **Edit Application Properties** button.

- From Shared Components:
 - Click **Shared Components**.
 - Under Application Logic, click **Application Definition Attributes**.

The Edit Application Definition page appears.

4. Edit the appropriate attributes.
5. Click **Apply Changes** to save your changes.

5.9.1.2 Application Definition Page

The Edit Application Definition page is divided into the following regions: Name, Properties, Application Icon, Availability, Error Handling, Global Notification, Substitutions, and Build Options.



Note:

Required values are marked with a red asterisk (*).

- [Name](#)
- [Properties](#)
- [Application Icon](#)
- [Availability](#)
- [Error Handling](#)
- [Global Notification](#)
- [Substitutions](#)
- [Build Options](#)
- [Report Printing](#)

5.9.1.2.1 Name

Use **Name** attributes to define basic characteristics of your application, including the application name, an optional alphanumeric alias, and a version number.

Table 5-4 Application Definition, Name

Attribute	Description	To Learn More
Name	A short descriptive name for the application to distinguish it from other applications in your development environment.	n/a

Table 5-4 (Cont.) Application Definition, Name

Attribute	Description	To Learn More
Application Alias	<p>Assigns an alternate alphanumeric application identifier. You can use this identifier for the application ID.</p> <p>When the Friendly URLs attribute is enabled, the Application Alias specified here displays in the URL when running the application. Applications created using Oracle Application Express 20.1 or later default the Application Alias to the application Name.</p>	<p>See:</p> <ul style="list-style-type: none"> • Understanding Friendly URL Syntax • Customizing a Friendly URL
Version	<p>Enter the application's version number. The value enter displays on the page. You can also automatically tie the version to the date of last modification using the following format masks:</p> <ul style="list-style-type: none"> • YYYY.MM.DD • MM.DD.YYYY • DD.MM.YYYY <p>If your application version uses YYYY.MM.DD, then App Builder replaces this format mask with the date of last modification of any application attribute.</p>	n/a
Application Group	<p>Displays the application group currently associated with this application. To select another application group, make a selection from the list. To remove an application from an existing group, select Unassigned.</p>	See Managing Application Groups

5.9.1.2.2 Properties

Use Properties attributes to configure logging, debug behavior, feedback, compatibility, email from address, and the application proxy server.

Table 5-5 Application Definition, Properties

Attribute	Description	To Learn More
Logging	<p>Determines whether user activity is recorded in the Oracle Application Express activity log. Select Yes to log every page view and enable an administrator to monitor user activity for each application.</p> <p>Disabling logging may be advisable for high volume applications.</p> <p>This attribute can only be modified if the Application Activity Logging attribute in Oracle Application Express Administration Services is set to Use Application Setting.</p>	See Enabling Application Activity Logging in Oracle Application Express Administration Guide

Table 5-5 (Cont.) Application Definition, Properties

Attribute	Description	To Learn More
Debugging	<p>Controls debug mode for the current application. Available options include:</p> <ul style="list-style-type: none"> • Yes - Enables the application to run in a debug mode from a browser at runtime. • No - Disables the application from enabling in debug from a browser. <p>Running an application in debug mode is useful when an application is under development. For production applications, Oracle recommends disabling debugging and thus preventing users from viewing application logic.</p> <p>Debug can be enabled programmatically regardless of this debug setting. If the application is run from the Application Express development environment, debugging can always be enabled.</p>	n/a
Allow Feedback	<p>Enables support for end user feedback for this application. Select Yes or No.</p> <p>If you select Yes and enable this option, you must create a feedback page and navigation bar icon to call that page. If you later disable feedback, the navigation bar icon is hidden. This enables you to turn on feedback for testing and turn it off for production.</p>	See Managing Feedback
Compatibility Mode	<p>Controls the compatibility mode of the Application Express runtime engine. Certain runtime behaviors change from release to release. To not break or change the behavior of existing applications, this attribute is automatically set during upgrade if necessary.</p> <p>Use this attribute to obtain specific application behavior. Compatibility Mode options include Pre 4.1, 4.1, 4.2, 5.0, 5.1/18.1/18.2, 19.1, and 19.2/20.1, 20.2, 21.1. To keep applications maintainable, set Compatibility Mode to the latest release after reviewing the changed behavior in the Release Notes and making the necessary changes.</p>	<p>See:</p> <ul style="list-style-type: none"> • For more information on Compatibility Mode see <i>Compatibility Mode</i> in <i>Oracle Application Express Release Notes</i>. • Updating App Compatibility Mode

Table 5-5 (Cont.) Application Definition, Properties

Attribute	Description	To Learn More
Application Email from Address	<p>Determines the email address to use as the from address in the application.</p> <p>Enter a valid email address to use as the from address when sending email from an email download or subscription. The value can be a literal string containing a valid email or a static substitution reference defined in the application using substitution syntax <code>APP_EMAIL</code>. Examples:</p> <pre>john.doe@abc.com &MY_APP_EMAIL_FROM.</pre> <p>Oracle does not recommend using an item substitution at the application or page-level since it only works in email download, but not for subscriptions.</p> <p>Tip: You can also specify the Email from Address by editing interactive report attributes. See "About Emailing from an Interactive Report."</p>	n/a
Proxy Server	<p>Specify a proxy server.</p> <p>For example, App Builder may require a proxy server when using a region source type of URL. The URL region source embeds the results of the URL (that is, the page returned by navigating to the URL) as the region source. If you use a firewall and the target of a URL is outside the firewall relative to App Builder, you may need to specify a proxy server.</p> <p>You can reference values entered into this field from PL/SQL using the PL/SQL package variable <code>APEX_APPLICATION.G_PROXY_SERVER</code>.</p> <p>For example:</p> <pre>www-proxy.company.com</pre>	n/a

5.9.1.2.3 Application Icon

In **Icon File Name**, enter the file name of an image which displays as the Application Icon in App Builder. The image should be 64 x 64 pixels, must be uploaded as **Application Image** within Shared Components, and must be present at the 'root' level (that is, not within a folder).

 **See Also:**

- [Managing Static Application Files](#)
- [Managing Static Workspace Files](#)

5.9.1.2.4 Availability

Use **Availability** attributes to manage your application by defining an application status and build status. For example, if you select the status **Restricted Access**, you can specify which users have access and can run the application.

Table 5-6 Application Definition, Availability

Attribute	Description	To Learn More
Status	<p>Specifies whether the application is available or unavailable for use. Options include:</p> <ul style="list-style-type: none"> • Available - Application is available with no restrictions. • Available with Developer Toolbar - Application is available for use. For developers, the Developer Toolbar displays on each page. Requires the developer to be logged in to App Builder in the same browser session. • Available to Developers Only - Application is available to users having developer privileges. • Restricted Access - Application is available to developers named in the Restrict to comma separated user list. • Unavailable - Application cannot be run or edited. The message in Message for unavailable application displays when users attempt to access the application. • Unavailable (Status Shown with PL/SQL) - Application cannot be run or edited. • Unavailable (Redirect to URL) - Application cannot be run. The user is linked to the URL entered in Message for unavailable application. 	<p>See:</p> <ul style="list-style-type: none"> • Changing Build Status for Multiple Applications and Changing Application Build Status in Administration Services in <i>Oracle Application Express Administration Guide</i> • Controlling Access to Applications, Pages, and Page Components
Build Status	<p>Identifies the build status of the current application. Options include:</p> <ul style="list-style-type: none"> • Run and Build Application - Developers and users can both run and develop the application. • Run Application Only - Users can only run the application. This option is intended for applications in a production instance. 	<p>See Changing Application Build Status in Administration Services in <i>Oracle Application Express Administration Guide</i></p>

Table 5-6 (Cont.) Application Definition, Availability

Attribute	Description	To Learn More
Message for unavailable application	Use this attribute with Status . If you set Status to Unavailable , Unavailable (Status Shown with PL/SQL) , or Unavailable (Redirect to URL) , the text you enter in this attribute displays. If you set Status to Available , the text you enter in this attribute does not display.	n/a
Restrict to comma separated user list (status must equal Restricted Access)	Use this attribute with the Status Restricted Access . If you set Status to Restricted Access , only the users listed in this attribute can run the application. To use this attribute: <ol style="list-style-type: none"> 1. From the Status list, select a restricted status. 2. Enter a comma-delimited list of users who can run the application in the field provided. 3. Click Apply Changes. 	n/a

5.9.1.2.5 Error Handling

Use the **Error Handling** attributes described to control or modify how an application logs errors.



Tip:

Error handling functions specified here are overridden by similar page-level attributes.

Table 5-7 Application Definition, Error Handling

Attribute	Description	To Learn More
Default Error Display Location	<p>Identifies where the validation error messages display for basic validations performed by Application Express or by plug-ins. Validation error messages can display in a notification area (defined as part of the page template), or within the field label. Options include:</p> <ul style="list-style-type: none"> • Inline with Field and in Notification - Error messages display in a notification area defined as part of the page template. • Inline with Field - Error messages display within the field label. • Inline in Notification - Displays in the #NOTIFICATION_MESSAGE# template substitution string when an error occurs on the page. 	n/a
Error Handling Function	<p>Enter the name of a PL/SQL error function to be called to modify the existing error message and display a more user-friendly message or log the error if one occurs. This function can reference a package function or standalone function in the database. For example:</p> <pre>log_apex_error</pre> <p>When referencing a database PL/SQL package or standalone function, use the #OWNER# substitution string to reference the parsing schema of the current application. For example:</p> <pre>#OWNER#.log_apex_error</pre> <p>You must implement error handling functions using the syntax described in the apex_error package.</p> <pre>function <name of function> (p_error in apex_error.t_error) return apex_error.t_error_result</pre> <p>Note: Error handling specified at the page-level overwrites any error handling function specified here.</p>	See APEX_ERROR in <i>Oracle Application Express API Reference</i>

5.9.1.2.6 Global Notification

Use the **Global Notification** attribute to communicate system status to application users. If the page templates used in your application contain the #GLOBAL_NOTIFICATION# substitution

string, the text entered here displays in that string's place. For example, you can use this attribute to notify users of scheduled downtime, or communicate other messages regarding application availability.

To create a global notification:

1. Include the #GLOBAL_NOTIFICATION# substitution string in your page template.
2. Navigate to the Edit Application Definition page and enter a message in the Global Notification attribute.
3. Click **Apply Changes**.

 **See Also:**

- [Using Substitution Strings](#)
- [Page Templates](#)

5.9.1.2.7 Substitutions

Use **Substitutions** to define static substitution strings for your application. You can use static substitution string for phrases or labels that occur in many places within an application. To create a substitution string, enter the string name in the **Substitution String** column and the string value in the **Substitution Value** column.

Defining static substitution strings centrally enables you to change text strings in multiple places in your application by making a single change to the **Substitution Value** defined on this page.

 **See Also:**

- [Using Substitution Strings](#)

5.9.1.2.8 Build Options

Build Options displays existing build options in the current application. Most applications have a build option attribute. Build Options have two possible values: `INCLUDE` and `EXCLUDE`. If you specify an attribute to be included, then the Application Express engine includes and enables it at runtime. However, if you specify an attribute to be excluded, then the Application Express engine disables it and excludes it at runtime.

Do not specify a build option unless you plan to exclude that object from specific installations.

**See Also:**

[Using Build Options to Control Configuration](#)

5.9.1.2.9 Report Printing

Report Printing controls the print server of the application. These settings override the settings from Instance Administration. Available options include:

- **Native Printing** - Use native printing. No external print server required.
- **Remote Print Server** - Choose a remote server of the type **Print Server** that is configured in the Workspace Utilities.
- **Use Instance Settings** - Use the Report Printing settings defined in Instance Administration.

Click the **Add Remove Print Server** button to open a wizard to create a Remote Print Server, including the credentials. To create a Remote Server, choose the Print Server Type, specify an Endpoint URL and click **Next**. If Authentication is required, specify the credentials. Click **Apply Changes** to add the Remote Print Server and Credentials to your workspace, and update the Report Printing attributes for the application. For detailed steps, see [Configuring Report Printing at the Application-Level](#).

**See Also:**

- [Printing Report Regions](#)
- [Configuring Report Printing in *Oracle Application Express Administration Guide*](#)

5.9.2 Configuring Security Attributes

Configure security for all pages in an application on the Security page. Security attributes are divided into the categories: Authentication, Authorization, Session Management, Session State Protection, Browser Security, and Database Session.

- [Accessing the Security Page](#)
- [Security Page](#)

**See Also:**

["Managing Application Security"](#)

5.9.2.1 Accessing the Security Page

1. To access the Security page:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
The Application home page appears.
3. From the Application home page, you can access the Security page in two ways:
 - From Shared Components:
 - a. Click **Shared Components**.
 - b. Under Security, click **Security Attributes**.
 - **Edit Application Properties** button:
 - a. Click **Edit Application Properties** to the right of the application name.
 - b. Click the **Security** tab.The Edit Security Attributes page appears.
4. Edit the appropriate attributes.
5. Click **Apply Changes** to save your changes.

5.9.2.2 Security Page

Use the Security page to set application-wide security settings. Edit application components directly to manage more granular settings.



Note:

Required values are marked with a red asterisk (*).

- [Authentication](#)
- [Authorization](#)
- [Session Management](#)
- [Session State Protection](#)
- [Browser Security](#)
- [Database Session](#)

5.9.2.2.1 Authentication

Authentication is the process of establishing users' identities before they can access an application. Although you can define multiple authentication schemes for your application, only one scheme can be current at a time.

Table 5-8 Authentication Attributes

Attribute	Descriptions	To Learn More
Public User	<p>Identifies the Oracle schema (or user) used to connect to the database through the Database Access Descriptor (DAD). Once a user has been identified, the Application Express engine keeps track of each user by setting the value of the built-in substitution string <code>APP_USER</code>.</p> <p>When <code>APP_USER</code> equals this value, the Application Express engine considers the current session to be a "public user" session. The Application Express engine supports the following built-in display conditions:</p> <ul style="list-style-type: none"> • <code>USER_IS_PUBLIC_USER</code> • <code>USER_IS_NOT_PUBLIC_USER</code> <p>If the current application user (<code>APP_USER</code>) equals the value of this attribute, then the user is logged on as a public user. Some applications have public (not logged in) and private (logged in) modes. By determining if the user is the public user, you can conditionally display or hide information.</p> <p>For example, you can show a login button if the user is the public user and a logout link if the user is not a public user. Reference this value using <code>APEX_APPLICATION.G_PUBLIC_USER</code>.</p>	See " HOME_LINK " and " Understanding Conditional Rendering and Processing "
Authentication Scheme	<p>identifies the current authentication method used by this application. The purpose of authentication is to determine the application users identity. To create an authentication scheme, click Define Authentication Schemes.</p>	See " How Authentication Works " and " Creating an Authentication Scheme "

5.9.2.2.2 Authorization

Application authorization schemes control access to all pages within an application. Unauthorized access to the application, regardless of which page is requested, causes an error page to display.

Table 5-9 Authorization Attributes

Attribute	Descriptions
Define Authorization Schemes	Click the Define Authorization Schemes button to create an authorization scheme.

Table 5-9 (Cont.) Authorization Attributes

Attribute	Descriptions
Authorization Scheme	Specify an authorization scheme for your application. Application authorization schemes are defined for an application for the purpose of controlling access. Setting a required authorization scheme here at the application level will require all pages of the application to pass the defined authorization check.
Run on Public Pages	Controls whether the application-level authorization scheme is checked on public pages (that is, pages that do not require authorization). Options include: <ul style="list-style-type: none"> • On - If you select On and the page is public, the application authorization is checked. • Off - If you select Off and the page is public, the application authorization is ignored. <p>Note: This attribute is ignored if you select Must Not Be Public User as Authorization Scheme.</p>
Source for Role or Group Schemes	Define what Application Express should use as the source for authorization schemes of type <i>Is In Role or Group</i> . The available values are: <ul style="list-style-type: none"> • Access Control User Role Assignments - Enable the user's assigned roles (under Shared Components / Application Access Control). • Authentication Scheme - If the application's authentication scheme is Application Express Accounts, enable the workspace user's assigned groups. If the application's authentication scheme is Database Accounts, database roles are checked when the authorization scheme is enabled. If the authentication scheme uses Real Application Security, enable RAS Dynamic Roles. • Custom Code - Call the procedure <code>apex_authentication.enable_dynamic_groups</code> in a Post-Authentication process, to populate dynamic groups.



See Also:

["Attaching an Authorization Scheme to an Application"](#)

5.9.2.2.3 Session Management

Use Session Management attributes to reduce exposure at the application-level for abandoned computers with an open web browser.

Table 5-10 Session Management

Attribute	Descriptions
Rejoin Sessions	<p>Use this attribute to control at the application-level whether URLs in this application contain session IDs. When Rejoin Sessions is enabled, Application Express attempts to use the session cookie to join an existing session, when a URL does not contain a session ID.</p> <p>To use Rejoin Sessions at the application-level, administrators must enable Rejoin Sessions at the instance-level. A more restrictive instance-level setting overrides application and page settings.</p> <p>Rejoin Sessions options include:</p> <ul style="list-style-type: none"> • Application Default - The application-level setting applies. • Disabled - If the URL does not contain a session ID Application Express creates a new session. • Enabled for Public Sessions - If the URL goes to a public page and does not contain a session ID, Application Express attempts to utilize the existing session cookie established for that application. Application Express only joins using the cookie when the session is not yet authenticated. • Enabled for All Sessions - If the URL does not contain a session ID, Application Express attempts to utilize the existing session cookie established for that application, providing the following conditions are met: <ul style="list-style-type: none"> – Session State Protection is enabled for the application and the URL includes a valid checksum. For public bookmarks, the most restrictive item level protection must be either Unrestricted or Checksum Required - Application Level. – OR, the URL does not contain payload (a request parameter, clear cache or data value pairs). <p>This option requires you set Embed In Frames to Allow from same origin or Deny. This is not tied to a condition about the URL payload, but also applies to session state protected URLs.</p> <p>Warning: Enabling rejoin sessions may expose your application to possible security breaches, as it can enable attackers to take over existing end user sessions. To learn more, see "About Rejoin Sessions."</p>
Deep Linking	<p>Enable or prevents deep linking to an application. Options include:</p> <ul style="list-style-type: none"> • Enabled - The URL to a specific page ultimately redirects there, possibly after the user has logged in. • Disabled - If the URL does not contain a valid session ID, Application Express starts a new session and redirects to the application's home page. <p>For example, browsers often save the URLs of opened tabs and try to restore the sessions after a restart, causing a deep link. This behavior may be undesirable (for example if a URL points to a page in the middle of a multi-step wizard). By selecting Disable, Application Express starts a new session and redirects to the application's home page.</p>

Table 5-10 (Cont.) Session Management

Attribute	Descriptions
Maximum Session Length in Seconds	<p>Defines how long (in seconds) sessions can exist and be used by this application.</p> <ul style="list-style-type: none"> • Enter a positive integer to control how long a session can exist. • Enter 0 to have sessions exist indefinitely. • Leave the value empty in order to use the session duration defined at the workspace-level or the instance level.
Session Timeout URL	<p>Enter an optional URL to redirect to when the maximum session lifetime has been exceeded. The target page in this URL, if implemented in Application Express, should be a public page.</p> <p>A common use for this page would be to inform the user of the session expiration and to present a login link or other options. If you do not enter a URL, users will see the message "Your session has timed out" and a link to the application home page. If you enter #LOGOUT_URL#, Application Express will execute a logout, just like when the user clicked on the application's logout link.</p> <p>Only three substitution items are supported:</p> <ul style="list-style-type: none"> • &APP_SESSION. • &SESSION. • &APP_ID. <p>Because of the particular purpose of this URL, it is not necessary to include either &APP_SESSION. or &SESSION. in the link.</p>
Maximum Session Idle Time in Seconds	<p>The Session Idle Time is the time between the last page request and the next page request. Options include:</p> <ul style="list-style-type: none"> • Enter a positive integer to control the idle time for sessions used by this application. • Leave the value empty in order to use the idle time defined at the workspace level or the instance level.
Session Idle Timeout URL	<p>Enter an optional URL to be redirected to when the maximum session idle time has been exceeded. The target page in this URL, if implemented in Application Express, should be a public page. A common use for this page would be to inform the user of the session expiration and to present a login link or other options. If you do not enter a URL, users will see the message "Your session has timed out" and a link to the application home page. If you enter #LOGOUT_URL#, Application Express will execute a logout, just like when the user clicked on the application's logout link..</p> <p>Only three substitution items are supported in this URL:</p> <ul style="list-style-type: none"> • &APP_SESSION. • &SESSION. • &APP_ID. <p>Because of the particular purpose of this URL, it is not necessary to include either &APP_SESSION. or &SESSION. in the link.</p>

Table 5-10 (Cont.) Session Management

Attribute	Descriptions
Session Timeout Warning in Seconds	<p>The session timeout warning time defines (in seconds) how long before a session times out (either maximum session length, or maximum session idle time), to warn the user. For the maximum session idle time warning, the user will have the opportunity to extend the session. For maximum session length warning, the user will be prompted to save any work, to avoid loss of data when the session maximum time is reached.</p> <ul style="list-style-type: none"> • Enter a positive integer to control the session timeout warning time for sessions used by this application. • Enter 0 to switch off session timeout warnings for sessions used by this application. • Leave the value empty in order to use the warning time defined at the workspace-level or the instance-level.

 **See Also:**

- ["About Utilizing Session Timeout"](#)
- ["Configuring Session Timeout for a Workspace"](#) and ["Configuring Session Timeout for an Instance"](#) in *Oracle Application Express Administration Guide*

5.9.2.2.4 Session State Protection

Enabling Session State Protection can prevent hackers from tampering with URLs within your application. URL tampering can adversely affect program logic, session state contents, and information privacy. This table describes the attributes available under Session State Protection.

Table 5-11 Session State Protection

Attribute	Descriptions
Expire Bookmarks	<p>Click Expire Bookmarks to reset this hidden application attribute (a checksum salt) salt attribute at any time. Clicking this button causes any bookmarked URLs that contain previously generated checksums to fail when they are subsequently used to access the application.</p> <p>Tip: You can also click Expire Bookmarks to change the Bookmark Hash Function to switch to a different algorithm for computing checksums.</p>
Manage Session State Protection	Click Manage Session State Protection to configure Session State Protection.
Session State Protection	Make a selection from the Session State Protection list, to enable or disable Session State Protection for your application. Selecting Enabled turns on session state protection controls defined at the page and item-level. To learn more, see field-level Help.

Table 5-11 (Cont.) Session State Protection

Attribute	Descriptions
Allows URLs Created After	Lists the date and time after which bookmarked links are usable to access pages in this application if the bookmarked link contains a checksum and Session State Protection is enabled for the application. Bookmarks created before this date and time are not usable to access this application if the bookmarked link contains a checksum and Session State Protection is enabled for the application. Bookmarks that do not contain checksums or bookmarks that contain checksums that are unnecessary are not affected by this attribute. Their usability is determined using other criteria. A hidden application attribute (a checksum salt) is used during the computation and later verification of checksums included in f?p= URLs generated during page rendering. Checksums are included when Session State Protection is enabled for the application. You can reset this checksum salt attribute at any time by clicking the Expire Bookmarks button.
Bookmark Hash Function	Used to create checksums for application-level and user-level checksums in bookmarkable URLs.

**See Also:**

["Preventing URL Tampering"](#)

5.9.2.2.5 Browser Security

This table describes the attributes available under Browser Security.

Table 5-12 Browser Security

Attribute	Descriptions
Cache	<p>Use Cache to enable or disable browser caching of application page contents. If enabled, the browser saves the contents of pages for this application in its cache, both in memory and on disk. Typically when caching is enabled and the browser back button is clicked, the page is loaded from the cache instead of from the server. If disabled, the browser is instructed not to save application page contents and requests the latest page content from the server whenever the URL changes.</p> <p>To avoid the possibility of saving sensitive data, Oracle recommends that this attribute be disabled. Otherwise, it is possible to go back in the browser history after a logout and see cached content from a previous session. Disabling the browser cache also prevents issues with pages that use partial page refreshes, such as is the case with interactive reports.</p> <p>If this attribute is set to Disabled, Application Express sends the HTTP header <code>cache-control: no-store</code> which instructs the browser to not cache the page contents on disk or in memory. Note that this feature requires modern browsers that support the HTTP header response variable <code>cache-control</code>.</p>

Table 5-12 (Cont.) Browser Security

Attribute	Descriptions
Embed in Frames	<p>Controls if a browser may display your application's pages within a frame. Available options include:</p> <ul style="list-style-type: none"> • Deny - The page cannot be displayed in a frame, regardless of the site attempting to do so. • Allow from same origin - The page can only be displayed in a frame on the same origin as the page itself. • Allow - The page can be displayed in any frame. <p>Displaying pages within frames can be misused with "clickjacking" attacks. In a "clickjacking" attack, the attacker uses multiple layers to trick a user into clicking a button or link on another page when they were intending to click the top level page. Thus, the attacker is hijacking clicks (or keystrokes) meant for their page and routing them to another page.</p> <p>To learn more, see field-level Help.</p>
HTML Escaping Mode	<p>Defines how Oracle Application Express escapes special characters. Options include:</p> <ul style="list-style-type: none"> • Basic: Escape &, ", < and > • Extended: Escape &, ", <, >, ', / and non-ASCII characters if the database character set is not AL32UTF8
HTTP Response Headers	<p>Enter additional application specific HTTP headers that Oracle Application Express should send on each response and that it does not support in another way (for example, X-Frame-Options using the Embed in Frames attribute).</p> <p>Example:</p> <pre>X-XSS-Protection: 1; mode=block X-Content-Type-Options: nosniff</pre>

**Tip:**

Both **Cache** and **Embed in Frames** require modern browsers that support the HTTP header response variable X-Frame-Options.

5.9.2.2.6 Database Session

This table describes the attributes available under Database Session.

Table 5-13 Database Session

Attribute	Descriptions
Parsing Schema	Specifies the schema that all SQL and PL/SQL in the application will be parsed as. You may use #OWNER# to reference this value in SQL queries and PL/SQL (for example, in a region or a process).

Table 5-13 (Cont.) Database Session

Attribute	Descriptions
Initialization PL/SQL Code	Use this attribute to enter a PL/SQL block that sets a context for the database session associated with the current "show page" or "accept page" request. The block you enter here is executed at a very early point during the page request, immediately after the APP_USER value is established. The value of APP_USER (using :APP_USER or v('APP_USER')) may be used within the block. Values of other items in session state may be referenced as well, but any such items must have been established in session state before the initiation of the current page request. To view examples, see field-level Help.
Cleanup PL/SQL Code	Use this attribute to enter a PL/SQL block that runs at the end of page processing. It can be used to free or clean up resources that were used, like VPD contexts or database links. To view examples, see field-level Help.
Runtime API Usage	Control how this application can access Oracle Application Express APIs that modify applications and workspace data, while it is running. Options include: <ul style="list-style-type: none"> • Modify This Application: The application can modify itself. • Modify Other Applications: The application can change other applications in the workspace. • Modify Workspace Repository: The application can change workspace users and groups.

**See Also:**

"[Providing Security Through Authorization](#)" and *Oracle Label Security Administrator's Guide*

5.9.3 Configuring Globalization Attributes

Configure attributes on the Edit Globalization Attributes to configure application globalization options. In App Builder you can develop applications that can run concurrently in different languages.

A single application can be translated to support different languages. Use the attributes on the Edit Globalization Attributes page to specify globalization options such as the primary application language and defaults for date format, time format, timestamp format, time zone format, and CSV encoding.

- [Accessing the Globalization Page](#)
- [Globalization Page](#)



See Also:

["Managing Application Globalization"](#)

5.9.3.1 Accessing the Globalization Page

1. To access the Globalization page:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
The Application home page appears.
 3. From Application home page, you can access the application Globalization page in two ways:
 - From Shared Components:
 - a. Click **Shared Components**.
 - b. Under Globalization, click **Globalization Attributes**.
 - **Edit Application Properties** button:
 - a. Click **Edit Application Properties** to the right of the application name.
 - b. Click the **Globalization** tab.The Globalization page appears.
 4. Edit the appropriate attributes.
 5. Click **Apply Changes** to save your changes.

5.9.3.2 Globalization Page

The following sections describe the attributes available on the application Globalization page.



Note:

Required values are marked with a red asterisk (*).

- [Application Primary Language](#)
- [Application Language Derived From](#)
- [Document Direction](#)
- [Application Date Format](#)
- [Application Date Time Format](#)
- [Application Timestamp Format](#)
- [Application Timestamp Time Zone Format](#)
- [Character Value Comparison](#)

- [Character Value Comparison Behavior](#)
- [Automatic Time Zone](#)
- [Automatic CSV Encoding](#)



See Also:

["Specifying the Primary Language for an Application"](#)

5.9.3.2.1 Application Primary Language

Identifies the language in which an application is developed. This language is the base language from which all translations are made. For example, suppose application 100 was authored in English, translated into French, and published as application 101. English would be the Application Primary Language.

All modifications to the application should be made to the primary language specified here.

5.9.3.2.2 Application Language Derived From

Specifies how Application Express derives the translated application language. The application primary language can be static, derived from the Web browser language, or determined from a user preference or item.

To learn more about the available options, see Field-level Help.

5.9.3.2.3 Document Direction

Sets the document direction. Options include:

- Left-To-Right
- Right-To-Left

5.9.3.2.4 Application Date Format

Determines the date format to be used in the application.

Use this date format to alter the `NLS_DATE_FORMAT` database session setting before showing or submitting any page in the application. This value can be a literal string containing a valid Oracle date format mask or an item reference using substitution syntax. If no value is specified, the default date format is derived from the database session at runtime. Consider the following examples:

```
Month DD, YYYY  
&MY_DATE_FORMAT.
```

5.9.3.2.5 Application Date Time Format

Specify the date time format to be used in the application.

This date time format can be referenced in an application using the substitution reference `&APP_DATE_TIME_FORMAT.`, or in PL/SQL using the function

`v('APP_DATE_TIME_FORMAT')`. This attribute does not alter any NLS settings. This value can be a literal string containing a valid Oracle date format mask or an item reference using substitution syntax. If this attribute value is not specified, then a reference to `APP_DATE_TIME_FORMAT` returns the NLS database session date format and the NLS time format. Consider the following examples:

```
Month DD, RRRR HH24:MI  
&MY_DATE_TIME_FORMAT.
```

5.9.3.2.6 Application Timestamp Format

Determines the timestamp format to be used in the application. Select a timestamp format from the list of values.

Use this timestamp format to alter the `NLS_TIMESTAMP_FORMAT` database session setting before showing or submitting any page in the application. This value can be a literal string containing a valid Oracle timestamp format mask or an item reference using substitution syntax. If no value is specified, the default timestamp format is derived from the database session at runtime. Consider the following examples:

```
DD-MON-RR HH.MI.SSXF AM  
&MY_TIMESTAMP_FORMAT.
```

5.9.3.2.7 Application Timestamp Time Zone Format

Determines the timestamp with time zone format to be used in the application.

Use this date format to alter the `NLS_TIMESTAMP_TZ_FORMAT` database session setting before showing or submitting any page in the application. This value can be a literal string containing a valid Oracle timestamp with time zone format mask or an item reference using substitution syntax. If no value is specified, the default timestamp with time zone format is derived from the database session at runtime. Consider the following examples:

```
DD-MON-RR HH.MI.SSXF AM TZR  
&MY_TIMESTAMP_TZ_FORMAT.
```

5.9.3.2.8 Character Value Comparison

Determines the collating sequence for character value comparison in various SQL operations and clauses, for example, `ORDER BY`, `LIKE`, `MIN/MAX`.

Use this value to alter `NLS_SORT` database session parameter for the execution of SQL queries in classic report and interactive report regions. If no value is specified, the default value is derived from the database session at runtime. Consider the following examples:

```
BINARY  
GERMAN  
CANADIAN_M
```

5.9.3.2.9 Character Value Comparison Behavior

Determines the collation behavior of SQL operations, for example, `LIKE`, `MIN/MAX`.

This value is used to alter `NLS_COMP` database session parameter for the execution of SQL queries in classic report, interactive report, and List view regions, as well as in plug-in API. Options include:

- **Database session NLS setting (default)** - The NLS_COMP value is derived from the database session at runtime.
- **Binary** - Comparisons in WHERE clauses and other SQL operations are binary.
- **Linguistic** - Comparisons in WHERE clauses and other SQL operations use the linguistic sort specified in the Character Value Comparison attribute (NLS_SORT).

5.9.3.2.10 Automatic Time Zone

Controls the setting of the database session time zone. When set to **On**, the client time zone is derived from the client's web browser and set for the duration of the Application Express session.

Subsequent page views have the database session time zone set properly per page view. Once set, this setting can be overridden using `APEX_UTIL.SET_SESSION_TIME_ZONE`, or reset using `APEX_UTIL.RESET_SESSION_TIME_ZONE`.



See Also:

Oracle Application Express API Reference

5.9.3.2.11 Automatic CSV Encoding

Automatic CSV Encoding controls the encoding of all comma-delimited (CSV) report output in an application. The default value for Automatic CSV Encoding is **Yes**. When Automatic CSV Encoding is set to **Yes**, CSV report output is converted to a character set compatible with localized desktop applications. The character set for the CSV encoding is determined by the Application Language Derived From setting.

The encoding of pages in App Builder is determined by the character set of the Database Access Descriptor (DAD) used to access Oracle Application Express. For example, if the character set of the Database Access Descriptor is AL32UTF8, all pages in all applications in the Oracle Application Express user interface are encoded in UTF-8.

By default, the CSV output from report regions is encoded in the same character set as the Database Access Descriptor. However, some desktop spreadsheet applications require that the data is encoded in the client desktop operating system character set. In the case of multibyte data, the CSV output from report regions often appears corrupted when opened by a desktop spreadsheet application. This is because the CSV output from report regions is encoded differently than what is required by the desktop application. Enabling Automatic CSV Encoding resolves this issue.

For example, if the user's language preference for an application is `de`, the CSV data is encoded in Western European Windows 1252, regardless of the Database Access Descriptor character set setting. If the user's language preference is `zh-cn`, the CSV data is encoded in Chinese GBK.

5.9.4 Editing User Interface Attributes

Use the User Interface page to determine the default characteristics of the application and optimize the display.

- [Accessing the User Interface Page](#)
- [User Interface Page](#)
- [Defining an Application Logo](#)

5.9.4.1 Accessing the User Interface Page

1. To access the User Interface page:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
The Application home page appears.
 3. From the Application home page, you can access the User Interface page in two ways:
 - Go to Shared Components:
 - a. Click **Shared Components**.
 - b. Under User Interface, click **User Interface Attributes**.
 - **Edit Application Properties** button:
 - a. Click **Edit Application Properties** to the right of the application name.
 - b. Click the **User Interface** tab.
4. Edit the appropriate attributes.
5. Click **Apply Changes** to save your changes.

The User Interfaces page appears.

5.9.4.2 User Interface Page

The User Interface page is divided into the following sections: General, Logo, Favicon, Attributes, Navigation Menu, Navigation Bar, JavaScript, Cascading Style Sheet, and Concatenated Files.



Tip:

To learn more about the attributes on this page, see field-level Help.

- [General](#)
- [Logo](#)
- [Favicon](#)
- [Attributes](#)
- [Navigation Menu](#)

- JavaScript
- Navigation Bar
- Cascading Style Sheets
- Concatenated Files

5.9.4.2.1 General

Use the attributes under General to define basic characteristics of the application user interface.

Table 5-14 User Interface, General

Attribute	Description
Static File Prefix	<p>Determines the virtual path the Web server uses to point to the static files when using the #APP_IMAGES# substitution string.</p> <p>Do not specify anything to reference files which are stored with your application definition in the database.</p> <p>For performance reasons you can also store your application files on your Web Server. Use any valid URL to reference them.</p> <p>Examples:</p> <ul style="list-style-type: none"> • /myFiles/ • http://contentDeliveryNetwork.com/myFiles/
Image Prefix	<p>Determines the virtual path the web server uses to point to the images directory distributed with App Builder. During installation, the virtual path is configured as /i/. If you are unsure, contact your administrator.</p> <p>When embedding an image in static text (for example, in page or region headers or footers), you can reference an image using the substitution string #IMAGE_PREFIX#. For example, to reference the image go.gif, you would use the following syntax:</p> <pre></pre> <p>Note: If the entered image prefix is equal to the instance image prefix, then the application-level attribute will always be null. This easily facilitates the movement of an application across different instances that may have different image prefixes.</p> <p>See Also: "IMAGE_PREFIX"</p>
Media Type	<p>Enter the Internet media type. An Internet media type is two-part identifier for file formats on the internet. A Media Type is composed of at least two parts: a type, a subtype, and one or more optional parameters. This Media Type is used in the Content-Type HTTP header when rendering the page.</p> <p>The page-level Media Type overrides the application-level Media Type. The default value for this attribute is NULL. If both the page-level and application-level values for Media Type are NULL, the Media Type text/html is used.</p>

5.9.4.2.2 Logo

Use Logo attributes to define an application logo. An application logo can be an image, text, image and text, or based on custom markup.

Table 5-15 User Interface, Logo

Attribute	Description
Logo	<p>For Logo, select a logo type. Options include:</p> <ul style="list-style-type: none"> • None • Image • Text • Image and Text • Custom <p>Additional attributes appear based depending upon your selection. To learn more about an attribute see item Help.</p> <p>If you select Image, Text, Image and Text, or Custom, additional attributes display and your page template your page template must include the #LOGO# substitution string.</p>



See Also:

"[Defining an Application Logo](#)" and

5.9.4.2.3 Favicon

In **Favicon HTML**, enter Favicon HTML code to create a favicon (or shortcut icon). To use this feature, your page template must include the #FAVICON# substitution string. Example:

```
<link rel="shortcut icon" href="/i51/favicon.ico">
<link rel="icon" sizes="16x16" href="/i51/favicon-16x16.png">
<link rel="icon" sizes="32x32" href="/i51/favicon-32x32.png">
<link rel="apple-touch-icon" sizes="180x180" href="/i51/favicon-180x180.png">
```

5.9.4.2.4 Attributes

Table 5-16 Attributes

Attribute	Description	To Learn More
Enable End Users to choose Theme Style	If set to On , end users can choose a Theme Style for their sessions within a customization dialog. Only Theme Styles marked as Public are eligible for selection.	See " Enabling Users to Select a Theme Style "
Add "Built with APEX" to Footer	If set to On , Oracle Application Express will add the text "Built with ♥ using Oracle APEX" to the footer of every page.	n/a

Table 5-16 (Cont.) Attributes

Attribute	Description	To Learn More
Auto Detect	Select whether the user interface should be automatically detected. If auto-detection is enabled, the user will be redirected to the corresponding login page or home page.	n/a
Home URL	Specify the home page of the application.	n/a
Login URL	Specify the login page of the application.	n/a
Theme	Shows the theme currently associated with the user interface.	See " Switching Themes "
Theme Style	Select a theme style. This option only displays for newer themes that support theme styles.	See " Using Theme Styles "
Global Page	If defined, displays the global page for the application.	See " Creating a Global Page to Display Components on Every Page "

5.9.4.2.5 Navigation Menu

Applications using newer themes, such as *Universal Theme - 42*, provide navigation with navigation menus.

Table 5-17 Navigation Menu

Attribute	Description
Display Navigation	Select On to include or Off to exclude a navigation men in your application.
Navigation Menu List	Select the list utilized for the navigation menu for the application.
Position	<p>Select the position where you would like your navigation menu to be placed on this application.</p> <ul style="list-style-type: none"> Side renders the navigation menu list template in the #SIDE_GLOBAL_NAVIGATION_LIST# position on your page template. Top renders the navigation menu list template in the #TOP_GLOBAL_NAVIGATION_LIST# position on your page template. <p>For example, if you choose Side, your navigation could be rendered as a tree on the left side of your pages; and choosing Top can render your navigation as a menu bar in the header of your pages.</p>
List Template	Select the List Template used to render the navigation menu for this application.
Template Options	Set Template Options for the List Template used for the navigation menu list for the application.

**See Also:**["Managing Navigation Menus"](#)

5.9.4.2.6 JavaScript

Use these attributes to control or modify how an application handles JavaScript.

Table 5-18 JavaScript

Attribute	Description
Content Delivery Network	<p>Specify the Content Delivery Network (CDN) that Application Express will try to use to load the libraries jQuery. If Application Express cannot load these libraries from the CDN, they will be loaded from your web server instead.</p> <p>Using a CDN can reduce the loading time of your application if the user has already visited other web sites which also use the same CDN to load the same libraries.</p>

Table 5-18 (Cont.) JavaScript

Attribute	Description
File URLs	<p>Enter JavaScript file URLs for code to be loaded on every page. Each URL has to be written into a new line. If you provide a minified version of your file, you can use the substitution string #MIN# to include .min or #MIN_DIRECTORY# to include minified/ in your file URL for a regular page view and an empty string if the page is viewed in debug mode. JavaScript file URLs you enter here replaces the #APPLICATION_JAVASCRIPT# substitution string in the page template.</p> <p>Note: You do not need to include opening or closing script tags. Just write the URL.</p> <p>Examples:</p> <ul style="list-style-type: none"> Standard file reference: <pre data-bbox="764 758 943 783">/myjs/main.js</pre> Standard file reference which loads the minified file main.min.js from /myjs/minified/ for regular page views and main.js from /myjs/ in debug mode: <pre data-bbox="764 936 1224 961">/myjs/#MIN_DIRECTORY#main#MIN#.js</pre> Use this syntax if the library is also used from a RequireJS require call. The define name must match what is used in the requirejs.config paths and the value must be the global symbol exposed by the library. Only applies when using RequireJS. This avoids RequireJS loading that library a second time. <pre data-bbox="764 1167 1308 1192">[define hammerjs=Hammer]/myjs/hammer.js</pre> Use this syntax if the file has a dependency on RequireJS. This will automatically load RequireJS before this file. <pre data-bbox="764 1314 1211 1339">[require requirejs]/myjs/main.js</pre> Use this syntax if the file has a dependency on Oracle JET. This will automatically load RequireJS and the Oracle JET RequireJS configuration before this file. <pre data-bbox="764 1486 1127 1512">[require jet]/myjs/main.js</pre>
Include Deprecated or Desupported Javascript Functions	<p>Specifies if deprecated or desupported JavaScript functions are included on every page in the application. The functions deprecated or desupported are listed in the Release Notes for every release. If you are confident your application does not contain any references to deprecated or supported functions, do not make a selection and reduce the overall size of the JavaScript files loaded.</p>

Table 5-18 (Cont.) JavaScript

Attribute	Description
Include jQuery Migrate	<p>Specifies if the jQuery Migrate plug-in should be included on every page in the application.</p> <p>The plug-in restores deprecated features and behaviors of jQuery so that old JavaScript code and jQuery plug-ins will still run properly with the jQuery version loaded by Application Express.</p> <p>If you are confident your application and any used jQuery plug-in does not contain any references to deprecated jQuery features, set this to No to reduce the overall size of the JavaScript files loaded.</p>

5.9.4.2.7 Navigation Bar

Applications using newer themes, such as *Universal Theme - 42*, include navigation bar lists. Navigation Bar settings enable you to select list and list templates. Selecting classic implementation uses tabs instead of a list. Navigation Bar attributes only display with newer themes.

Table 5-19 Navigation Bar

Attribute	Description
Implementation	<p>Select how you wish to implement the navigation bar in this application.</p> <ul style="list-style-type: none"> Classic renders the navigation bar as a classic navigation bar in the #NAVIGATION_BAR# position on your page template. List renders the navigation bar as a list, using the selected list and list template in the #NAVIGATION_BAR# position on your page template.
Navigation Bar List	Select the list utilized for the navigation bar on this application.
List Template	Select the List Template used to render the navigation menu for this application.
Template Options	Set Template Options for the List Template used for the navigation menu list for the application.



See Also:

["Managing Navigation Bar Lists"](#)

5.9.4.2.8 Cascading Style Sheets

In **File URLs**, enter Cascading Style Sheet file URLs to be loaded on every page. Each URL has to be written into a new line. If you provide a minified version of your file you can use the substitution string #MIN# to include .min or #MIN_DIRECTORY# to include minified/ in your file URL for a regular page view and an empty string if the page is viewed in debug mode. You also have access to the substitution string #APP_VERSION# if you want to include the application's version in the file URL.

File URLs you enter here will replace the `#APPLICATION_CSS#` substitution string in the page template.

Note: You do not need to include opening or closing `link` tags. Just include the file URL.

Examples:

- Standard file reference.

```
/mycss/main.css
```

- Standard file reference which loads the minified file `main.min.css` from `/mycss/minified/` for regular page views and `main.css` from `/mycss/` in debug mode.

```
/mycss/#MIN_DIRECTORY#main#MIN#.css
```

- Conditional media query.

```
[media="only screen and (max-device-width: 480px)"]/mycss/  
smartphone.css
```

- File reference using a query string in the URL referencing the application version, such that when the application is upgraded (and the version is incremented), the browser is instructed to always load the new file and ignore any previously cached files.

```
/mycss/main.css?version=#APP_VERSION#
```

5.9.4.2.9 Concatenated Files

Using a concatenated file can increase the performance of loading your page because instead of issuing multiple HTTP requests for each single file, the browser only loads one file. This approach gives you the option to use smaller, more modular files during development and to use a single concatenated file when running the application outside of the Application Express development environment.

To create a concatenated file, click **Concatenated File** and follow the on-screen instructions. To learn more and view examples, see field-level Help.

5.9.4.3 Defining an Application Logo

To define an application logo:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. From the Application home page, you can access the User Interface page in two ways:
 - From Shared Components:
 - a. Click **Shared Components**.
 - b. Under User Interface, click **User Interface Attributes**.
 - Click the **Edit Application Properties** button:

- a. Click **Edit Application Properties** to the right of the application name.
- b. Click the **User Interface** tab.

The User Interfaces page appears.

4. Under **Logo**, select a logo type. Additional attributes appear depending upon your selection.
 - **None** - No logo is shown in the app.
 - **Image**- Creates a logo based on a valid image file type.
 - Logo - Select **Image**.
 - Image URL - Enter the url for the image to be used as the logo, including the filename extension. Note your page template must include the #LOGO# substitution string. For example:

```
#APP_IMAGES#my-logo.png
```
 - **Text** - Defines a text only logo.
 - Logo - Select **Text**.
 - Text - Select **Text** - Enter the text that should be display in the application logo.
 - **Image and Text** - Defines an image and text logo.
 - Logo - Select **Image and Text**.
 - Image URL - Enter the url for the image to be used as the logo, including the filename extension. Note your page template must include the #LOGO# substitution string. For example:

```
#APP_IMAGES#my-logo.png
```
 - Text - Select **Text** - Enter the text that should be display in the application logo.
 - **Custom**
 - Logo - Select **Custom**.
 - **Custom HTML** - Enter markup of your application's logo. The value in this field will be inserted into the #LOGO# substitution string of your page template.
5. Click **Apply Changes**.

 **Tip:**

You can also reference an image uploaded to the static file repository using a substitution string. See "[Referencing Static Application Files](#)" and "[About Referencing Static Workspace Files](#)."

 **See Also:**

- ["Managing Static Application Files"](#)
- ["Managing Static Workspace Files"](#)
- ["Creating Custom Themes"](#)
- ["Page Templates"](#)

5.10 Adding Developer Comments

Add comments to an application, a page, or a group of pages using the Developer Comment, Bug, or To Do button. You can use developer comments to communicate application changes, report issues, or record developer suggestions.

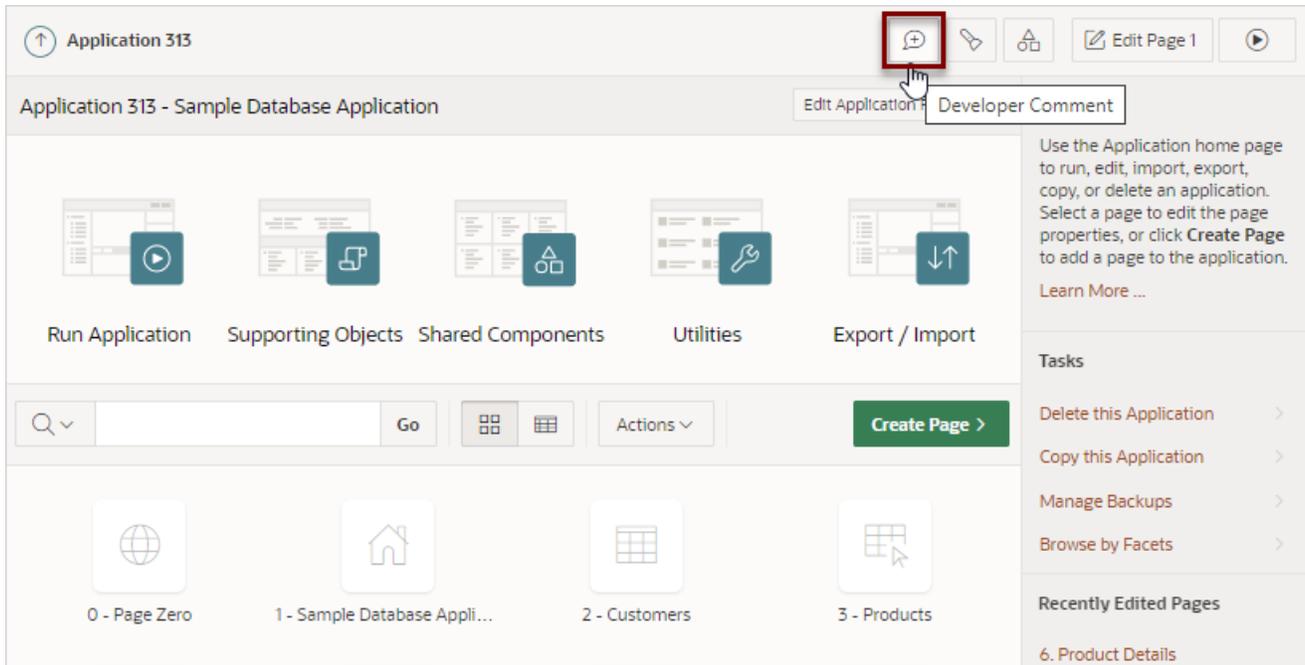
- [Developer Comment Button](#)
- [Adding Developer Comments to an Application](#)
- [Viewing and Editing Developer Comments](#)
- [Deleting Developer Comments](#)
- [Accessing the Developer Comments from Shared Components](#)
- [Viewing the Developer Comments Calendar](#)

 **See Also:**

- ["Adding Database Application Comments"](#)

5.10.1 Developer Comment Button

The Developer Comment button resembles a small word balloon. This button displays on most pages in App Builder that relate to a specific application or application page.



5.10.2 Adding Developer Comments to an Application

You can add developer comments to an application, a page, or a group of pages.

1. To add a developer comment:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. Click the **Developer Comment** button.
 4. In Comment, enter up to 4000 characters of text.
 5. Click **Create**.

5.10.3 Viewing and Editing Developer Comments

1. To edit a developer comment:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. Click the **Developer Comment** button.
 4. Click **View Comments**.
The Developer Comments page appears.
 5. Locate the comment to be edited.
 6. Click the **Edit** icon.
The Edit Comment page appears.
 7. In Comment, enter up to 4000 characters of text.
 8. Click **Apply Changes**.



Tip:

You can also view and edit Developer comments on the Shared Components page. Navigate to the Shared Components page and click **Developer Comments** in the Tasks region. See "[Accessing the Developer Comments from Shared Components](#)."

5.10.4 Deleting Developer Comments

You can delete specific developer comments or delete multiple comments at once.

- [Deleting a Specific Developer Comment](#)
- [Deleting Multiple Developer Comments](#)

5.10.4.1 Deleting a Specific Developer Comment

1. To delete a developer comment:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. Click the **Developer Comment** button.
 4. Click **View Comments**.
The Developer Comments page appears.
 5. Locate the comment to be deleted.
 6. Click the **Edit** icon.
The Edit Comment page appears.
 7. Click **Delete**.

5.10.4.2 Deleting Multiple Developer Comments

To delete multiple developer comments:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click the **Developer Comment** button.
4. Click **View Comments**.
5. Click **Delete Comments**.
6. Select one of the following actions:
 - **Delete all comments**
 - **Delete comments created by a developer**
 - **Delete comments by date**
7. Follow the on-screen instructions.

5.10.5 Accessing the Developer Comments from Shared Components

To access the Developer Comments report from Shared Components:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click **Shared Components**
4. Under Tasks, click **Developer Comments**.

The Developer Comments report appears.

A navigation bar appears at the top of the page and contains the following controls:

- **Select columns to search** - Resembles a magnifying glass. Click this icon to narrow your search to only specific columns. To search all columns, select **All Columns**.
- **Text area** - Enter case insensitive search criteria (wildcard characters are implied) and click **Go**.
- **Go button** - Executes a search.
- **Actions menu** - Use the Actions menu to customize the report view. See "[About the Actions Menu](#)."



See Also:

["Viewing and Editing Developer Comments"](#) and ["Deleting Developer Comments"](#)

5.10.6 Viewing the Developer Comments Calendar

To access the Developer Comments Calendar:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click **Shared Components**
4. Under Tasks, click **Developer Comments**.

The Developer Comments page appears.

5. Click **Developer Comments Calendar**.

The Developer Comments Calendar page appears.

6. Use the Previous, Today and Next buttons to navigate.

5.11 Using the Find Icon

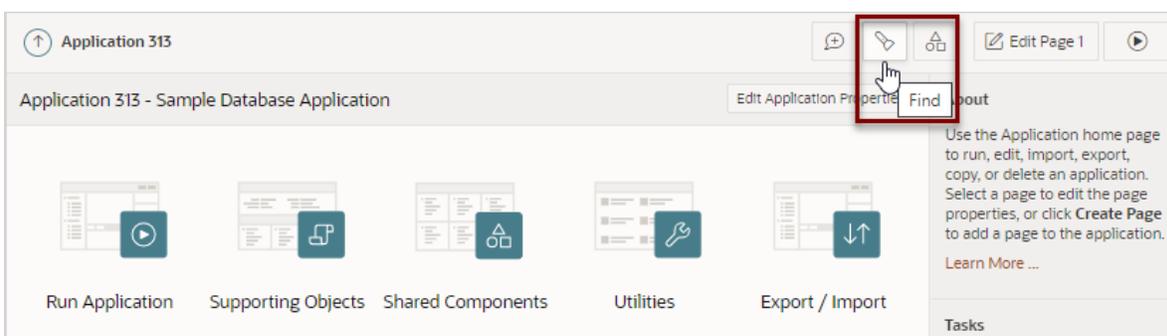
The Find icon resembles a flashlight and displays on many pages in App Builder including Application home page, Shared Components, and the Edit Application Definition. Click the Find icon to search for items, pages, queries, tables, PL/SQL code, or images, view debug reports, view session state, and view errors.

- [Accessing the Find Icon](#)
- [Searching for Items](#)
- [Searching for Pages](#)
- [Searching for Queries](#)
- [Searching for Tables](#)
- [Using the PL/SQL Finder](#)
- [Searching for Images](#)

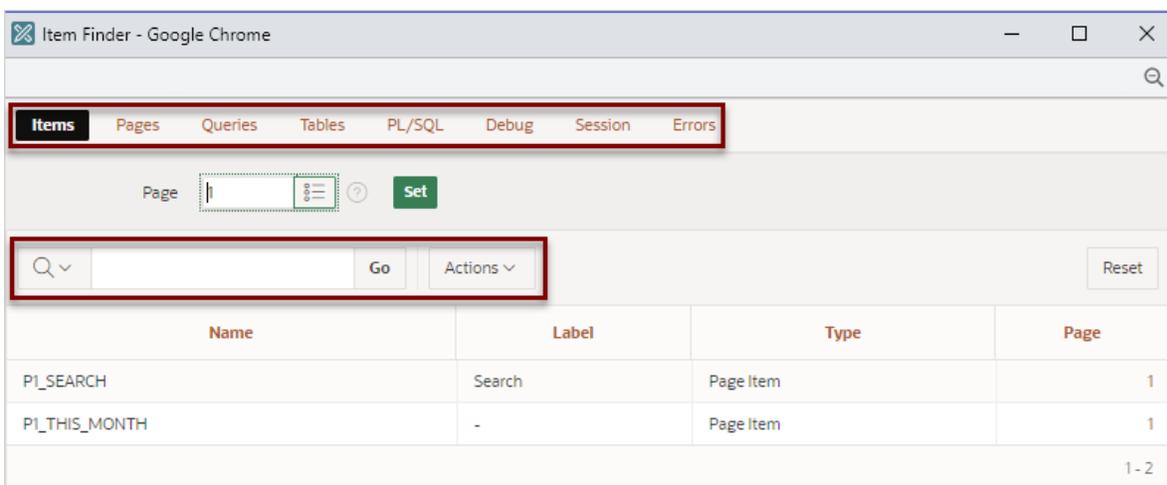
5.11.1 Accessing the Find Icon

To access the Find icon:

1. Click the **Find** icon.



The Items Finder appears.



2. Click one of the following tabs:
 - **Items** - See "[Searching for Items.](#)"
 - **Pages** - See "[Searching for Pages.](#)"

- **Queries** - See "[Searching for Queries.](#)"
- **Tables** - See "[Searching for Tables.](#)"
- **PL/SQL** - See "[Using the PL/SQL Finder.](#)"
- **Images** - See "[Searching for Images.](#)"
- **Debug** - See "[Viewing Debug Reports.](#)"
- **Session** - See "[Viewing Session State](#)"
- **Errors** - See View errors.

5.11.2 Searching for Items

In App Builder, an item can be a text field, text area, password, select list, check box, and so on. You can use the Item Finder to search for items within the current application or within the schema associated with the workspace.

To search for items:

1. Click the **Find** icon.

The Items Finder appears.

A navigation bar displays in the center the page (see previous illustration) and contains the following controls:

- **Select columns to search** - Resembles a magnifying glass. Click this icon to narrow your search to specific columns. To search all columns, select **All Columns**.
 - **Text area** - Enter case insensitive search criteria (wildcard characters are implied) and click **Go**.
 - **Go button** - Executes a search.
 - **Actions menu** - Clicking the icon displays the Actions menu. Use this menu to customize the display.
2. To edit a specific item, navigate to the appropriate item.



See Also:

["Understanding Page-Level Items"](#)

5.11.3 Searching for Pages

A page is the basic building block of an application. You can use the Pages Finder to search for pages within the current application or within the schema associated with the workspace.

To search for a page:

1. Click the **Find** icon.
2. Click the **Pages** tab.

The Pages Finder appears. A search bar displays at the top of the page and contains the following controls:

- **Select columns to search** - Resembles a magnifying glass. Click this icon to narrow your search to specific columns. To search all columns, select **All Columns**.
 - **Text area** - Enter case insensitive search criteria (wildcard characters are implied) and click **Go**.
 - **Go button** - Executes a search.
 - **Actions menu** - Clicking the icon displays the Actions menu. Use this menu to customize an interactive report.
3. To link to the Items page, click the page number.

5.11.4 Searching for Queries

You can use the Queries Finder to locate a query within your application or within the schema associated with the workspace.

To search for a query using the Queries Finder:

1. Click the **Find** icon.
2. Click the **Queries** tab.

The Queries Finder appears. A search bar displays at the top of the page and contains the following controls:

- **Select columns to search** - Resembles a magnifying glass. Click this icon to narrow your search to specific columns. To search all columns, select **All Columns**.
 - **Text area** - Enter case insensitive search criteria (wildcard characters are implied) and click **Go**.
 - **Go button** - Executes a search.
 - **Actions menu** - Clicking the icon displays the Actions menu. Use this menu to customize an interactive report. See "[About the Actions Menu](#)."
3. To link to the Items page, click the page number.

5.11.5 Searching for Tables

You can use the Tables Finder to view tables within the schema associated with the workspace.

To view tables associated within the current schema:

1. Click the **Find** icon.
2. Click the **Tables** tab.

The Tables Finder appears. A search bar displays at the top of the page and contains the following controls:

- **Select columns to search** - Resembles a magnifying glass. Click this icon to narrow your search to specific columns. To search all columns, select **All Columns**.
- **Text area** - Enter case insensitive search criteria (wildcard characters are implied) and click **Go**.

- **Go button** - Executes a search.
 - **Actions menu** - Clicking the icon displays the Actions menu. Use this menu to customize an interactive report.
3. Select a table name.

A table definition appears.

This report displays the column names, data type, length, precision, and scale and the SQL necessary to re-create the table appears at the bottom of the page.



See Also:

"Managing Tables" in *Oracle Application Express SQL Workshop Guide*

5.11.6 Using the PL/SQL Finder

You can use the PL/SQL Finder to locate and view details about stored procedures, functions, and packages associated with each object within the schema associated with the workspace.

To search for PL/SQL code in the current schema:

1. Click the **Find** icon.
2. Click the **PL/SQL** tab.

The PL/SQL Finder appears. A search bar displays at the top of the page and contains the following controls:

- **Select columns to search** - Resembles a magnifying glass. Click this icon to narrow your search to specific columns. To search all columns, select **All Columns**.
 - **Text area** - Enter case insensitive search criteria (wildcard characters are implied) and click **Go**.
 - **Go button** - Executes a search.
 - **Actions menu** - Clicking the icon displays the Actions menu. Use this menu to customize an interactive report.
3. To view additional details, select the procedure, function, or package name.

The procedure, package, or function name appears and additional information including the owner, source name, source type, return type, argument names, data types, and IN/OUT parameters.



See Also:

"Managing Database Objects with Object Browser" in *Oracle Application Express SQL Workshop Guide*

5.11.7 Searching for Images

You can use the Images Finder to identify images available to the current application.

To view available images:

1. Click the **Find** icon.
2. Click the **Images** tab.
The Images Finder appears.
3. From Show, select the type of images to view. Options include:
 - Standard Images
 - Workspace Images
 - Application Images



See Also:

"Managing Database Objects with Object Browser" in *Oracle Application Express SQL Workshop Guide*

5.12 Adding Database Application Comments

Use Application Comments to describe an application or track developers involved in the application development.

To create an application comment:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
3. Select an application.
4. On the Application home page, click **Shared Components**.
The Shared Components page appears.
5. Under Tasks, click **Edit Application Comment**.
The Application Comments page appears.
6. Enter comments in the Comments field and click **Apply Changes**.

5.13 Managing Application Groups

Organize applications by assigning them to application groups. To use application groups, first create a group and then assign applications to it.

- [Viewing Database Application Groups](#)
- [Creating a Database Application Group](#)

- [Assigning a Database Application to an Application Group](#)
- [Removing a Database Application from an Application Group](#)
- [Deleting an Database Application Group](#)



See Also:

["Accessing Page Specific Utilities"](#)

5.13.1 Viewing Database Application Groups

To view database application groups:

1. On the Workspace home page, click the **App Builder** icon.
2. Click **Workspace Utilities**.
3. Click **Application Groups**.

The Application Group page appears.

A Search bar displays at the top of the page. Available controls include:

- **Select columns to search** - Resembles a magnifying glass. Click this icon to narrow your search. To search all columns, select **All Columns**.
 - **Text area** - Enter case insensitive search criteria (wildcard characters are implied) to search for a group by name and click **Go**.
 - **Go button** - Executes a search or applies a filter.
 - **View Icons** (the default) displays each group as a large icon. To edit a group, click the appropriate icon.
 - **View Report** displays each group as a line in a report. To edit a group, click the name.
4. To view the applications associated with a group, you click the group name.

5.13.2 Creating a Database Application Group

To create a database application group:

1. On the Workspace home page, click the **App Builder** icon
2. Click **Workspace Utilities**.
3. Click **Application Groups**.
4. On the Application Group page, click **Create**.
5. Enter a name, a description (optional), and click **Create**.

5.13.3 Assigning a Database Application to an Application Group

To assign a database application to a group:

1. On the Workspace home page, click the **App Builder** icon.
2. Click **Workspace Utilities**.

3. Click **Application Groups**.
4. On the Tasks list, click **Manage Unassigned**.
The Manage Application Group Assignments page appears.
5. From the New Group list, select a group.
6. Select the applications to be assigned and click **Assigned Checked**.

 **Tip:**

You can also assign an application to an application group by editing the application definition. Select the group from the Application Group list. See "[Editing the Application Definition](#)."

5.13.4 Removing a Database Application from an Application Group

To remove an application from an application group:

1. On the Workspace home page, click the **App Builder** icon.
2. Click **Workspace Utilities**.
3. Click **Application Groups**.
4. On the Tasks list, click **Manage Assignments**.
The Manage Application Group Assignments page appears.
5. From the New Group list, select **Unassign**.
6. Select the pages to be unassigned and click **Assigned Checked**.

 **Tip:**

You can also remove an application from an application group by editing the application definition. Select **Unassigned** from the Application Group list. See "[Editing the Application Definition](#)."

5.13.5 Deleting an Database Application Group

To delete an application group:

1. On the Workspace home page, click the **App Builder** icon.
2. Click **Workspace Utilities**.
3. Click **Application Groups**.
4. Assign all applications in the group to Unassign:
 - a. On the Tasks list, click **Manage Assignments**.
 - b. From the New Group list, select **Unassign**.
 - c. Select the pages to be unassigned and click **Assigned Checked**.
5. Return to the Application Groups page.

6. Select the application group to be deleted.
7. On the Application Group page, click **Delete**.
A confirmation page appears.
8. Confirm your request.

5.14 Using Application Utilities

Access the Utilities page to view useful application summaries and reports.

- [Accessing Application Utilities](#)
Access the Application Utilities page by selecting the application and then clicking the **Utilities** icon.
- [Application Utilities Page](#)
Use the Application Utilities page to access the Application Dashboard, Advisor, Upgrade Application, Recently Updated Pages, Attribute Dictionary, Change History, Debug Messages, Application Express Views, Export Repository, Manage Backups, and the Embedded Code Utility.
- [Viewing the Application Dashboard](#)
View a report that summarizes application components and attributes.
- [Running Application Upgrade](#)
After upgrading to a new release, the Application Upgrade wizard can help you to bulk update your application to leverage new features instead of deprecated ones or to automatically enable new functionality for existing components.
- [Viewing the Recently Updated Pages Report](#)
Displays a report of pages recently updated by the current user.
- [Viewing the Change History Report](#)
The Change History report displays a summary report of edits to the current applications by developer, component type, and page number
- [Accessing Application Express Views](#)
Query various views against Application Express metadata.
- [Managing Application Backups](#)
Review backup history, perform manual backups, or restore an application from a backup.
- [Using the Embedded Code Utility](#)
Review all embedded code used in an Application Express application on one page. Embedded code is defined as code (such as SQL, PL/SQL and JavaScript) entered in the App Builder but does not include code such as PL/SQL packages or JavaScript libraries that code may reference.
- [Viewing Page and Application Checksums](#)
View page and application checksums to compare to compare different application deployments and determine if the application or pages are different.
- [Accessing Font APEX](#)
View the Font APEX page to search for Font APEX icons and view HTML markup.
- [Accessing Page Specific Utilities](#)
Use the links in the Page Specific Utilities region to access Cross Page Utilities and Page Groups as well as access handy utilities for regions, buttons, items, computations, validations, process, dynamic actions, and branches.

- [Accessing Cross Page Utilities](#)
Use Cross Page Utilities to perform edits across pages in the application.
- [Using Interactive Report Utilities](#)
View and delete saved interactive reports and interactive report subscriptions.



See Also:

"[Creating Custom Activity Reports Using APEX_ACTIVITY_LOG](#)"

5.14.4 Running Application Upgrade

After upgrading to a new release, the Application Upgrade wizard can help you to bulk update your application to leverage new features instead of deprecated ones or to automatically enable new functionality for existing components.

The Upgrade Application page displays the available upgrade types and the number of objects that can be upgraded. Click on the number under **Candidate Object** to review the candidates and upgrade.

To upgrade an application to use new components:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
3. Select an application.

The Application home page appears.

4. Click **Utilities**.
5. Click **Upgrade Application**.

The Upgrade Application page appears displaying the available upgrade types and the number of objects that can be upgraded.

6. To review the candidate objects, click the number link under the **Candidate Objects** column.
7. On the Upgrade page, select the objects to upgrade and click **Upgrade**.
8. Run and test your application.

5.14.1 Accessing Application Utilities

Access the Application Utilities page by selecting the application and then clicking the **Utilities** icon.

To access Application Utilities page:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.
3. Click the **Utilities** icon.

The application Utilities page appears.

 **Note:**

To learn more about this page, see "[Application Utilities Page](#)."

 **See Also:**

- [Accessing Cross Page Utilities](#)
- [Accessing Page Specific Utilities](#)

5.14.2 Application Utilities Page

Use the Application Utilities page to access the Application Dashboard, Advisor, Upgrade Application, Recently Updated Pages, Attribute Dictionary, Change History, Debug Messages, Application Express Views, Export Repository, Manage Backups, and the Embedded Code Utility.

The following table describes the links on the application Utilities page.

Link	Description	To Learn More
Application Dashboard	View a summary of application components and attributes	See: Viewing the Application Dashboard
Advisor	Performs various checks on your application, including checks for programming errors, security issues, quality assurance, and other best practice	See: Running Advisor to Check Application Integrity
Upgrade Application	Upgrade the current application to a new release. Review components eligible for upgrading to include the latest features.	See: Upgrading Application Express Applications
Recently Updated Pages	View a history of page updates made to this application.	See Viewing the Recently Updated Pages Report
Attribute Dictionary	Manage item and column user interface defaults for a selected page.	See: Using the Attribute Dictionary
Change History	View a report of component updates made in this application.	See: Viewing the Change History Report
Debug Messages	Review debug messages generated by this application.	See: Debugging an Application
Application Express Views	Query various views against Application Express metadata.	See: Accessing Application Express Views
Export Repository	Manage Export Files in the Export Repository.	See: Installing Export Files
Manage Backups	View and manage application backups in the current workspace. Backups provide a simple way to recover applications that may have been unexpectedly modified or deleted.	See: Managing Application Backups

Link	Description	To Learn More
Embedded Code	View all embedded code (such as SQL, PL/SQL and JavaScript) from all pages in an Application Express application presented in easy-to-use faceted search page.	See: Using the Embedded Code Utility
Page Specific Utilities	Page Specific Utilities display in a region on the right-side of the Utilities page. Use the links in the Page Specific Utilities region to access Cross Page Utilities and Page Groups as well as access handy utilities for managing regions, buttons, items, computations, validations, process, dynamic actions, and branches.	See: <ul style="list-style-type: none"> • Accessing Page Specific Utilities • Accessing Cross Page Utilities
Interactive Report Utilities	Interactive Report Utilities display in a region on the lower right-side of the Utilities page.. Click Saved Reports to delete saved interactive reports in the current application. Click Subscriptions to manage interactive report subscriptions.	See: Using Interactive Report Utilities
Application Checksum	View the application checksum to determine if the same application is deployed in different workspaces.	See Viewing the Application Checksum
Font APEX Icons	Search Font APEX icons and HTML markup.	See Accessing Font APEX
Page Checksum	View the page checksum to compare two application deployments and determine which pages are the same and which are different.	See Viewing the Page Checksum

5.14.3 Viewing the Application Dashboard

View a report that summarizes application components and attributes.

To view the Application Dashboard:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
3. Select an application.
The Application home page appears.
4. Click **Utilities**.
5. Click **Application Dashboard**.

The Application Dashboard appears and contains the following sections:

- **Application Overview** lists detailed information and statistics about the current application, including the ID, name, alias, parsing schema, associated group, number of pages, and associated theme.

- **Security** lists the current authentication scheme, number of public and non public pages, and the number of authorization schemes used within the current application.
 - **Templates** contains links to reports of templates used within the current application.
 - **Pages by Type** lists counts of components, including types of reports and forms and dynamic HTML.
 - **Application Components** contains links to reports of application-level controls and logic, including lists, shortcuts, lists of value, tabs, application computations, application items, plug-ins, and application processes.
 - **Page Components** contains links to reports of page-level controls and logic, including regions, items, branches, computations, validations, dynamic actions, classic report columns, interactive report columns, and button.
 - **Native Region Component Utilization** charts the total number of all types of region components used in the app. This is a visualization of the information provided in the Pages by Type section, the Page Components, and others.
 - **Plugin Region Utilization** charts the total number of plug-ins used in the app.
6. To view a specific report, click the number link to the right of the component type or template.



See Also:

["Identifying At Risk Password Items"](#)

5.14.5 Viewing the Recently Updated Pages Report

Displays a report of pages recently updated by the current user.

To view the Recently Updated Pages report:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
3. Select an application.

The Application home page appears.

4. Click **Utilities**.
5. Click **Recently Updated Pages**.

The Recently Updated Pages report appears.

5.14.6 Viewing the Change History Report

The Change History report displays a summary report of edits to the current applications by developer, component type, and page number

To view the Change History report:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.

3. Select an application.
The Application home page appears.
4. Click **Utilities**.
5. Click **Change History**.
The Change History report appears. Use the Since list to control the amount of time to include in your report.
6. From **Since** at the top of the page, select the amount of time to include in your report and click **Set**.

5.14.7 Accessing Application Express Views

Query various views against Application Express metadata.

Application Express Views are data dictionary views that expose the metadata for applications. In Application Express Views, you cannot only see the view, but you can also see the data they contain.

To access the Application Express Views page:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
3. Select an application.
The Application home page appears.
4. Click **Utilities**.
5. Click **Application Express Views**.

The Application Express Views report appears. Use the Search bar at the top of the page to customize the display.

Tip:

Click **Tree View** to switch to a relational view of this information with expandable parent and children entries.

6. Select a view.
7. On Selected Columns, select columns from **Select Columns** and click the **Results** button.
The Results report appears.
8. On Results:
 - To view the query that was executed, expand the **Query** region . You can copy this query for reuse with SQL Commands or SQL Developer.
 - Click **Download**, to download to a file.

5.14.8 Managing Application Backups

Review backup history, perform manual backups, or restore an application from a backup.

- [About Application Backups](#)
Backups provide a simple way for developers to recover applications that may have been unexpectedly modified or deleted.
- [Viewing All Application Backups](#)
View a summary of all application backups on the Manage Backups page.
- [Managing Backups for a Specific Application](#)
Manage Backups for all application on the Manage Backup page.

5.14.8.1 About Application Backups

Backups provide a simple way for developers to recover applications that may have been unexpectedly modified or deleted.

Oracle Application Express automatically backs up modified applications as a part of daily maintenance. Applications are not backed up, however, if they meet the following criteria:

- If no changes have been made to the application since the last backup, then the application is not backed up again.
- Run-time only applications are not be backed up.
- Applications that are installed into runtime-only instances are not backed up.

About Configuring the Number of Backups

By default, Application Express only retains the 25 most recent backups. Older backups are deleted to make room for new ones.

Instance administrators can configure the number of backups per application, or disable automatic backups all together. To configure the number of backups for each application, sign in to the Administration Services application and navigate to **Manage Instance, Feature Configuration, Application Development**, and update the **Number of backups per application** attribute. Valid values are between 0 and 30. A value of zero (0) disables the backup feature.



See Also:

"Configuring the Number of Application Backups" in *Oracle Application Express Administration Guide*

Viewing the Backup Log

Instance administrators monitor the performance of the backup job in the Backup Log. To view the Backup Log, sign in to the Administration Services application and navigate to **Monitor Activity, Backup Log**. The Backup Log reports when a backup job ran, the number of applications backed up by the job, and the elapsed time required to backup the applications.



See Also:

and "Viewing the Backup Log" in *Oracle Application Express Administration Guide*

Managing Backups

Developers can view all backups in App Builder in **Workspace Utilities, Manage Backups**. To view backups for a specific application, click the application name.

5.14.8.2 Viewing All Application Backups

View a summary of all application backups on the Manage Backups page.

App Builder automatically backs up modified applications on a daily basis.

1. To view the Manage Backups page:
 1. Navigate to the Workspace Utilities page:
 - a. Sign in to Oracle Application Express.
 - b. On the Workspace home page, click the **App Builder** icon.
 - c. Click the **Workspace Utilities** icon.
 2. Click **Manage Backups**.

Application	Application Name	Last Size	Last Backup ↓↑	Last Updated	Application Exists	# Backups
484	Projects			3 hours ago	✓	0
219	Sample Database Application	176KB	10 hours ago	2 hours ago	✓	4
392	Demonstration - EMP / DEPT	77KB	34 hours ago			8
519	Projects Cards Page	46KB	34 hours ago			2
523	Demonstration - Projects	48KB	4 days ago			1
376	HR App	47KB	5 days ago			1
326	Demonstration - EMP / DEPT	75KB	12 days ago			5
327	Data Reporter	480KB	2 weeks ago			1
383	Demonstration - Projects Application	81KB	5 weeks ago			3
281	Sample Dynamic Actions	82KB	5 weeks ago			1

The Manage Backups page appears displaying the following columns:

- Application - Displays the Application ID
 - Application Name - Displays the application name when the backup occurred. If the name has changed, both names display in the report.
 - Last Size
 - Last Updated
 - Application Exists - Displays the Application ID.
 - # Backup - Displays the number of backups.
3. To view backup details for a specific application, click the Application Name.

The Manage Backups page for the application appears.

**Tip:**

You can also access the Manage Backups page from the App Builder home page. Select **Manage Backups** from the Tasks region.

5.14.8.3 Managing Backups for a Specific Application

Manage Backups for all application on the Manage Backup page.

1. To manage backups for a specific application:
 1. Navigate to the Manage Backups page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Click the **Workspace Utilities** icon.
 - c. Click **Manage Backups**.

The Manage Backups page appears.

2. To view backups for a specific application, click the Application Name.

The application, Manage Backups page appears displaying the following columns:

Name	Revision	Date ↓↑	Change Summary	Created By	Size	Status	Action
Sample Database Application	5	10 hours ago	Pages: 40 New Components: 1 New, 1 Modified	Automated Backup	176KB		
Demonstration - Tasks Spreadsheet	4	6 weeks ago	Application Properties: Modified	Automated Backup	75KB		
Demonstration - Tasks Spreadsheet	3	6 weeks ago	Pages: 1 Modified	Automated Backup	75KB		
Demonstration - Tasks Spreadsheet	2	2 months ago	Pages: 27 New, 5 Modified Components: 97 New, 3 Modified	Automated Backup	75KB		
					402KB		

About

Automated backups are performed as part of daily maintenance. Only applications that have been modified will be backed up.

To manually back up the application, outside of daily maintenance, click [Create Backup](#).

[Learn More ...](#)

Application

Last Update: 2 hours ago
Last Backup: 10 hours ago

Settings

Only the 25 most recent application backups are retained. Older backups will be...

- Name - Application name at the time of backup.
- Revision - Revision number.
- Date - Backup date.
- Change Summary - Indicates the number of new, modified, or deleted pages and components since the last backup.
- Created By - Indicates whether the back up was automated or manual. If manual, the user who created the backup displays.

- Size - Backup size.
 - Status - Generally displays a Lock or Unlock status icon. Locking a backup prevents it from being removed if the backup limit is reached. If a developer restores an application, then a Restore icon appears.
 - Action - Menu options include: Restore, Download, View Details, Manage Lock, or Delete. These options are discussed in detail in the steps that follow.
3. To restore a backup:
 - a. Locate the application and click the **Actions** menu.
 - b. From the Actions menu, select **Restore**.
 - c. In the Restore Application dialog:
 - i. Install As Application - Select one of the following:
 - **Restore Application ID** - The existing application ID will be used. This option overwrites the existing application without changing the ID.
 - **Auto Assign New Application ID** - A new application ID will be created for you.
 - **Change Application ID** - You specify a new application ID.
 - ii. Click **Restore Application**.
 4. To download a backup:
 - a. Locate the application and click the **Actions** menu.
 - b. From the Actions menu, select **Download**.
 - c. Import the Export Files.
 5. To view backup details:
 - a. Locate the application and click the **Actions** menu.
 - b. From the Actions menu, select **View Details**.
 6. To manage backup locks:
 - a. Locate the application and click the **Actions** menu.
 - b. From the Actions menu, select **Manage Lock**.

Locking a backup prevents it from being deleted during daily maintenance.
 - c. In the Manage Backup Lock dialog, select **Unlock Backup** or **Lock Backup**.
 7. To delete a backup:
 - a. Locate the application and click the **Actions** menu.
 - b. From the Actions menu, select **Delete**.
 - c. In the Delete Backup dialog, select **Delete Backup**.
 8. To backup an application manually:
 - a. Click **Create Backup**.
 - b. In the Create a Backup dialog, enter comments and click **Backup**.
 9. To remove all backups for an application:
 - a. Click **Remove All**.
 - b. In the Remove All Backups dialog, confirm your selection by clicking **Remove All Backups**.

 **Note:**

You can also access the backups for a specific application from the Application home page. Navigate to the application and select **Manage Backups** from the Tasks list.

 **See Also:**

["Importing an Application, Page or Component Export"](#)

5.14.9 Using the Embedded Code Utility

Review all embedded code used in an Application Express application on one page. Embedded code is defined as code (such as SQL, PL/SQL and JavaScript) entered in the App Builder but does not include code such as PL/SQL packages or JavaScript libraries that code may reference.

The Embedded Code Utility displays all embedded code from all pages in an application in an easy-to-use faceted search page. Using the Embedded Code Utility is ideal for tasks such as code reviews, security evaluations, and application turning where historically developers would need to click on every property in a page or Shared Component.

1. To access the Embedded Code Utility:
 1. Navigate to the Workspace home page.
 2. Click the **App Builder** icon.
 3. Select an application.
The Application home page appears.
 4. Click **Utilities**.
 5. Click **Embedded Code**.

The Embedded Code page appears. The following example shows the *Sample Database Application*. Note that large applications may take longer to display.

Application 313 \ Utilities \ Embedded Code

Search

Total Row Count 115

Search... Go

Language

SQL (72)

PL/SQL (39)

JavaScript (4)

Scope

Filter Scope

Shared Component (13)

Page 1 - Sample Database Application (5)

Page 2 - Customers (1)

Page 3 - Products (2)

Page 4 - Orders (1)

Page 5 - Sales by Month (3)

Page 6 - Product Details (4)

Page 7 - Customer Details (1)

Page 8 - Order Confirmation (2)

Page 9 - Application Theme Style (7)

Show More

Component Type

Region (42)

Process (21)

Page Item (17)

Series (7)

List of Values (5)

Search Results

Download

Shared Component Application Computation: A01

Computation SQL Query

```
select count(*) from demo_customers
```

Shared Component Application Computation: A02

Computation SQL Query

```
select count(*) from demo_product_info
```

Shared Component Application Computation: A03

Computation SQL Query

```
select count(*)
  from demo_orders o,
       demo_customers c
 where o.customer_id = c.customer_id
```

Shared Component Plugin: Highlight

Source PL/SQL Code

```
-- The render function generates the necessary javascript code for the
-- dynamic action plug-in and registers this function with the dynamic action
-- client side framework.
-- The render function has a defined interface which every plug-in has to
-- implement. It's designed in a way that future enhancements to the interface
-- will not break existing plug-ins.
function render_highlight (
  p_dynamic_action in apex_plugin.t_dynamic_action,
  p_plugin          in apex_plugin.t_plugin )
  return apex_plugin.t_dynamic_action_render_result
is
```

Shared Component Plugin: Badge List

Source PL/SQL Code

The left region contains facets that enable you to filter the Search Results report. The values of the facets depend upon the embedded code in the application. The left region contains the following facet filters:

- **Language** - Identifies the programming language of the embedded code. Currently, SQL, PL/SQL and JavaScript are supported.

Only those languages that are included in the application appear. For example, if an application uses SQL and PL/SQL, but not JavaScript, then only the first two options will appear as filters. Selecting a filter refreshes the report and only displays the code that matches the languages selected.

- **Scope** - Identifies where in the application the embedded code is used.

Shared Component refers to any application component that is not part of a page such as application processes, authentication schemes, lists of values and so on. All other values refer to a specific page of an application. Selecting a page limits the results to only the embedded code for that page.

- **Component Type** - Identifies the type of component that contains the embedded code.

Only those component types that contain embedded code display in the filter. For example, a classic report that uses a SQL query results in a **Region** component type to be included. Similarly, if an application does not have any buttons, then a **Button** filter does not appear. Note that not all conditions require embedded code.

A Search Results report displays in the right region and includes identifying information about the component as well as where the embedded code is used by the component. For example, a page item may have a Source query used to populate the item's value and it can also have a Server-side Condition to determine if the item should be included on the page.

6. Click **Download** to create a ZIP archive containing files for each of the components by language type.

The directory hierarchy of the files is similar to the Export as ZIP hierarchy. The difference is that all files will be located below the `embedded_code` directory as opposed to the `application` directory.

5.14.10 Viewing Page and Application Checksums

View page and application checksums to compare to compare different application deployments and determine if the application or pages are different.

- [Viewing the Application Checksum](#)
View the application checksum to compare if the same application is deployed in different workspaces.
- [Viewing the Page Checksum](#)
View the page checksum to compare two application deployments and determine which pages are the same and which are different.

5.14.10.1 Viewing the Application Checksum

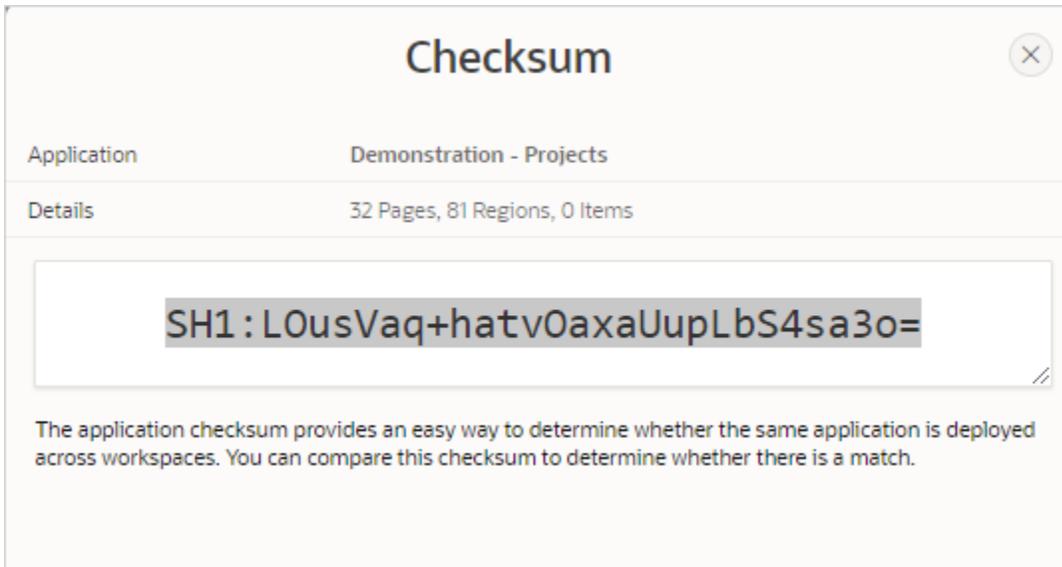
View the application checksum to compare if the same application is deployed in different workspaces.

The application checksum is a unique identifier consisting of number and character strings. View the application checksum to verify if the same application is deployed across workspaces.

To view the application checksum:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
3. Select an application.
The Application home page appears.
4. Click **Utilities**.
5. Click **Application Checksum**.

The Checksum window appears displaying the application name and details such as the number of pages, regions, or items. The application checksum displays in the center of the window.



6. Copy the checksum.

5.14.10.2 Viewing the Page Checksum

View the page checksum to compare two application deployments and determine which pages are the same and which are different.

A page checksum is a unique identifier consisting of number and character strings. Use the page checksum to verify if the same page is deployed across workspaces.

To view the page checksum:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
3. Select an application.

The Application home page appears.

4. Click **Utilities**.
5. Click **Page Checksum**.

The Page Checksum Report appears and includes the following columns: Name, Page (number), Alias, Checksum, Updated By, Group, and Updated.

6. To view the page checksum in Page Designer:
 - a. From the Page Checksum Report, click the page name.
Page Designer appears.
 - b. From the Page Designer toolbar, click the **Utilities** menu



and select **Checksum**.

The Checksum window appears displaying the page name and details such as the number of regions, items, or buttons. The checksum displays in the center of the window.

- c. Copy the checksum.

5.14.11 Accessing Font APEX

View the Font APEX page to search for Font APEX icons and view HTML markup.

- [Font APEX](#)
Font APEX is the icon library for Oracle Application Express and the Universal Theme.
- [Viewing Font APEX Icons](#)
Search for and view Font APEX icons on the Font APEX page.

5.14.11.1 Font APEX

Font APEX is the icon library for Oracle Application Express and the Universal Theme.

Font APEX was originally designed as a replacement for Font Awesome 4. The library contains versions of nearly all the Font Awesome icons, but each has been re-drawn on a 16x16 grid as line-icons. To make it seamless to switch from Font Awesome to Font APEX, some icons are named using the same "fa" prefix.

Small icons are based on a 16x16 grid and are ideally suited for buttons and menus. Large icons are based on a 32x32 grid and are well suited for places where you need to provide a larger graphic, such as cards, media lists, or hero regions.

Many Application Express components automatically use the large or small icons based on the context (such as Template Options). For example, when using Cards, the Block and Featured template option automatically shows the larger versions of the icons. In contrast, the Basic and Compact template options use icons from the smaller set. Font APEX contains over 1150 icons. You can choose from 25 modifiers that you can place on top of any existing icons so you can customize any icon to fit your needs.

5.14.11.2 Viewing Font APEX Icons

Search for and view Font APEX icons on the Font APEX page.

Once you find the appropriate icon, you can customize the icon by configuring attributes. As you make selections, the icon image changes and HTML and Icon attributes are updated. You can then copy the updated HTML Markup and icon property for use in your applications.

To view Font APEX icons:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
3. Select an application.
The Application home page appears.
4. Click **Utilities**.
5. Click **Font APEX Icons**.
The Font APEX page appear.
6. Use the Search region on the right side of the page to narrow the display.
 - Choose **Small** or **Large**
 - In the Search field, enter keywords and click **Go**.
 - Select a Category.

7. Under Icons, select an icon.

The following example shows **fa-bar-chart**.

The screenshot shows the Oracle APEX icon configuration utility for the 'fa-gear' icon. The interface includes a title bar with 'fa-gear' and a close button. A 'Reset Icon' button is located in the top right corner. The main area displays a gear icon on a checkered background. Below the icon, there are several configuration options: 'Size' with radio buttons for 'Small' and 'Large' (selected); 'Scale' with radio buttons for '1x', '2x', '3x', '4x', and '5x' (selected); 'Animation' with a dropdown menu set to 'Static'; 'Rotate' with a dropdown menu set to 'Normal'; and 'Modifier' with a dropdown menu set to 'None'. At the bottom, there are two sections: 'HTML' with a 'Copy' button and a text box containing the HTML code ''; and 'Icon' with a 'Copy' button and a text box containing the icon property 'fa-gear fa-lg'. A note at the bottom states: 'Enter in the Icon property for Buttons, Regions, and other components.'

8. Configure the attributes:

- Size
- Scale
- Animation
- Rotate
- Modifier

As you configure attributes, the icon image changes and the HTML and Icon attributes are updated to reflect your selections.

9. HTML - Displays the HTML Markup. Click **Copy** to copy the HTML Markup.
10. Icon - Displays the icon property for buttons, regions, and other components. Click **Copy** to copy the icon..
11. Click **Reset Icon** in the upper right corner to revert the attributes to the default settings.

5.14.12 Accessing Page Specific Utilities

Use the links in the Page Specific Utilities region to access Cross Page Utilities and Page Groups as well as access handy utilities for regions, buttons, items, computations, validations, process, dynamic actions, and branches.

To access Page Specific Utilities page:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
The App Builder home page appears
3. Select an application.
The Application home page appears.
4. Click **Utilities**.
5. Under Page Specific Utilities, select one of the following:
 - Cross Page Utilities
 - Page Groups
 - Region Utilities
 - Button Utilities
 - Item Utilities
 - Computations Utilities
 - Validation Utilities
 - Process Utilities
 - Dynamic Action Utilities
 - Branch Utilities



See Also:

["Accessing Cross Page Utilities"](#)

5.14.13 Accessing Cross Page Utilities

Use Cross Page Utilities to perform edits across pages in the application.

To access the Cross Page Utilities page:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click **Utilities**.
4. From Page Specific Utilities, click **Cross Page Utilities**.

The Cross Page Utilities page provides access to the following tools and reports:

- **Grid Edit of all Pages.** Use this report to edit the page name, alias, title, page template, and security options. To link to a specific page, click the Edit icon adjacent to the page number. To save your changes, click **Apply Changes**.
- **Delete Multiple Pages.** Delete multiple pages at once.
- **Page Attributes.** View a report of details for all pages in the current application including the page name, page title, defined groups, type and number of components and controls, and application logic. To customize the report, use the search bar at the top of the page. To link to a specific page, click the page number.
- **Page Locks.** Use Page Locks to prevent conflicts during application development. By locking a page, you prevent other developers from editing it.

 **See Also:**

- ["Locking and Unlocking a Page"](#)
- ["Deleting Multiple Pages"](#)
- ["Using Application Utilities"](#)

5.14.14 Using Interactive Report Utilities

View and delete saved interactive reports and interactive report subscriptions.

- [Deleting Saved Interactive Reports](#)
View and delete saved interactive reports in the current application.
- [Viewing Subscriptions](#)
View and delete interactive report subscriptions.

5.14.14.1 Deleting Saved Interactive Reports

View and delete saved interactive reports in the current application.

To delete saved interactive reports:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
The Application home page appears.
3. Click **Utilities**.
4. Under Interactive Report Utilities, select **Saved Reports**.
The report displays all of the saved report for the application which are not primary defaults. Each row includes the page number, region name, report type, report name, report alias, and owner.
5. To view private saved reports, deselect the checkbox for the **Primary Default** filter located below the search bar.
6. To delete a report, select the check box adjacent to the page number and click **Delete Checked**.
7. To view the page containing the report, click the page number.



See Also:

- ["Linking to Shared Interactive Reports"](#)
- ["Saving Interactive Reports"](#)
- ["Managing Saved Interactive Reports"](#) in *Oracle Application Express Administration Guide*

5.14.14.2 Viewing Subscriptions

View and delete interactive report subscriptions.

End users can receive updated versions of a report by subscribing to it. Workspace administrators can view and manage these subscriptions on the Subscriptions page.

To manage interactive report subscriptions:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
The Application home page appears.
3. Click **Utilities**.
4. Under Interactive Report Utilities, select **Subscriptions**.
The Subscriptions report appears.
5. To delete a subscriptions, select the check box adjacent to the page number and click **Delete Checked**.

5.15 Using Workspace Utilities

Use the Workspace Utilities page to access App Builder Defaults, REST Enabled SQL Services, Remote Servers, Application Groups, Web Credentials, Workspace Themes, Export, Application Express Views, and Manage Backups.

- [Accessing Workspace Utilities](#)
Access Workspace Utilities by clicking the Workspace Utilities icon in the center of the {Conref}App Builder home page.
- [Workspace Utilities Page](#)
The Workspace Utilities page contains links to common workspace utilities including App Builder Defaults, REST Enabled SQL services, Remote Servers, Application Groups, Web Credentials, Workspace Themes, Export, Application Express Views, and Manage Backups.
- [Viewing Cross Application Reports](#)
Use the links under Cross Application Reports page to view and edit information across multiple applications in the current workspace.

5.15.1 Accessing Workspace Utilities

Access Workspace Utilities by clicking the Workspace Utilities icon in the center of the {Conref}App Builder home page.

1. To access Workspace Utilities:
 1. Sign in to Oracle Application Express.
 2. On the Workspace home page, click the **App Builder** icon.
The App Builder home page appears.
 3. On the App Builder home pack, click the **Workspace Utilities** icon.
The Workspace Utilities page appears.

5.15.2 Workspace Utilities Page

The Workspace Utilities page contains links to common workspace utilities including App Builder Defaults, REST Enabled SQL services, Remote Servers, Application Groups, Web Credentials, Workspace Themes, Export, Application Express Views, and Manage Backups.

The following table describes the links on the Workspace Utilities page.

Link	Description	To Learn More
App Builder Defaults	Define application settings, themes, and globalization attributes.	See: "Leveraging App Builder Defaults" in <i>Oracle Application Express Administration Guide</i>
REST Enabled SQL Services	Manage references to external REST Enabled SQL services.	See: " Managing REST Enabled SQL References "
Remote Servers	Manage Remote Server objects used in REST Data Sources and Authentications.	See: " Managing Remote Servers "
Application Groups	Organize applications by assigning them to application groups. To use application groups, first create a group and then assign applications to it.	See: " Managing Application Groups "
Web Credentials	Manage secure credentials to connect to REST Enabled SQL or other REST services.	See: " Managing Web Credentials "
Workspace Themes	Manage workspace themes that can be utilized by any application within the workspace.	See: " Managing Workspace Themes "
Export	Export workspace components.	See: " Exporting an Application and Application Components "
Application Express Views	Query the various views against Application Express meta data.	See: " Accessing Application Express Views "

Link	Description	To Learn More
Manage Backups	View and manage application backups in the current workspace. Backups provide a simple way to recover applications that may have been unexpectedly modified or deleted.	See: " Managing Application Backups "
Cross Application Reports	Cross Application Reports display on the right side of the Workspace Utilities page. Access these reports to view and edit information across multiple applications in the current workspace.	See: " Viewing Cross Application Reports "

5.15.3 Viewing Cross Application Reports

Use the links under Cross Application Reports page to view and edit information across multiple applications in the current workspace.

1. To access cross application reports:
 1. Sign in to Oracle Application Express.
The Workspace home page appears.
 2. Click the **App Builder** icon.
The App Builder home page appears.
 3. Click the **Workspace Utilities** icon.
 4. Locate the **Cross Application Reports** region on the right side of the window. Available reports include:
 - All Reports
 - Application Attributes
 - Build Options
 - Developer Comments
 - Comments Calendar
 - Application Comparison
 - Component Comparison
 - Security Profiles
 - Authentication Schemes
 - Password Items
 - Theme Summary
5. To view all reports:
 - a. Click **All Reports**.
 - b. On the Cross Application Reports page, select a report to review.

6

Managing Pages in a Database Application

A page is the basic building block of an application. Developers add pages to an application by running the Create Page Wizard.

- [About Creating New Pages](#)
Developers add pages to an application by running the Create Page Wizard.
- [Adding a New Page to an Application](#)
Add a new page by running the Create Page Wizard from the Application home page.
- [Understanding Page Types in the Create Page Wizard](#)
Run the Create Page Wizard to add a new page to existing application. How the wizard works depends upon the type of page you are creating.
- [Creating Dialog Pages](#)
Oracle Application Express includes support for modal and non-modal dialog pages. Modal and non-modal dialog pages are only supported if the current application theme contains at least one page template of template type Dialog Page.
- [About Copying Database Application Pages](#)
Copy a page from the current application or from another application.
- [About Deleting Database Application Pages](#)
Deleting a page deletes the corresponding tabs, breadcrumbs, and list entries. You can only delete unlocked pages or pages that you have locked.
- [Creating Page Groups](#)
Organize pages into page groups to make them access easier. To use page groups, you create a group and then assign pages to the group.
- [Locking and Unlocking a Page](#)
Prevent conflicts during application development by locking pages in your application. By locking a page, you prevent other developers from editing it.



See Also:

["Editing Pages in Page Designer"](#) and ["Using Application Utilities"](#)

6.1 About Creating New Pages

Developers add pages to an application by running the Create Page Wizard.

The Create Page Wizard includes two types of pages:

- **Component** pages provide page-level functionality. Available Component pages include Report, Form, Plug-ins, Chart, Calendar, Tree, Wizard, Data Loading, Legacy Page, and Dashboard Page.

- **Feature** pages provide application-level functionality and can only be added once per application. Available Features include About Page, Access Control, Activity Reporting, Configuration Options, Email Reporting, Feedback, Login Page, and Theme Style Selection.

You can access the Create Page Wizard as follows:

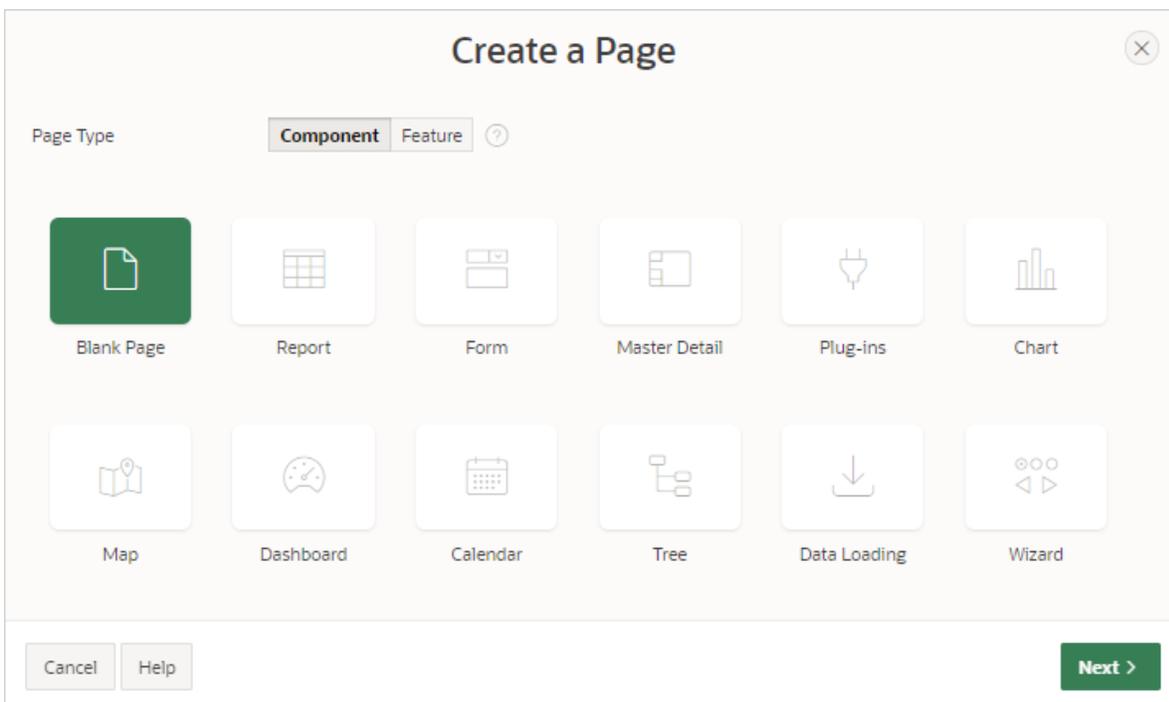
- Application home page — Click **Create Page**. See "[Adding a New Page to an Application](#)."
- Viewing a page in Page Designer — Click **Create** on the Page Designer Developer toolbar and select **Page**. See "[Page Designer Toolbar](#)"

6.2 Adding a New Page to an Application

Add a new page by running the Create Page Wizard from the Application home page.

To create a new page:

1. On the Workspace home page, click **App Builder**.
2. Select an application.
The Application home page appears.
3. Click the **Create Page** button.
The Create Page Wizard appears.



4. For Create a Page:
 - a. Page Type - Select the type of page you want to create. Options include:
 - **Component** - Provides page-level functionality and can be added multiple times within a given application. Available Component pages include

Blank Page, Report, Form, Plug-ins, Chart, Calendar, Tree, Wizard, Data Loading, Legacy Page, and Dashboard Page.

- **Feature** - Provides application-level functionality. Available Features pages include About Page, Access Control, Activity Reporting, Configuration Options, Email Reporting, Feedback, Login Page, and Theme Style Selection.

 **Tip:**

The Page Type you select(that is, **Component** or **Feature**) determines what appears next. To learn more see,"[Understanding Page Types in the Create Page Wizard.](#)"

- b. Click **Next**.
5. What displays next changes based on your selection. Follow the on-screen instructions. To learn more about an attribute, see field-level Help.

 **See Also:**

["About Creating New Pages"](#)

6.3 Understanding Page Types in the Create Page Wizard

Run the Create Page Wizard to add a new page to existing application. How the wizard works depends upon the type of page your are creating.

 **Tip:**

Universal Theme - 42 is optimized to work equally well in either a mobile or desktop environment. In previous releases and in earlier themes, the Mobile user interface is based on jQuery Mobile. Because jQuery Mobile is desupported, you must migrate existing mobile applications to the Universal Theme.

- [Available Component Page Types](#)
Learn about available components when running the Create Page Wizard using the Universal Theme.
- [Available Features Page Types](#)
Learn about available features when running the Create Page Wizard using the Universal Theme.
- [About Removing Features Created with the Create Page Wizard](#)
Remove features created with a wizard using build options.

6.3.1 Available Component Page Types

Learn about available components when running the Create Page Wizard using the Universal Theme.

Table 6-1 Desktop Applications — Component Types

Page Type	Description	To Learn More
Blank Page	Creates a page with no built-in functionality.	See online Help when creating this page.
Report	A report is the formatted result of a SQL query. Report options include: <ul style="list-style-type: none"> • Interactive Report • Interactive Grid • Classic Report • Report and Form on Table • List View (Optimized for mobile) • Column Toggle Report (Optimized for mobile) • Reflow Report (Optimized for mobile) 	See: <ul style="list-style-type: none"> • Developing Reports • Report Options When Running the Create Page Wizard
Form	Forms enable users to update a single row or multiple rows in a table. Form options include: <ul style="list-style-type: none"> • Form • Editable Interactive Grid • Report with Form • List View with Form (Optimized for mobile) • Form on Local Procedure 	See: <ul style="list-style-type: none"> • Creating a Form • Understanding Form Types • Form Options When Running the Create Page Wizard
Master Detail	A master detail form reflects a one-to-many relationship between two tables in a database. Master detail forms enable users to insert, update, and delete values from two tables or views. Master Detail options include: <ul style="list-style-type: none"> • Stacked - Creates a single page master detail with editable interactive grids. • Side by Side - Creates a single page (or Side by Side) master detail utilizing side by side layout and report regions with modal edit windows. The left side contains a master list to navigate to the master record. The right side contains the selected master record and the associated detail report. • Drill Down - Creates a two page (or Drill Down) master detail. The first page contains an interactive report for the master table. The second page features a standard form for the master and interactive grids for the detail. 	See: <ul style="list-style-type: none"> • Creating Master Detail Forms • About Master Detail Forms
Plug-ins	Creates a new page based on a region type plug-in. Plug-ins enable developers to declaratively extend, share, and reuse the built-in types available with Oracle Application Express.	See Importing a Plug-in from the Plug-in Page

Table 6-1 (Cont.) Desktop Applications — Component Types

Page Type	Description	To Learn More
Chart	Creates a new page containing a chart. Supported chart types include area, bar, box plot, bubble, combination, status meter gauge, donut, funnel, gantt, line, line with area, pie, polar, pyramid, radar, scatter, and stock charts.	See Creating Charts
Map	The map component consists of a background map and spatial geometry objects (or layers) sourced from data in a local table. Supported spatial geometry objects (or layers) include: Points, Lines, Polygons, Heat Map, or Extruded Polygons. Spatial geometry objects can be either:	See Creating Maps
Dashboard	Creates a dashboard page. Choose from four different chart layouts which you can easily customize in Page Designer. Available chart layouts include Primary and 2 secondary charts, Grid of 4 charts, Primary and 3 secondary charts, and Grid of 6 charts.	See online Help when creating this page.
Calendar	Generates a calendar with monthly, weekly, and daily views.	See Creating Calendars
Tree	Creates a tree to graphically communicate hierarchical or multiple level data and optionally navigating to a page or URL specific to each tree node.	See Managing Trees
Wizard	Create a collection of pages to be used as a wizard. Generally wizards are used for entering data across multiple steps.	See online Help when creating this page.
Data Loading	If a Data Load Definition exists, you can create a Data Loading page. The Create Page Wizard creates a single page with the Native Data Loading page process to provide the ability to upload data from a file or by copy and paste, and then upload the data. This Data Loading page enables end users to manage the loading of data.	See Creating a Data Loading Page Manually
Legacy Page	Legacy pages contains components Oracle still supports but does not recommend using. Options include: <ul style="list-style-type: none"> • Legacy Master Detail • Summary Page • Report on Legacy Web Service • Form on Legacy Web Service • Report and Form on Legacy Web Service • Legacy Data Loading 	See Managing Application Legacy Components

6.3.2 Available Features Page Types

Learn about available features when running the Create Page Wizard using the Universal Theme.

This table lists available Features for Desktop Applications when running the Create Page Wizard.

Table 6-2 Create Page Wizard — Features

Page Type	Description	To Learn More
About Page	Include an About this Application page which features a description field that describes the application, includes the application version, and a count of the number of pages	See online Help when creating feature.
Access Control	Creates pages to manage an access control list. Use the Application Access Control shared component to associate application roles with application users. This wizard also adds a reader , contributor and administrator role and corresponding authorization scheme to your application. Apply these authorization schemes to pages and page components to manage access by user and role.	See " Controlling Access to Applications, Pages, and Page Components "
Activity Monitoring	Include numerous reports on end user activity for your application. Determine the most active users, the most used pages, the performance of pages, and errors raised, to better understand how your application is being utilized and areas for improvement.	Not applicable.
Configuration Options	Enables application administrators to enable or disable specific functionality within the application. This feature is useful if you select features that need additional development effort before they can be used by end users. You can expand this feature to application-specific features. If developers define additional build options and associate them with specific functionality throughout the application, then they can be added to the configuration settings for administrators.	Not applicable.
Email Reporting	Include numerous reports on emails queued from this application, emails sent, and errors sending emails.	Not applicable.
Feedback	Feedback provides a mechanism for end users to post general comments for application administrators and developers. The posts include useful session state information to help developers determine where the end user sent the feedback from. Creating Feedback: <ul style="list-style-type: none"> • Creates Navigation bar icon which users can click to leave feedback. • Creates a report for viewing and updating feedback. • Captures the application and page ID, feedback comments, date and time, and user information. 	See " Managing Feedback ".

Table 6-2 (Cont.) Create Page Wizard — Features

Page Type	Description	To Learn More
Job Reporting	This option only appears if you have database jobs associated with the underlying schemas for the workspace. Include reports on jobs and job run details within the schema associated with this application.	Not applicable.
Login Page	Creates a Login Page which enables the user to enter login credentials for accessing your application. Developers can select a template and labels for the Username and Password fields as well as determine if the Username value is stored as a system-generated cookies.	Not applicable.
Theme Style Selection	Enables administrators to select a default color scheme (theme style) for the application. Administrators can also choose to allow end users to choose their own theme style. End users can simply click on the Customize button at the bottom of the home page, and select from the available theme styles. For example, users with visual impairment may prefer to utilize the Vista theme style which has a much higher color contrast.	Not applicable.

**See Also:**

["About Removing Features Created with the Create Page Wizard"](#)

6.3.3 About Removing Features Created with the Create Page Wizard

Remove features created with a wizard using build options.

When you add a feature using a wizard, the wizard creates one or more pages and other components and processes to seamlessly integrate it into your application. Each feature is associated with a build option which contains one or more components. You use the associated build option to enable, disable, or permanently remove features.

Using Build Options to Include or Exclude Features

Build options have two possible values: **Include** and **Exclude**. If you select the build option status of **Include**, then the Application Express engine considers the associated components (in this case features) as part of the application definition at runtime. Conversely, if you specify the build options status as **Exclude**, then the Application Express engine treats it and any associated components as if it did not exist.

Removing Features Permanently

You remove features created with a wizard by first removing the components associated with the build option and then deleting the build option.

 **See Also:**

- ["Including or Excluding Build Options"](#)
- ["Deleting Build Options and Associated Components"](#)

6.4 Creating Dialog Pages

Oracle Application Express includes support for modal and non-modal dialog pages. Modal and non-modal dialog pages are only supported if the current application theme contains at least one page template of template type Dialog Page.

- [About Supported Dialogs](#)
- [Using a Dialog Page Template](#)
- [Defining a Dialog Page in Page Designer](#)
- [Generating a Cancel Dialog Dynamic Action on the Dialog Page](#)
- [Generating a Close Dialog Page Process on the Dialog Page](#)
- [About Branching with Dialog Pages](#)
- [Handling Refresh Actions on Parent Page](#)

6.4.1 About Supported Dialogs

When you create a new page, the wizard prompts you to select a Page Mode. The Page Mode determines if the page is a **normal** application page or a **dialog** page. Oracle Application Express supports two types of dialog pages:

- **Modal Dialog** - A modal dialog is an overlay window positioned within the same browser window. A modal dialog remains active and focused until the user has finished with it and closes it. While a modal dialog is active, the user is unable to interact with the rest of the page until the dialog is closed.
- **Non-modal Dialog** - A non-modal dialog displays a separate popup browser window. A user can interact with a non-modal dialog and content on the page. Use a non-modal dialog when the requested information is not essential to continue. This type of window can be left open while work continues elsewhere.

6.4.2 Using a Dialog Page Template

Oracle Application Express includes dialog page templates in the *Universal Theme - 42*. When you set the Page Mode to either **Modal** or **Non-Modal**, Oracle Application Express automatically uses the default dialog page template. This section describes how to create a dialog template if your theme does not include one and how to edit dialog template attributes.

- [Creating a Dialog Page Template](#)
- [About Defining Dialog Page Template Attributes](#)

6.4.2.1 Creating a Dialog Page Template

If you are using an existing application and the theme does not contain such a dialog page template, then you must create one. While you can create one from scratch, the easiest option is to copy an existing dialog template.

To create a dialog page template:

1. Copy the dialog page template from the Sample Database application:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select the application to which you want to copy the template.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Templates**.
 - e. Click **Create**.
 - f. In the Create Template Wizard:
 - Template Type - Select **Page** and click **Next**.
 - Creation Method - Select **As a Copy of an Existing Template** and click **Next**.
 - Copy From - Select **Sample Database Application** and click **Next**.
 - Identify Theme - Select the theme you are copying from and the theme you are copying to and click **Next**.
 - New Template - Locate the Modal Dialog template. Under Copy, select **Yes**.
 - Select Create **Copy Page Templates**.
2. Verify the dialog page template is active in the current theme.



See Also:

["Selecting a Default Page Template"](#)

6.4.2.2 About Defining Dialog Page Template Attributes

The dialog page template contains JavaScript function calls that handle the initialization, closure, and cancellation of a dialog page. When you create a dialog page template you must define these and other Dialog Page Templates attributes.



See Also:

["Required Dialog Page Template Attributes"](#)

6.4.3 Defining a Dialog Page in Page Designer

To define a page as a dialog in Page Designer:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears. Attributes are organized in groups.
2. In Page Designer locate the **Appearance** group.
3. For Page Mode, select one of the following:
 - **Modal Dialog** - The page is presented as a modal dialog. A modal dialog is an overlay window positioned within the viewport, which remains active and focused until the end user dismisses (closes) it. The underlying page is grayed out and the end user is prevented from interacting with the rest of the page until the dialog is closed.
 - **Non-Modal Dialog** - The page is presented as a non-modal dialog. A non-modal dialog is an overlay window positioned within the viewport, where the end user can interact with the dialog, and content on the page that launched the dialog. A non-modal dialog can be used when the requested information is not essential to continue, work can continue elsewhere while the window is still open.
4. Edit other **Appearance** attributes as needed.

 **Tip:**

To learn more about an attribute, see field-level Help.

5. Under Dialog, edit the appropriate attributes:
 - a. **Width** - Enter the width of the dialog, in pixels or a percentage. The substitution string `#DIALOG_WIDTH#` in the dialog initialization code of the page template is replaced with the value entered in this item. For a page using a Desktop user interface, the value is set in pixels, such as 500.
 - b. **Height** - Enter the height of the dialog, in pixels, for example, 500. The substitution string `#DIALOG_HEIGHT#` in the dialog initialization code of the page template is replaced with the value entered.
 - c. **Maximum Width** - Enter the maximum width of the dialog in pixels. The substitution string `#DIALOG_MAX_WIDTH#` in the dialog initialization code of the page template is replaced with the value entered in this item.
 - d. **Attributes** - Dialog support varies depending on the user interface of the page. A subset of dialog attributes are declaratively supported: height, width, and maximum width. To define any additional attributes for the dialog, enter the name/value pairings in a comma separated list. The substitution string `#DIALOG_ATTRIBUTES#` in the dialog initialization code defined at page template level, is replaced by any value(s) entered in this item.
 - e. **CSS Classes** - Enter classes to add to this component. You may add multiple classes by separating them with spaces.
 - f. **Chained** - Select **On** if this dialog is opened by another dialog, and should reuse the same dialog window. For example, if this dialog is part of a multiple page dialog wizard and you wish to reuse the dialog window for each step of

the wizard. Select **Off** if this dialog is opened by another dialog and should be opened in a new dialog window. For example, when this dialog is modal, and you wish to open it within a parent modal dialog window.

6. To save your changes, click **Save**.

**See Also:**

["About Creating New Pages"](#)

6.4.4 Generating a Cancel Dialog Dynamic Action on the Dialog Page

If your dialog page contains a Cancel button, then you must generate a dynamic action based upon the Click of that button, with its True Action event being set to **Cancel Dialog**. This dynamic action will use the cancellation JavaScript call contained in the page template (`apex.navigation.dialog.cancel`) to handle the cancelling the dialog.

**See Also:**

["Managing Dynamic Actions"](#)

6.4.5 Generating a Close Dialog Page Process on the Dialog Page

You close a dialog page in Oracle Application Express by creating a Close Dialog page process. In previous releases, this page process was referred to as a Close Popup Window. This dialog will use the closure JavaScript call contained in the page template (`apex.navigation.dialog.close`), to handle the closing of the dialog. The page process also supports the return of dialog page items, which you may wish to reference on the parent page. To view examples, edit any of the Dialog pages in the *Sample Database Application*.

**Tip:**

You can also close a dialog page with the Close Dialog dynamic action. Both the dynamic action and the process support returning dialog page items. Use the page process when the page needs to be submitted and use the dynamic action when the page does not need to be submitted. Both end up calling the closure JavaScript call. Alternatively, you can create a page branch, which will close a dialog page and redirect to the page specified in the branch.

 **See Also:**

- ["Understanding Page Processes"](#)
- ["Controlling Navigation Using Branches"](#)

6.4.6 About Branching with Dialog Pages

You can open dialog pages using buttons or links. Dialog pages support the following branching options:

- Dialog page to dialog page.

You can branch from one dialog page to another dialog page if:

- Both pages have the same Page Mode, for example Modal Dialog and the dialog Chained attribute is set to **On**. Setting the Chained attribute to **On** enables support for chained or nested dialogs such as the dialogs that appear many internal Application Express wizards. Chained or nested dialogs enable you to re-use a dialog window to display each page.
- Dialog page to Normal page.
 - When branching from a dialog page to a normal page, the dialog page is closed and the user navigates to a new page in the browser. The new page can be parent (or launching) page or another Normal page in an application.

6.4.7 Handling Refresh Actions on Parent Page

If you have generated a Close Dialog page process on the dialog page, you must implement refresh actions on the parent page using the new `Dialog Closed` dynamic action event type. You can use the set type Dialog Return Item when creating a Set Value True Action, to set a single value, based on the return item of a dialog.

To see an example, go to the Products page in the *Sample Database Application*. On the Products page, the Create Product button has an associated dynamic action that launches the dialog. Closing the dialog triggers the `Dialog Closed` dynamic action. You can use this type of dynamic action for whatever True Actions you wish to define. In this example, it refreshes the report on the parent page and submits the page.

 **Tip:**

For a partial page refresh of a parent page, implement the close dialog with dynamic action (for example, for report and form pages where you want to edit data in a modal dialog form and only want the report refreshed on close). In contrast, branching is the best approach if you have a multi step modal wizard or if you have several possible target pages when closing the dialog.

 **See Also:**
["Managing Dynamic Actions"](#)

6.5 About Copying Database Application Pages

Copy a page from the current application or from another application.

During the copy process, you can also copy shared components or change mappings to shared components in the target application.

About Copying Pages Between User Interfaces in Older Themes

The Copy Page Wizard enables you to copy a page to a different user interface. During the copying process, the user can select the user interface for the new page. If the application contains a Desktop and a Mobile theme, both user interface options display.

 **See Also:**
["Copying a Database Application Page "](#)

6.6 About Deleting Database Application Pages

Deleting a page deletes the corresponding tabs, breadcrumbs, and list entries. You can only delete unlocked pages or pages that you have locked.

 **See Also:**
["Deleting Pages"](#)

6.7 Creating Page Groups

Organize pages into page groups to make them access easier. To use page groups, you create a group and then assign pages to the group.

 **Tip:**
Page groups do not have any function other than to aid developers in organizing their application pages.

- [Viewing Page Groups](#)

- [Creating a Page Group](#)
- [Editing a Page Group Definition](#)
- [Assigning a Page to a Page Group](#)
- [Viewing Pages by Page Group](#)
- [Deleting a Page Group](#)

6.7.1 Viewing Page Groups

To access the Page Groups page:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.
3. Click the **Utilities** icon.
4. From Page Specific Utilities, click **Page Groups**.

The Page Groups page appears.

A Search bar displays at the top of the page. Available controls include:

- **Select columns to search** - Resembles a magnifying glass. Click this icon to narrow your search. To search all columns, select **All Columns**.
 - **Text area** - Enter case insensitive search criteria (wildcard characters are implied) to search for a page group by name and click **Go**.
 - **Go button** - Executes a search or applies a filter.
 - **View Icons** - Displays each group as a large icon. To edit a group, click the appropriate icon.
 - **View Report** - Displays each group as a line in a report. To edit a group, click the name.
 - **Actions menu** - Use the Actions menu to customize the report view.
5. To view the pages associated with a group, click **Pages by Page Group**.



See Also:

["About the Actions Menu"](#)

6.7.2 Creating a Page Group

To create a page group:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.
3. Click the **Utilities** icon.
4. From Page Specific Utilities, click **Page Groups**.
5. On the Page Groups page, click **Create**.

6. Enter a name, a description (optional), and click **Create**.

6.7.3 Editing a Page Group Definition

When you create a page group you specify a name and description.

To edit the Page Group definition:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.
3. Click the **Utilities** icon.
4. From Page Specific Utilities, click **Page Groups**.
5. Select a page group.
6. On the Page Group page, edit the name or description and click **Apply Changes**.
7. To move to the next Page Group definition, click the **Previous** (<) and **Next** (>) buttons and repeat the previous step.

6.7.4 Assigning a Page to a Page Group

To assign pages to a group:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.
3. Click the **Utilities** icon.
4. From Page Specific Utilities, click **Page Groups**.
5. Click the **Page Assignments** tab.
The Page Assignments page appears.
6. Click the page number.
The Page Attributes page appears.
7. Locate the Name region and select a group from the Group list.
8. Click **Apply Changes**.

6.7.5 Viewing Pages by Page Group

To view pages by page group:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.
3. Click the **Utilities** icon.
4. From Page Specific Utilities, click **Page Groups**.
5. Click the **Pages by Page Group** tab.
The Pages by Page Group page appears. Click the Page Name to view the page.
6. To remove a page from a group:
 - a. Click the page number.

Page	Name	Alias	Updated	Updated By	Type	Group	Lock	Run
0	Global Page - Desktop	-	3 hours ago	admin	Global Page	Unassigned		
1	Home	home	3 hours ago	admin	Home	Unassigned		
2	Projects	projects	3 hours ago	admin	Interactive Report	Unassigned		

6.8.2 Locking a Page

Developers can lock a page on the Application home page, Page Locks page, and in Page Designer.

- [Locking a Page from the Application Home Page](#)
- [Locking a Page from the Page Locks Page](#)
- [Locking a Page in Page Designer](#)

6.8.2.1 Locking a Page from the Application Home Page

To lock a page from the Application Home Page:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the search bar, click the **View Report or View Detail** icon.
4. Click the **Lock** icon.
5. Enter a comment in the Comment field.
6. Click **Lock Page(s)**.

6.8.2.2 Locking a Page from the Page Locks Page

To lock a page from the Page Locks Page:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click the **Utilities** icon.
4. On the Page Specific Utilities list, click **Cross Page Utilities**.

5. Click **Page Locks**.
6. Select the appropriate pages and click **Lock Checked**.
7. Enter a comment in the Comment field.
8. Click **Lock Page(s)**.

6.8.2.3 Locking a Page in Page Designer

The Page Lock button on the Page Designer toolbar indicates whether a page is locked. If the page is unlocked, the Page Lock button displays as an unlocked padlock.

To lock a page in Page Designer:

1. Navigate to the appropriate page in Page Designer.
2. On the Page Designer toolbar, click the **Page Unlocked** button.
3. Enter a comment in the Comment field.
4. Click **Lock**.

When a page is locked, the Page Lock button displays as a locked padlock.



See Also:

["Viewing a Page in Page Designer"](#)

6.8.3 Unlocking a Page

Only the developer who locks a page can unlock it. However, a developer with administrative privileges can unlock pages locked by other developers.



Tip:

To view information about an existing page lock, navigate to the Lock Details page and expand the Lock History region.

- [Unlocking Pages from Utilities](#)
- [Unlocking Pages from the Application Home Page](#)
- [Unlocking a Page in Page Designer](#)
- [Unlocking Pages As a Workspace Administrator](#)

6.8.3.1 Unlocking Pages from Utilities

To unlock a page from the Page Locks page:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click the **Utilities** icon.

4. On the Page Specific Utilities list, click **Cross Page Utilities**.
5. Click **Page Locks**.
6. Select the appropriate pages.
7. Click **Unlock Checked**.

6.8.3.2 Unlocking Pages from the Application Home Page

To unlock a page from the Application Home Page:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the search bar, click the **View Report** icon.
4. Click the **Lock** icon.
The Lock Details page appears.
5. Click **Unlock**.

6.8.3.3 Unlocking a Page in Page Designer

The Page Lock button on the Page Designer toolbar indicates whether a page is locked. If the page is locked, the Page Lock button displays as a locked padlock. Passing your cursor over a locked Page Lock button displays a tooltip which indicated who locked it.

To unlock a page in Page Designer:

1. Navigate to the appropriate page in Page Designer.
If a page is locked, the Page Lock button displays as a locked padlock.
2. On the Page Designer toolbar, click the **Page locked by you** button.
If the page has been locked by another user the Lock button appears in red. You cannot unlock a page locked by another user.
3. Click **Unlock**.
When a page is unlocked, the Page Lock button displays as an unlocked padlock.

["Viewing a Page in Page Designer"](#)

6.8.3.4 Unlocking Pages As a Workspace Administrator

To unlock pages as a Workspace Administrator:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click the **Utilities** icon.
4. On the Page Specific Utilities list, click **Cross Page Utilities**.
5. Click **Page Locks**.
6. Click **Lock Administration**.
7. Select the appropriate pages.
8. Click **Unlock Page(s)**.

7

Editing Pages in Page Designer

Developers view and edit application pages in Page Designer. Page Designer is a full featured Integrated Development Environment (IDE) that includes a toolbar and multiple panes.

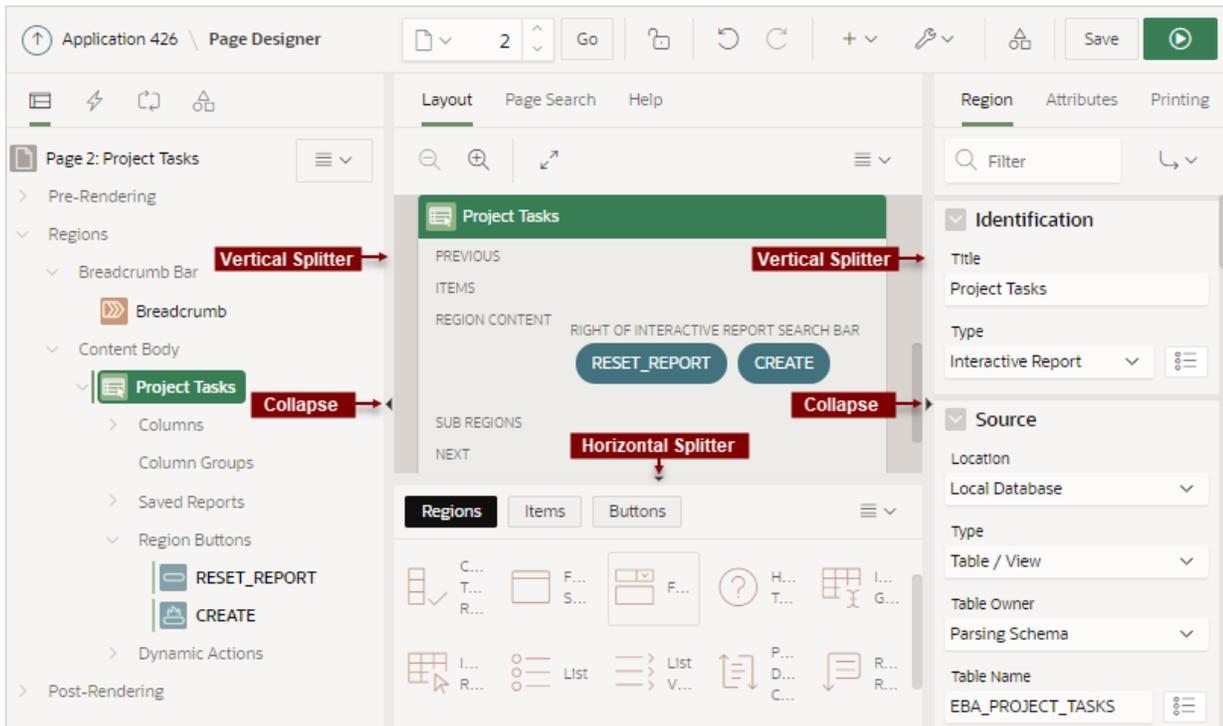
- [About Page Designer](#)
Use Page Designer to maintain and enhance pages within an Oracle Application Express application. Page Designer is a full featured Integrated Development Environment (IDE) that includes a toolbar and multiple panes.
- [Understanding Page Designer UI Elements](#)
The Page Designer window features three panes: a left pane, a central pane, and a right pane. You select a component in the left or central pane and then edit the component's attributes in the Property Editor located in the right pane.
- [Using Page Designer](#)
Use Page Designer to view and edit database application pages.
- [Managing Page Attributes](#)
Edit page attributes to control basic information and functionality for a given page, including the page name or title, header and footer text, navigation menus, inclusion of page-level JavaScript or CSS files, error handling, and the selected authorization scheme.
- [Running a Page from Page Designer](#)
The Application Express engine dynamically renders and processes pages based on data stored in database tables. To view a rendered version of an application, you run or submit it to the Application Express engine.
- [Runtime Developer Toolbar](#)
Use the Runtime Developer toolbar to quickly edit the current application or currently running page, or view session state.
- [Copying a Database Application Page](#)
You can copy a page from the current application or from another application. During the copy process, you can also copy shared components or change mappings to shared components in the target application.
- [Deleting Pages](#)
Deleting a page deletes the corresponding tabs, breadcrumbs, and list entries.

See Also:

- ["Adding Developer Comments"](#)
- ["Creating Database Applications"](#)
- ["Controlling Page Layout"](#)
- ["Adding Navigation"](#)

7.1 About Page Designer

Use Page Designer to maintain and enhance pages within an Oracle Application Express application. Page Designer is a full featured Integrated Development Environment (IDE) that includes a toolbar and multiple panes.



The Page Designer window is divided into three main panes:

- **Left Pane** - Includes four tabs that display as a tree: Rendering, Dynamic Actions, Processing, and Shared Components.
- **Central Pane** - Includes the following tabs: Layout, Component View, Page Search, and Help.
- **Right Pane** - Displays the Property Editor. Use the Property Editor to update attributes for the selected component. When you select multiple components, the Property Editor only displays common attributes. Updating a common attribute updates that attribute for all of the selected components.

You can adjust the size of each pane by selecting and dragging the horizontal and vertical splitters. To expand or collapse each pane, click the small triangle labeled Collapse in the center of each splitter.

Tip:

You can view an online summary that describes the Page Designer window. View a page in Page Designer, click the **Help** menu at the top of the page, and select **Getting Started with Page Designer**.

 **See Also:**

- ["Understanding Page Designer UI Elements"](#)
- ["Viewing Help in Page Designer"](#)
- ["Editing Pages in Page Designer"](#)

7.2 Understanding Page Designer UI Elements

The Page Designer window features three panes: a left pane, a central pane, and a right pane. You select a component in the left or central pane and then edit the component's attributes in the Property Editor located in the right pane.

The **left** pane includes four tabs: Rendering, Dynamic Actions, Processing, and Page Shared Components. The **central** pane contains four tabs: Layout, Component View, Page Search, and Help and a Gallery pane at the bottom. The **right** pane contains the Property Editor.

 **Tip:**

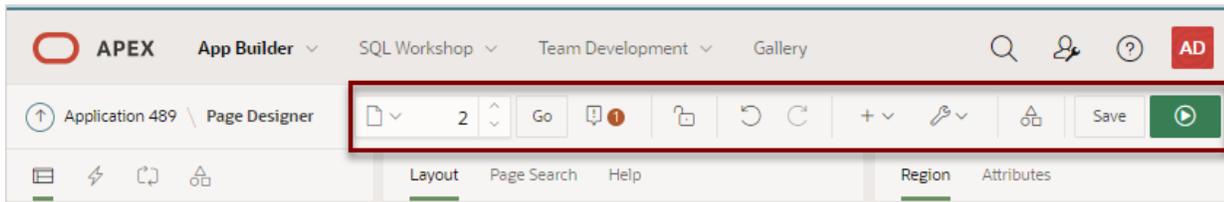
You can view an online summary of this information. View a page in Page Designer, click the **Help** menu at the top of the page, and select **Getting Started with Page Designer**.

- [Page Designer Toolbar](#)
The Page Designer toolbar displays at the top of the page and contains both buttons and menu options. Passing your cursor over an active button and menu displays a tooltip.
- [Left Pane of Page Designer](#)
The left pane in Page Designer includes four tabs: **Rendering**, **Dynamic Actions**, **Processing**, and **Page Shared Components**. Each tab displays a list of the corresponding component types and components created on the current page.
- [Central Pane of Page Designer](#)
The top of the central pane contains the **Layout**, **Component View** (not displayed by default), **Page Search**, and **Help** tabs. The lower part of the central pane contains the Gallery.
- [Right Pane of Page Designer \(Property Editor\)](#)
The right pane in Page Designer contains the Property Editor. Use the Property Editor to edit the attributes of the currently selected component.
- [Code Editor](#)
For attributes requiring large amounts of code (for example, a region Source), you can enter text directly in to the field or access a full featured Code Editor.

 **See Also:**
["Using Page Designer"](#)

7.2.1 Page Designer Toolbar

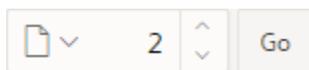
The Page Designer toolbar displays at the top of the page and contains both buttons and menu options. Passing your cursor over an active button and menu displays a tooltip.



 **Tip:**
You can view an online summary of how to use Page Designer. View a page in Page Designer, click the **Help** menu at the top of the page, and select **Getting Started with Page Designer**.

The Page Designer toolbar features the following buttons and menu options.

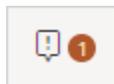
Page Selector



The **Page Selector** displays the current page. Click the down arrow (labeled **Page Finder**) to search for pages. Alternatively, enter a page number in the field and click **Go**. To navigate to the previous or next page, click **Navigate to Next Page** (up arrow) and **Navigate to Previous Page** (down arrow).

 **See Also:**
["Searching for Pages"](#)

Show Messages



When you add a new component to a page, Page Designer indicates what actions are required next. The **Show Messages** icon only displays if there is an error. Click the

Show Messages icon to view a dialog listing all the errors. Select an error to highlight the associated attribute in the Property Editor.

Page Unlocked and Page Locked



Indicates the lock status of a page. **Page Unlocked** indicates the current page is unlocked and editable. **Page Locked** indicates the page is unavailable for editing. The appearance of the padlock icon changes depending upon the lock status:

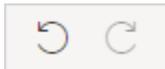
- Clear unlocked padlock — Indicates the page is unlocked.
- Green locked padlock — Indicates the page is locked by you.
- Red locked padlock — Indicates the page is locked by another user. To view the lock owner, or update the lock comment, click the red packlock.



See Also:

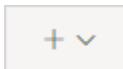
["Locking and Unlocking a Page"](#)

Undo and Redo



Applies to actions that result in a change to the page data. **Undo** reverts the previous update you made within Page Designer. **Redo** reapplies the last update that was undone using **Undo**.

Create



Features a graphical plus sign (+). Create menu options include:

- **Page**. Access to the Create Page Wizard. See ["About Creating New Pages."](#)
- **Page as Copy**. Access the Copy Page Wizard. See ["Copying a Database Application Page ."](#)
- **Page Component**. Provides a summary of how to create page components in Page Designer.
- **Breadcrumb Region**. Access to the Create Breadcrumb Wizard. See ["Creating Breadcrumbs"](#) and ["Creating a Breadcrumb Region in Page Designer."](#)
- **Shared Component**. Access to the Create Application Component Wizard. Shared components are common elements that can display or be applied on any page within an application. See ["Managing Shared Components."](#)
- **Page Group**. Links to the Page Group page. Use page groups to organize pages. See ["Creating Page Groups."](#)
- **Developer Comment**. Access the Developer Comments dialog. Developers can add comments to an application, a page, or a group of pages. See ["Adding Developer Comments."](#)

- **Issue.** Create a new issue in Team Development. See "[Creating an Issue.](#)"

Utilities



Features a graphic of a wrench. Utilities menu options include:

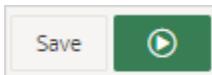
- **Delete Page.** Delete the current page. See "[Deleting Pages.](#)"
- **Advisor.** Access Oracle Application Express Advisor (Advisor). Use Advisor to check the integrity and quality of your Oracle Application Express application. See "[Running Advisor to Check Application Integrity.](#)"
- **Caching.** Links to the Caching page. Enabling caching is an effective way to improve the performance. See "[Utilizing Region Caching in Page Designer.](#)"
- **History.** Displays a report of changes to the current page.
- **Checksum.** View the page checksum. You can also access the page checksum from the Application Utilities page. See "[Viewing the Page Checksum](#)" and "[Using Application Utilities.](#)"
- **Export.** Export the current page. See "[Exporting an Application and Application Components.](#)"
- **Show.** Includes the following options:
 - **Tooltips.** Disable and enable tooltips within the UI.
 - **Component View.** Disable or enable the Component View tab in the central pane of Page Designer. See "[Component View Tab.](#)"
 - **Layout View.** Disable or enable the Layout tab in the central pane of Page Designer. See "[Layout Tab.](#)"
- **Layout.** Controls the number of panes that display in Page Designer. See "[Switching Between Three Pane and Two Pane Mode.](#)"

Shared Components



Links to the Shared Components page. Shared components can display or be applied on any page within an application. See "[Managing Shared Components.](#)"

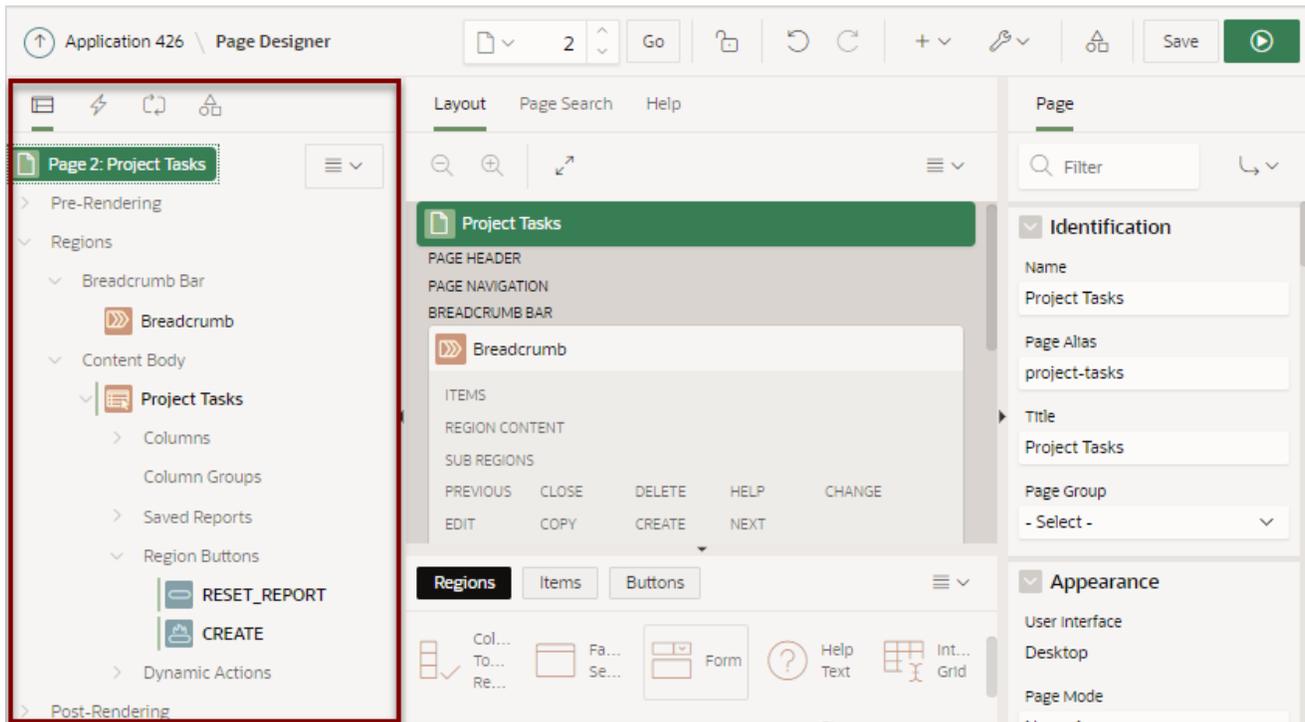
Save and Save and Run Page



Click **Save** to save the current page. Click **Save and Run Page** to save and then run the current page. See "[Running a Page from Page Designer.](#)"

7.2.2 Left Pane of Page Designer

The left pane in Page Designer includes four tabs: **Rendering**, **Dynamic Actions**, **Processing**, and **Page Shared Components**. Each tab displays a list of the corresponding component types and components created on the current page.



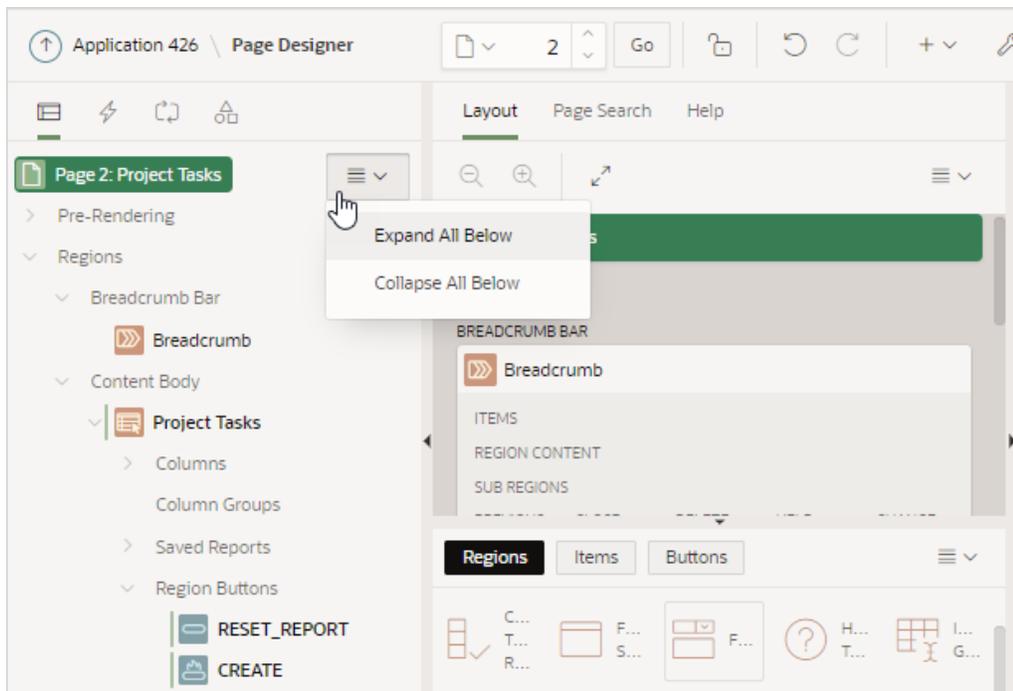
Key features of the Left pane include:

- **Context menus.** Right-click a component or control to display a context menu.
- **Quick Access to the Property Editor.** Select a component or multiple components to display the corresponding attributes in the Property Editor in the right pane.
- **Drag and Drop.** Drag components up and down within the tree to change the position or sequence of the selected component.
- **Tooltips.** Position the mouse over a component or control to view a tooltip of basic information, such as the region type, item type, and so on.

Rendering Tab

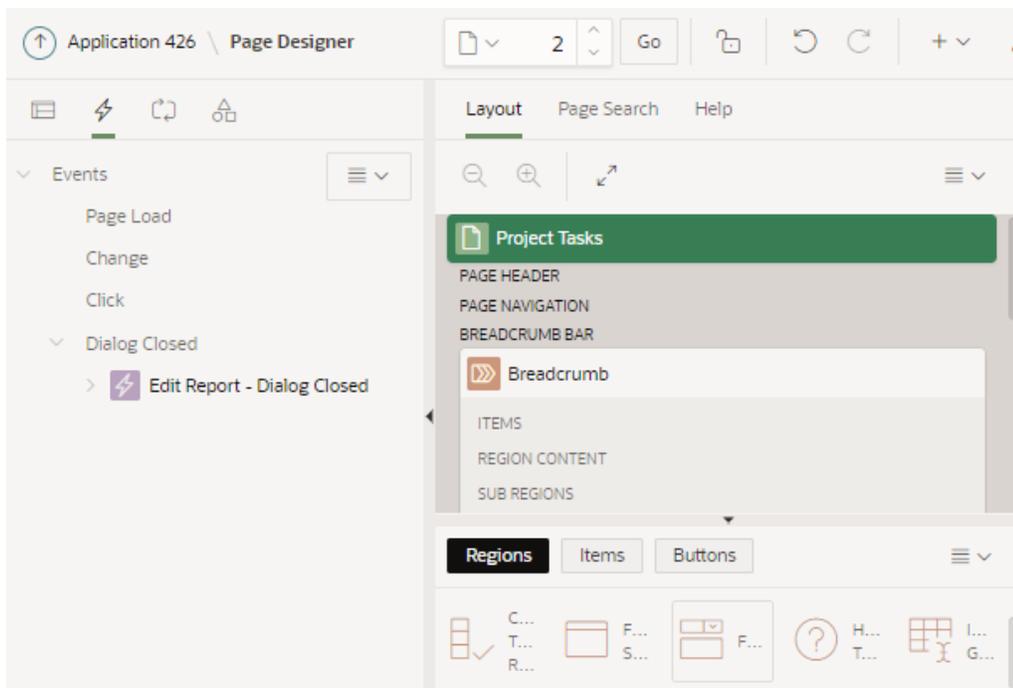
The Rendering tab displays regions, page items, page button, page components, and application logic. The Rendering tab groups and orders components based on how Oracle Application Express processes them.

You can alter the display by selecting **Expand All Below** and **Collapse All Below** from the Rendering Menu.



Dynamic Actions Tab

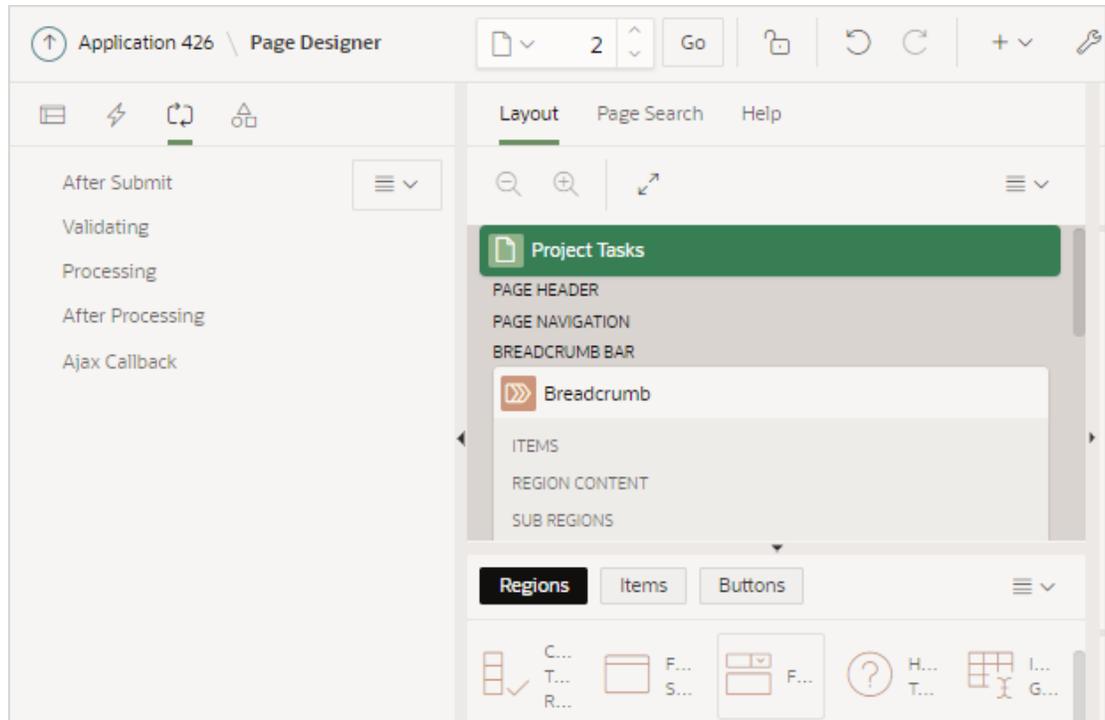
The Dynamic Actions tab displays dynamic actions defined on the current page. By creating a dynamic action, you can define complex client-side behavior declaratively without the need for JavaScript.



 **See Also:**
["Managing Dynamic Actions"](#)

Processing Tab

The Processing tab displays application logic defined on the page and groups and orders components based on how Oracle Application Express processes them.

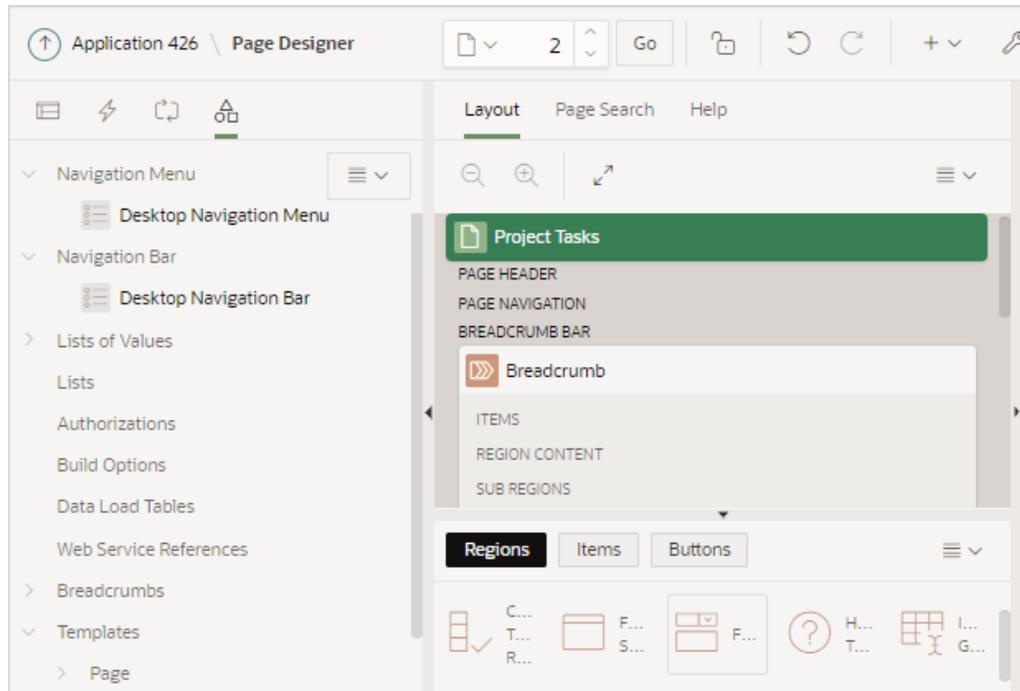


You can alter the display by selecting **Expand All Below** and **Collapse All Below** from the Rendering Menu.

 **See Also:**
["Managing Computations, Validations, and Processes"](#)

Page Shared Components Tab

The Page Shared Components tab displays shared components associated with this page.



See Also:

["Managing Shared Components"](#)

7.2.3 Central Pane of Page Designer

The top of the central pane contains the **Layout**, **Component View** (not displayed by default), **Page Search**, and **Help** tabs. The lower part of the central pane contains the Gallery.

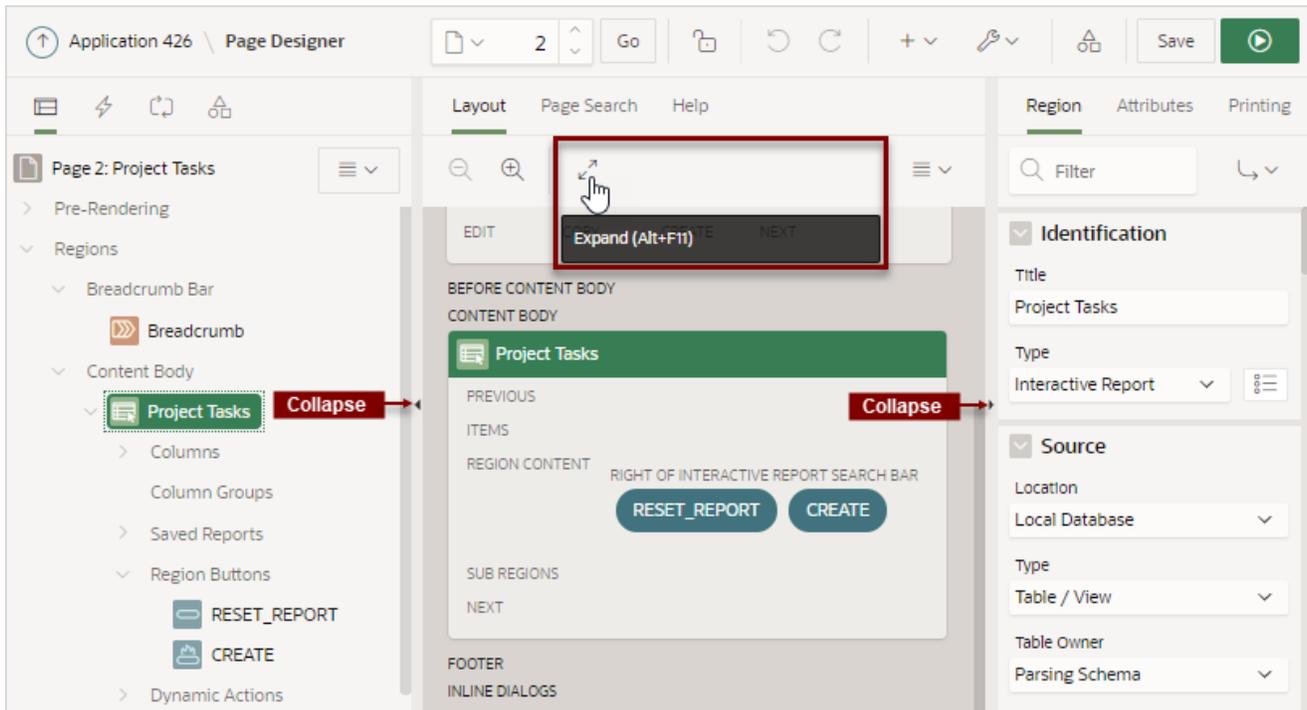
- [Layout Tab](#)
- [Component View Tab](#)
- [Page Search Tab](#)
- [Help Tab](#)
- [Gallery](#)

7.2.3.1 Layout Tab

The Layout tab displays in the central pane of Page Designer and is a visual representation of how the components are positioned on the page. The Layout tab features context menus. By selecting a component and right-clicking, you can delete, move, or copy the component to other regions, or new regions on the page. You can also move existing regions, items, and buttons relative to other components by simply clicking on the component and dragging it to the new location. For example, you can place items next to one another by dragging the second item to the end of the first item and dropping it in the dark yellow box that appears when you hover in the desired

location. You can quickly add new components to an existing page by dragging the component from the Gallery up to the desired position within the Layout tab.

You can adjust the size of each pane by selecting and dragging the horizontal and vertical splitters. To expand or collapse each pane, click the small triangle labeled **Collapse** in the center of each splitter. Alternatively, you can click the **Expand** button to make the Layout tab larger and then **Restore** to return it to the previous size.



Tip:

Hidden items do not display in the Layout tab, but do display in the Rendering tree.

Key features of the Layout tab include:

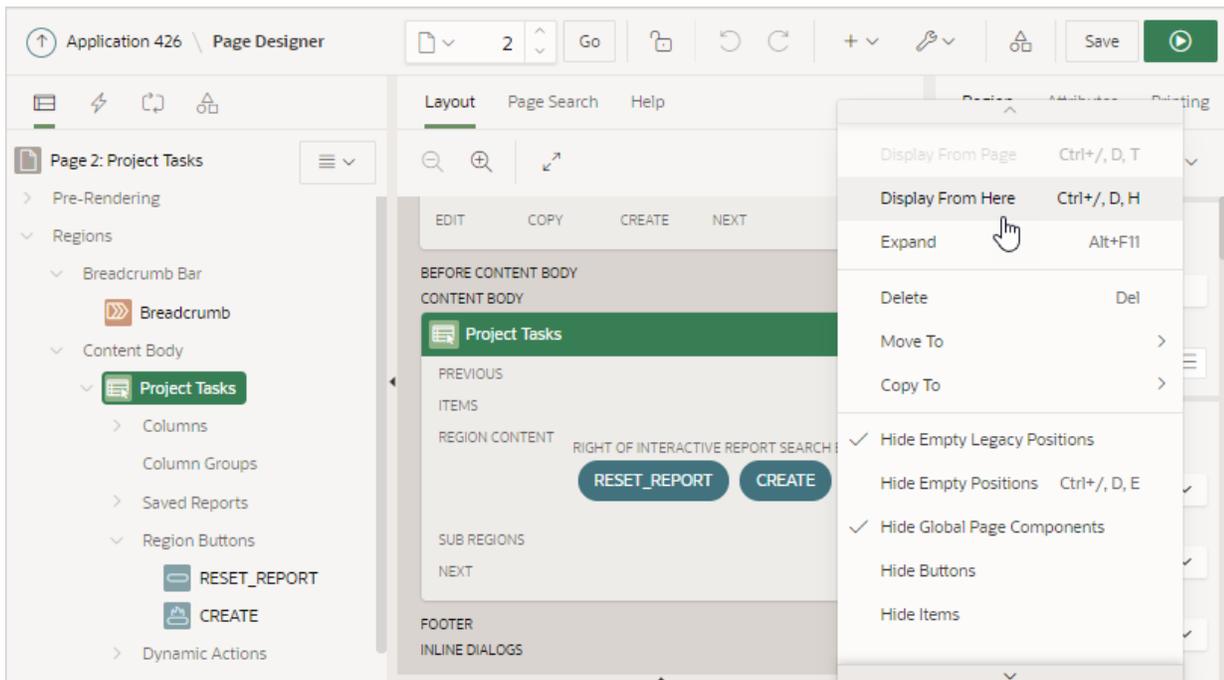
- **Context menus.** Right-click a component or control to display a context menu.
- **Quick Access to the Property Editor.** Select a component or multiple components to display the corresponding attributes in the Property Editor in the right pane.
- **Drag and Drop .** Move, copy, and reorder regions, items, and buttons by dragging and dropping. You can also add new regions, items, and button by dragging them from the Gallery and dropping them to the desired position on the page.
- **Tooltips.** Position the mouse over a component or control to view a tooltip of basic information, such as the region type, item type, and so on.

Tip:

When dragging components to a new position, such as dragging an item onto the same line as an exiting item, you need to drag the component into the desired position and wait until the grid changes and the new drop position displays. See "[Adding a Region, Item, or Button by Dragging and Dropping](#)".

Layout Menu

The Layout menu displays on the right side of the pane. Use this menu to customize the type and amount of information that displays and to delete, move, and copy selected components. To have a specific region fill the the Layout tab, select the region and select **Display from Here** from the Layout menu. The selected region fills the Layout tab. To restore the view, select **Display from Page**.



See Also:

"[Adding a Region, Item, or Button by Dragging and Dropping](#)"

7.2.3.2 Component View Tab

Tip:

The Component View tab was added in Oracle Application Express release 5.1 to assist developers with the transition from Legacy Component View to Page Designer. Legacy Component View was desupported in release 18.1.

The Component View tab does not display by default. To display it, click **Utilities** menu on the Page Developer toolbar and select **Show, Component View**.

When enabled, the Component View displays in the central pane of Page Designer and presents user interface elements and application logic by component type. The Component View tab consists of following sections:

- **Page Rendering.** Page rendering is the process of generating a page from the database. Use the Page Rendering section to modify controls that impact the rendering of a page, including page attributes, regions, buttons, items, page rendering computations, and page processes.
- **Page Processing.** Page processing is the process of submitting a page. A page is typically submitted when a user clicks a button. Use the Page Processing section to specify application logic such as computations, validations, processes, and branches. In general, the Application Express engine runs this logic in the order it appears on the page.

You can adjust the size of the Component View tab using the window splitters. Alternatively, you can click the **Expand** button in the upper left corner to maximize the window and then click **Restore** to return it to the previous size.

To edit a component, click the component name and the Property Editor highlights the corresponding attribute in the right pane. Unlike the Layout tab, the Component View tab does not offer a visual representation of a page or support the dragging and dropping of page components. To preview the position of components on a page, click **Layout** or run the page.

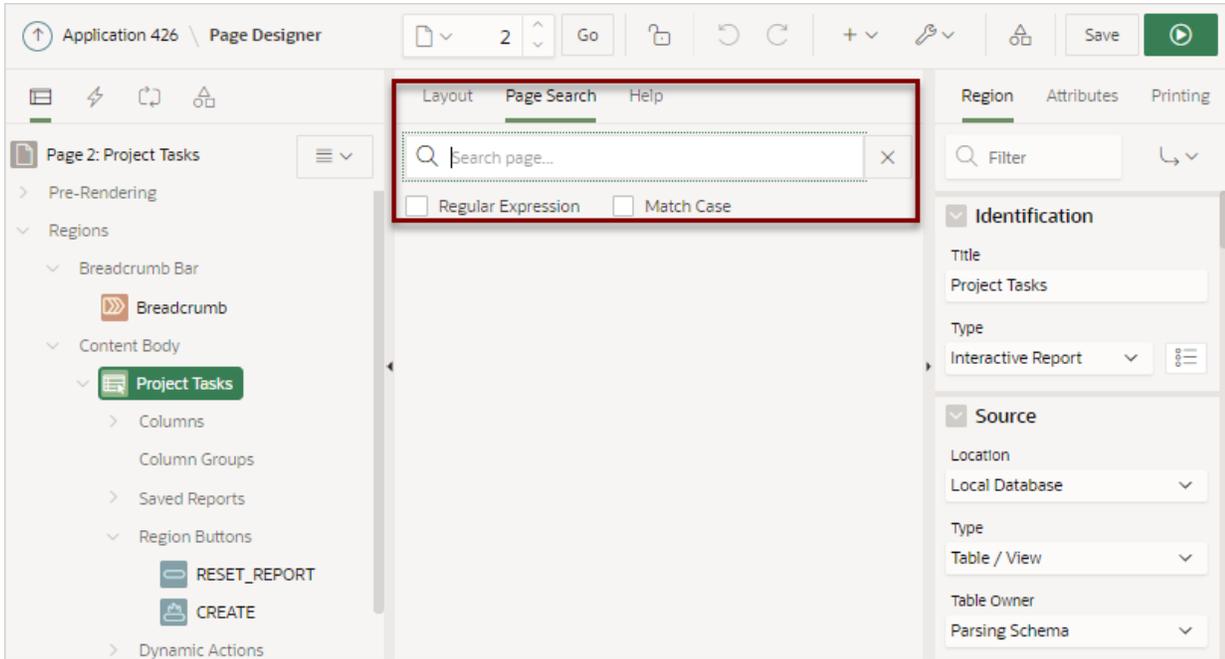
To add a new control, component, or process, click the **Create** icon to the right of the section name.

See Also:

["Adding a Region, Item, or Button from the Component View Tab"](#)

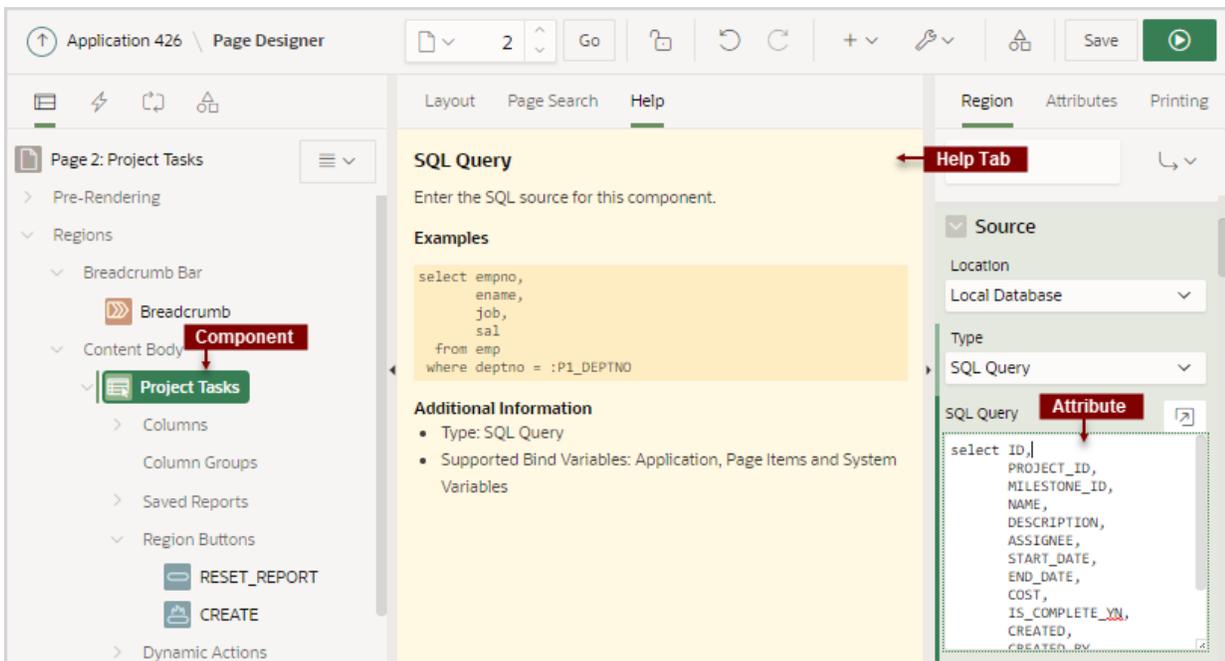
7.2.3.3 Page Search Tab

The Page Search tab displays to the right of Layout in the central pane. Use Page Search to search all page metadata including regions, items, buttons, dynamic actions, columns, and so on. To search a page, enter a search terms in the field provided. To match the case, select **Match Case**. To search for a regular expression, select **Regular Expression**.



7.2.3.4 Help Tab

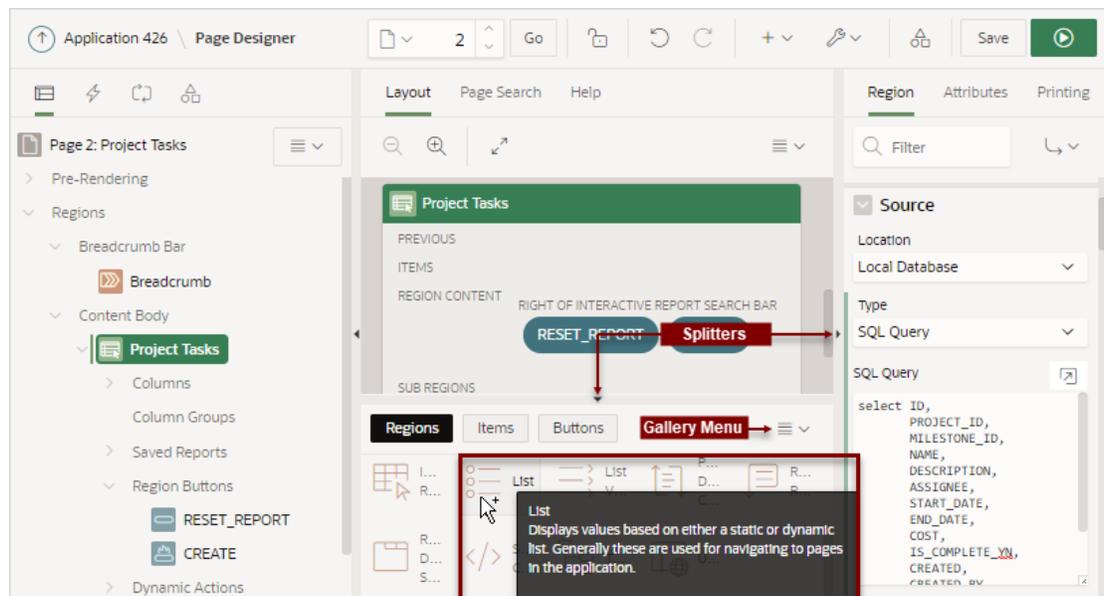
Page Designer includes Help for every Property Editor attribute. To view Help, select the attribute and click the **Help** tab. Once you activate the Help pane, the content that displays changes every time you select another attribute. In this example, the **Source**, **Type** attribute is selected and the Help tab describes what the attribute is for and the available options.



 **See Also:**
"Viewing Help in Page Designer"

7.2.3.5 Gallery

The Gallery displays beneath the Layout tab in the central pane of Page Designer. The Gallery contains three tabs: Regions, Items, and Buttons. When you pass the cursor over a control or component, a tooltip displays that describes it. You can adjust the size of the pane by dragging the horizontal and vertical splitters. To collapse or restore the Gallery pane, click the small triangle in the center of each splitter.



You can add new controls and components to a page by selecting the control or component from the Gallery and dragging and dropping them into the Layout tab. Alternatively, you can select a control or component in the Gallery and right-click to view a context menu.

 **See Also:**
"Adding a Region, Item, or Button by Dragging and Dropping" and "About Adding Components Using Gallery Context Menus"

Gallery Menu

The Gallery menu displays on the right side of the Gallery pane. By default, the Gallery only displays supported controls and components. To view unsupported controls and components (such as legacy application components), enable **Show Unsupported Components** on the Gallery menu. To view legacy controls and components, enable **Show Legacy Components** on the Gallery menu.

 **Note:**

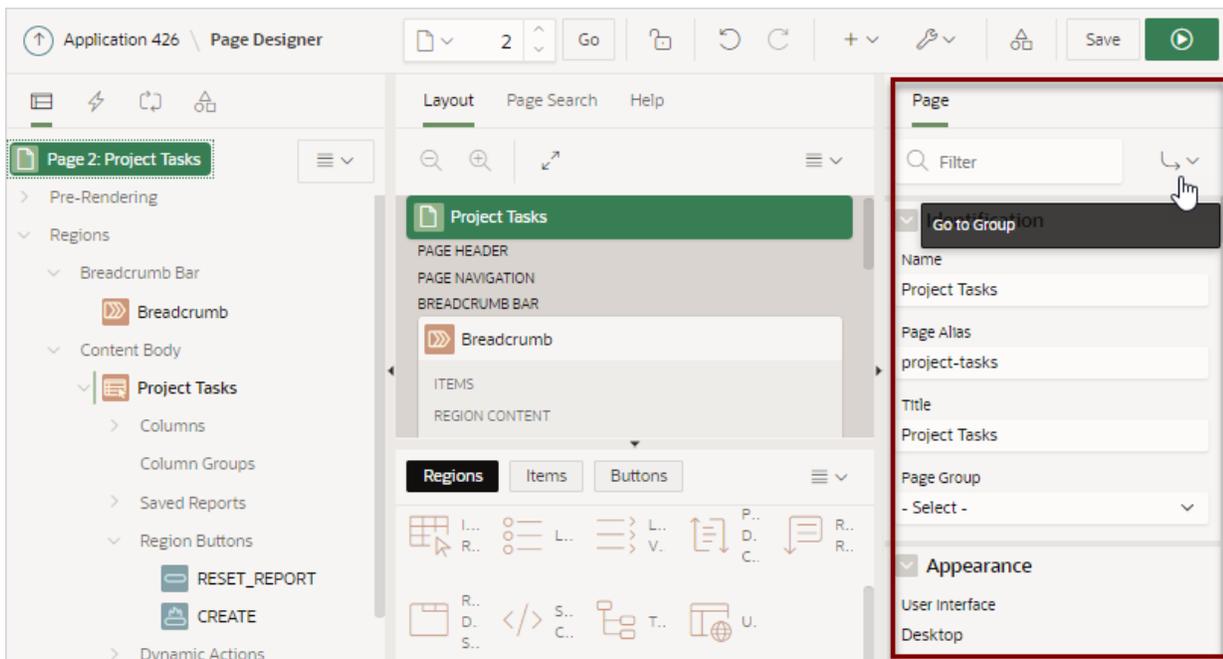
"Managing Application Legacy Components"

7.2.4 Right Pane of Page Designer (Property Editor)

The right pane in Page Designer contains the Property Editor. Use the Property Editor to edit the attributes of the currently selected component.

Property Editor

Property Editor displays all attributes for the currently selected component. When you select multiple components, the Property Editor only displays common attributes. Updating a common attribute updates that attribute for all of the selected components.

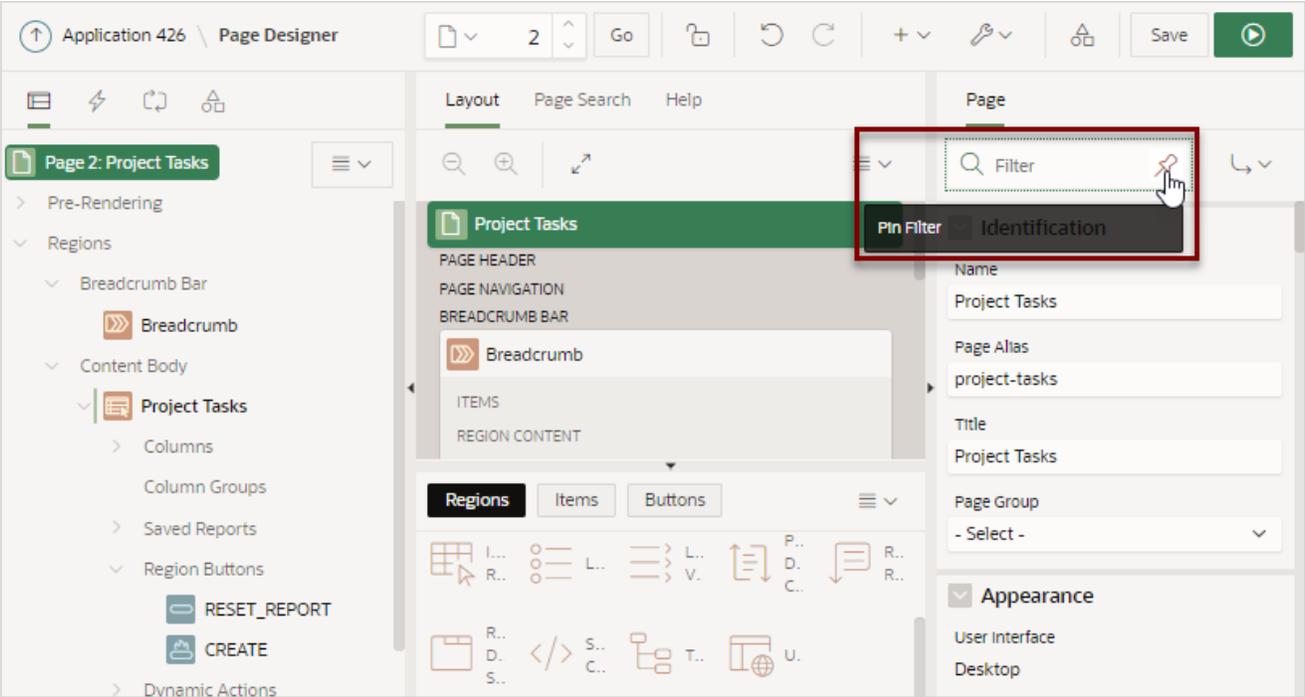


Property Editor organizes attributes into functional groups. To quickly access a group, click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.

Searching for Attributes

To search for a group or an attribute, enter a keyword in the Filter Properties field. The groups and attributes containing the keyword appear. To return to the default display, delete the keyword in the Filter Properties field.

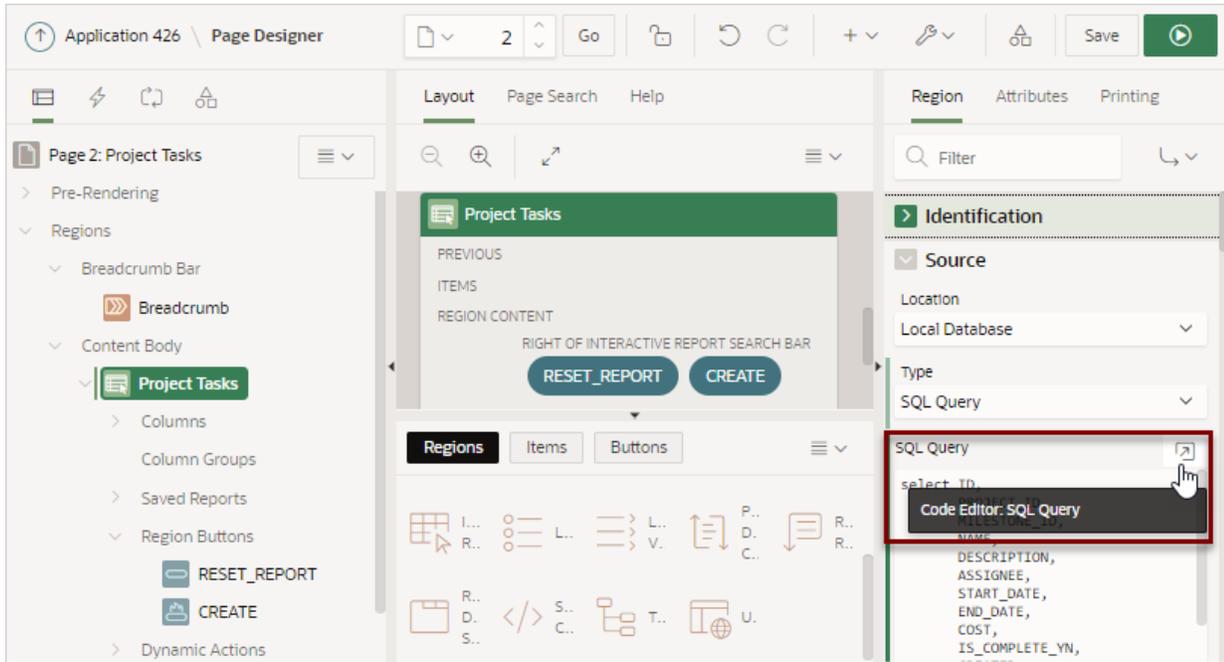
Click the **Pin Filter** button on the right side of the search field to search across different items, regions, and processes. You can “pin” keywords to have them persist as you click around Page Designer. To “unpin” the search, click the **Pin Filter** button again.



 **See Also:**
["Using Page Designer"](#) and ["Managing Page Attributes"](#)

7.2.5 Code Editor

For attributes requiring large amounts of code (for example, a region Source), you can enter text directly in to the field or access a full featured Code Editor.

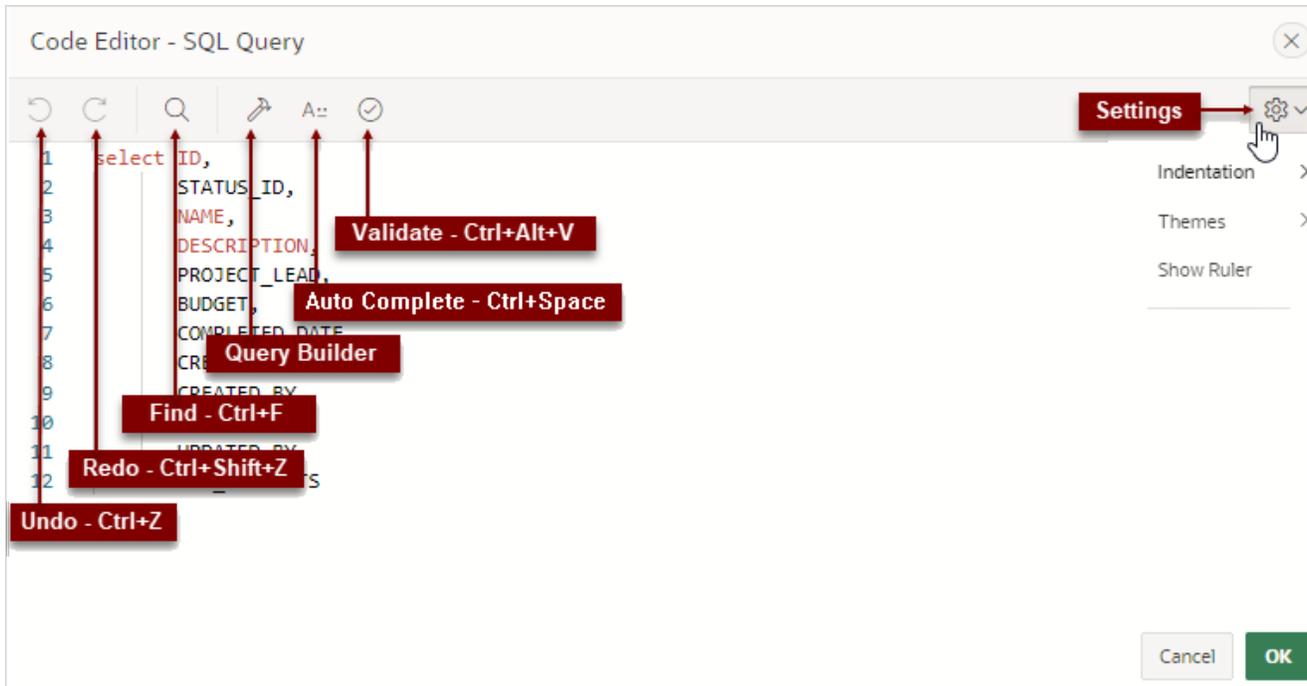


 **See Also:**
["Accessing Property Editor"](#)

You access Code Editor by clicking the **Code Editor** button which resembles an arrow within a square.

Code Editor Key Features

The Code Editor displays as a modal dialog and provides an enhanced code editor to edit PL/SQL, SQL, HTML, CSS, and JavaScript component properties. The code highlighting is determined by the input required for the specific property.



Code Editor controls include:

- Undo - Ctrl+Z
- Redo - Ctrl+Shift+Z
- Find - Ctrl+F
- Query Builder
- Auto Complete - Ctrl+Space
- Validate - Ctrl+Alt+V
- Context Menu - Right-click and select one of the following:
 - Change All Occurrences (Ctrl+F2) - Right click and select **Change All Occurrences** from the context menu.
 - Cut
 - Copy
 - Command Palette (F1) - Displays the Command Palette.

Command Palette

Right click to display a context menu and select **Command Palette**. The Command Palette includes over 80 commands including:

- Replace (Ctrl+H)
- Replace with Next Value (Ctrl+Shift+.)
- Replace with Previous Value (Ctrl+Shift+,)

Multi Cursor Selection

- Add cursors at arbitrary positions - Select a position with your mouse and press Shift+Alt+click (Shift+Option+click on macOS).
- Set cursors above the current position - Select a position with your mouse and press Ctrl+Alt+Up (Option+Command+Up on macOS).
- Set cursors below the current position - Select a position with your mouse and press Ctrl+Alt+Down (Option+Command+Down on macOS).

Settings Menu

The **Settings** menu displays on the right side and includes the following options:

- Indentation - Options include: Tab Inserts Spaces, Tab Size, and Indent Size
- Themes - Options include: Automatic, Light, Dark, and High Contrast Dark
- Show Ruler

7.3 Using Page Designer

Use Page Designer to view and edit database application pages.



Tip:

To view a list of keyboard shortcuts, click **Alt+Shift+F1**. Alternately, click the **Help** menu at the top of the page and select **Shortcuts**.

- [Viewing a Page in Page Designer](#)
- [Searching for Pages](#)
- [Dragging and Dropping Tabs Between Panes](#)
- [Switching Between Three Pane and Two Pane Mode](#)
- [Accessing Property Editor](#)
- [Adding a Region, Item, or Button by Dragging and Dropping](#)
- [About Adding Components Using Gallery Context Menus](#)
- [Adding a Region, Item, or Button from the Rendering Tab](#)
- [Adding a Region, Item, or Button from the Component View Tab](#)
- [Copying a Region, Item, or Button](#)
- [Creating Pre-Rendering Branches, Computations, and Processes](#)
- [Creating Page Submission Branches, Validations, Computations, and Processes](#)

**See Also:**

"Understanding Page Designer UI Elements" and "Viewing Help in Page Designer"

7.3.1 Viewing a Page in Page Designer

To view a page in Page Designer:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
3. Select an application.
4. Select a page.

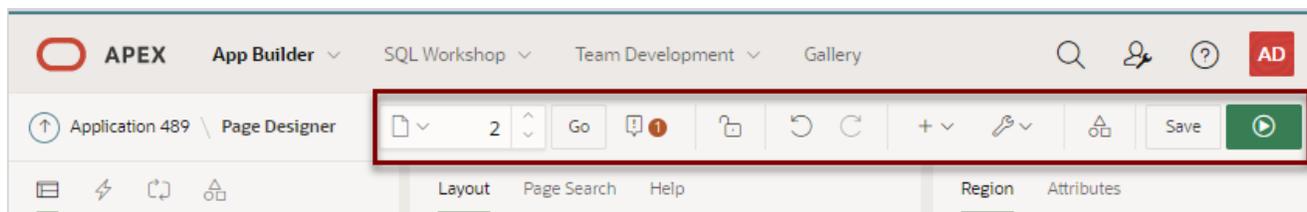
The default view, Page Designer appears.

You preview a page by running it. Running an application page displays the rendered version as end users would see it.

**See Also:**

"Running a Page from Page Designer"

7.3.2 Searching for Pages



The Page Selector is the first control in the Page Designer toolbar and displays the current page number. Use the Page Selector to search for pages within the current application.

To search for pages within an application:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. On the Page Designer toolbar, click the **Page Selector**.

The Page Finder appears.

3. Click the tabs at the top of the window to change the view:
 - **Current User Interface** - Displays pages in the current user interface.
 - **Current Group** - If the current page is associated with a group, this tab displays the pages associated with the current group.
 - **All Pages** - Displays all pages in the current application.
 - **Recently Edited** - Displays recently edited pages.
4. Enter search terms in the Search field and press **ENTER** or click **Go**.
Search for page numbers, page names, user interface, or group names. The search is not case sensitive and supports regular expressions.



See Also:

["Running a Page from Page Designer"](#) and ["Creating Page Groups"](#)

7.3.3 Dragging and Dropping Tabs Between Panes

By default, Page Designer displays three panes which contain one or more tabs. You can drag and drop tabs within a pane or between panes by selecting the pane heading (or icon) and then dragging and dropping it to a new location. To return to the default display, click **Utilities** on the Page Designer toolbar and select **Layout** and then **Reset Layout**.

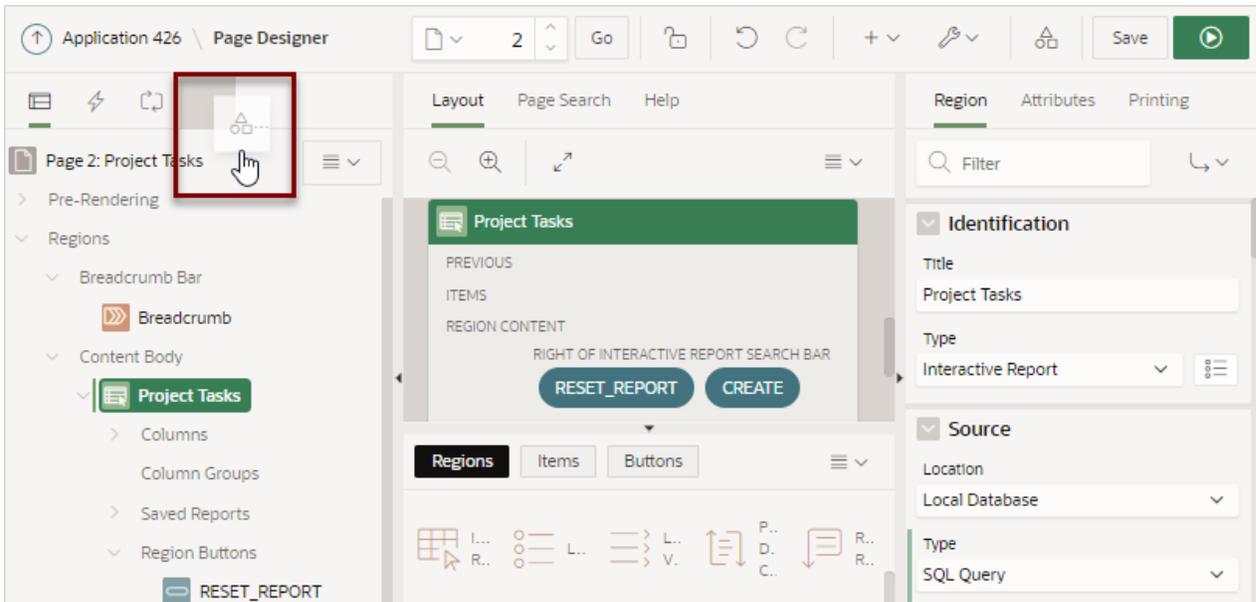
To drag and drop tabs in Page Designer:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. Select a tab heading (or icon) and then drag and drop it to a new location.

In the following example, the **Page Shared Components** tab is selected and being moved within the left pane.



3. To return to the default display:
 - a. On the Page Designer toolbar, click **Utilities**.
 - b. Select **Layout** and then **Reset Layout**.

See Also:

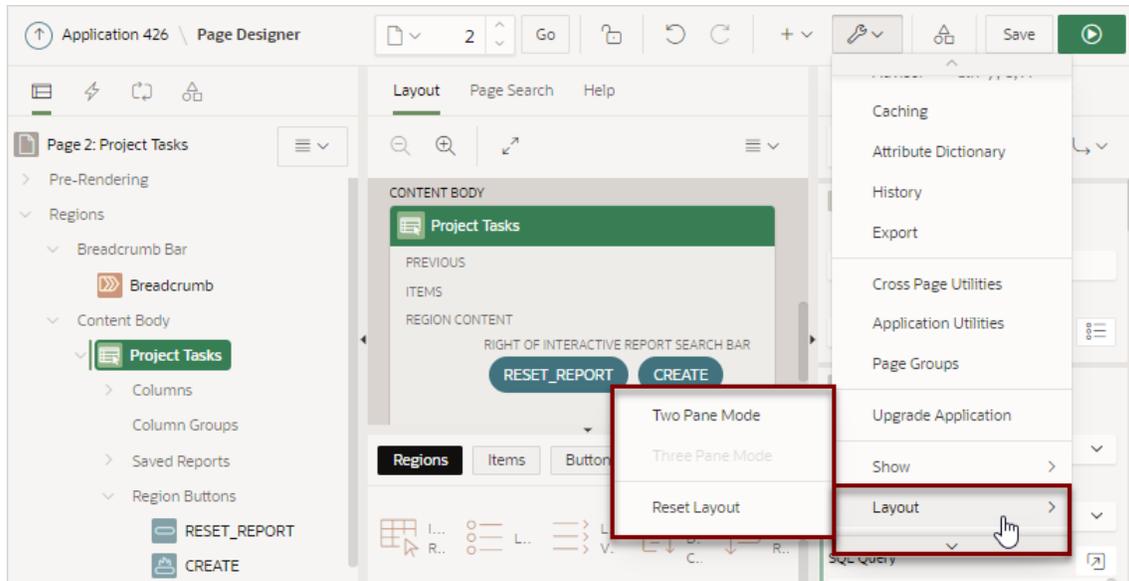
["Understanding Page Designer UI Elements"](#)

7.3.4 Switching Between Three Pane and Two Pane Mode

Use the Layout options on the Utilities menu on the Page Designer toolbar to switch between pane modes. **Three Pane Mode** (the default) displays the left pane, central pane, and the right pane. **Two Pane Mode** displays just the central pane and the right pane. A typical use case for accessing Two Pane Mode, is when you want to view just the Rendering tree and the Property Editor. To return to the default display, click **Utilities** on the Page Designer toolbar and then select **Layout** and then **Reset Layout**.

To hide and show Page Designer panes:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
 Page Designer appears.
2. To select a page mode:
 - a. On the Page Designer toolbar, click **Utilities** and then **Layout**.



The Layout menu has three options: **Two Pane Mode**, **Three Pane Mode**, and **Reset Layout**.

- b. From Layout, select one of the following:
 - **Two Pane Mode** - Displays just the central pane and the right pane.
 - **Three Pane Mode** (the default) - Displays the left pane, central pane, and the right pane.
3. To return to the default display:
 - a. On the Page Designer toolbar, click **Utilities**.
 - b. Select **Layout** and then **Reset Layout**.

7.3.5 Accessing Property Editor

The Property Editor displays in the right pane of Page Designer and displays all attributes for currently selected components.

To access Property Editor:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
 Page Designer appears.
2. In either the left pane or the Layout tab, select components or controls to edit. Passing the cursor over a control or component, displays a tooltip that describes it.

 **Tip:**

Once you select a component, press ALT+6 to navigate directly to the Property Editor. To learn more, see *Oracle Application Express Accessibility Guide*

The Property Editor displays attributes for the selected component or control. As you select different components in either the left pane or the Layout tab, the Property Editor automatically updates to reflect the selected component. When you select multiple components, the Property Editor only displays common attributes. Updating a common attribute updates that attribute for all of the selected components.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

 **See Also:**

["Right Pane of Page Designer \(Property Editor\)"](#)

7.3.6 Adding a Region, Item, or Button by Dragging and Dropping

Each application page can have buttons and fields (called items) which are grouped into containers called regions. You can add regions, items, and buttons to a page by dragging and dropping them from the Gallery.

To add a region, item, or button by dragging and dropping from the Gallery:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. If needed, select the Layout tab in the central pane.
3. In the Gallery at the bottom of the central pane, locate the component or control you want to create.

The Gallery lists all controls or components you can add to a page. Passing the cursor over a control or component displays a tooltip that describes it.

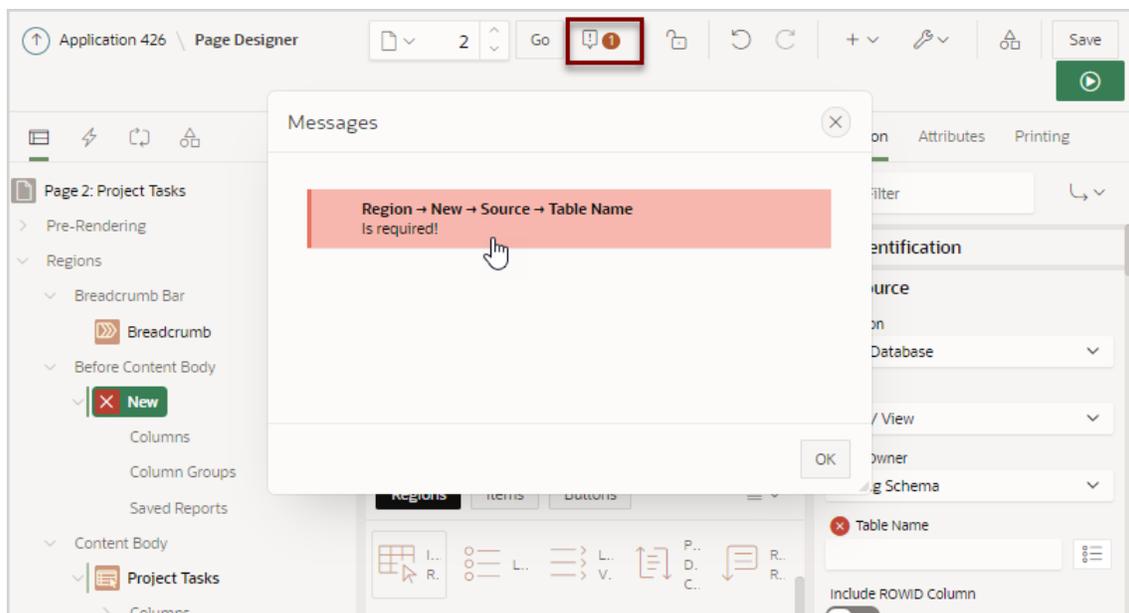
Tip:

In addition to dragging and dropping components from the Gallery, you can also right-click a component in the Gallery to view a context menu. Select **Add To** and then the location where you want to add the component.

4. Click and hold the mouse on the component to be created and drag it the desired location in the Layout tab.

When the mouse is over the appropriate location, the Layout tab displays as a darkened yellow tile. Release the mouse to drop the component. You can only drop components into appropriate drop positions, as determined by the component type.

5. Page Designer indicates what to do next. If there is an error, the Show Messages icon displays in the Page Developer toolbar.
 - a. Click the **Show Messages** icon on the Page Designer toolbar.
The Messages dialog displays errors that must be addressed.



- b. Select an error to highlight the associated attribute in the Property Editor.
6. Edit the appropriate attributes in the Property Editor.

Tip:

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

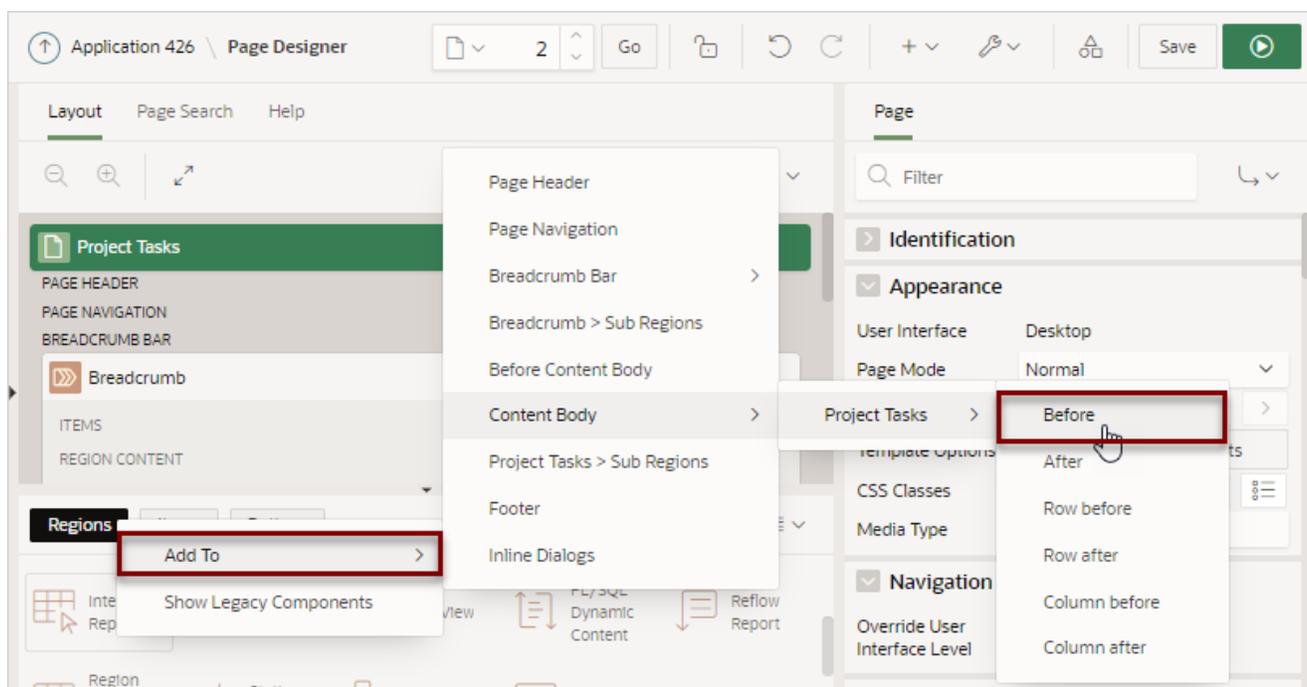
7. Click **Save** or **Save and Run Page**.

See Also:

- ["Running a Page from Page Designer"](#)
- ["About Adding Components Using Gallery Context Menus"](#)

7.3.7 About Adding Components Using Gallery Context Menus

In addition to dragging and dropping components from the Gallery, you can also right-click a component in the Gallery to view a context menu. Each context menu features an Add To option which displays the actual locations where you can add the component. In this example, the developer is adding a new report to before the Content Body region.

**See Also:**

- ["Adding a Region, Item, or Button by Dragging and Dropping"](#)

7.3.8 Adding a Region, Item, or Button from the Rendering Tab

To create new components within the Rendering tab:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.

- b. Select an application.
 - c. Select a page.
 2. In the left pane, select the **Rendering** tab.
 3. Locate and select the appropriate region, item, or region button.
 4. Right-click an existing component or container to display the context menu for that component type.
 5. Select a command (for example, Create Region, Create Sub Region, Create Page Item, Create Button and so on). The options available depend upon the node you select.
 6. Edit the appropriate attributes in the Property Editor.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

7. Click **Save** or **Save and Run Page**.

 **See Also:**

- ["Right Pane of Page Designer \(Property Editor\)"](#)
- ["Managing Regions "](#)
- ["Viewing Page-Level Items"](#)
- ["Creating a Button"](#)

7.3.9 Adding a Region, Item, or Button from the Component View Tab

 **Tip:**

The Component View tab was added in Oracle Application Express release 5.1 to assist developers with the transition from Legacy Component View to Page Designer. Legacy Component View was desupported in release 18.1.

To assist developers with the transition to Page Designer, Page Designer includes a Component View tab. Similar in appearance to Legacy Component View, the Page Designer Component View tab presents user interface elements and application logic by component type.

To create new components from the Component View tab:

1. View the page in Page Designer. See ["Viewing a Page in Page Designer."](#) Page Designer appears.

2. If not displayed, display the Component View tab:
 - a. Click **Utilities** menu on the Page Developer toolbar.
 - b. Select **Show, Component View**.

If a dialog appears asking to reload the page, click **Ok**.

3. In the central pane, select the **Component View** tab.
4. Under the appropriate component type, click the **Create** icon.

Page Designer identifies the new component as "New" in the left pane and in the central pane.

5. Edit the appropriate attributes in the Property Editor.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

6. Click **Save** or **Save and Run Page**.

 **See Also:**

- ["Component View Tab"](#)
- ["Right Pane of Page Designer \(Property Editor\)"](#)
- ["Managing Buttons"](#)
- ["Managing Regions ,"](#)
- ["Viewing Page-Level Items,"](#)

7.3.10 Copying a Region, Item, or Button

Each application page can have buttons and fields (called items) which are grouped into containers called regions. Developers can copy regions, items, and buttons by using context menus or pressing **CTRL** and dragging and dropping with the mouse.

Copying a Region, Item, or Button Using Context Menus

To copy a region, item, or button using context menus:

1. In the central pane, select the **Layout** tab.
2. Locate and select the appropriate region, item, or region button.
3. Right-click to display the context menu.
4. From the context menu, select **Copy To** and then select the location.
5. Edit the component attributes.

Copying a Region, Item, or Button by Dragging and Dropping

To copy a region, item, or button by dragging and dropping:

1. In the left pane, select the **Rendering** tab.
2. Locate and select the appropriate region, item, or region button.
3. Press **CTRL** and then use the mouse to drag and drop the component to the new location.

A copy of the component appears in the new location.

4. Edit the component attributes.

Copying a Region, Item, or Button to Another Page

To copy a region, item, or button to another page:

1. In the left pane, select the **Rendering** tab.
2. Locate and select the appropriate region, item, or region button.
3. Right-click the component, and select **Copy to other Page**.

The appropriate wizard appears.

4. Follow the on-screen instructions.

7.3.11 Creating Pre-Rendering Branches, Computations, and Processes

To create branches, computations, and processes that execute before rendering the page:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In the left pane, select the Rendering tab.
3. Expand the Pre-Rendering node at the top of the Rendering tab.
4. Determine the processing point. Right-click **Before Header**, **After Header**, or **Before Regions** to display the context menu for that processing point.
5. Select the appropriate option: **Create Branch**, **Create Computation**, or **Create Process**.
6. Edit the appropriate attributes in the Property Editor.

Tip:

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

7. Click **Save** or **Save and Run Page**.

 **Tip:**

If you have changed the default display to group components by component type, then you must navigate to the Processing tab to maintain pre-rendering components.

 **See Also:**

["Managing Computations, Validations, and Processes"](#)

7.3.12 Creating Page Submission Branches, Validations, Computations, and Processes

To create branches, validations, computations, and processes that execute when the page is submitted:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In the left pane, select the Processing tab.
3. Navigate to After Submit, Validating, Processing, or After Processing as appropriate within the processing tree.
4. Right-click the identifier or an existing component to display the context menu for that processing point.
5. Select **Create Branch**, **Create Validation**, **Create Computation**, or **Create Process**.
6. Edit the appropriate attributes in the Property Editor.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

7. Click **Save** or **Save and Run Page**.

**Tip:**

You can use context menus to duplicate, delete, and copy a component to other pages.

**See Also:**

"Managing Computations, Validations, and Processes"

7.4 Managing Page Attributes

Edit page attributes to control basic information and functionality for a given page, including the page name or title, header and footer text, navigation menus, inclusion of page-level JavaScript or CSS files, error handling, and the selected authorization scheme.

- [Editing Page Attributes](#)
Edit page attributes by viewing the page in Page Designer and selecting the the page name.
- [Incorporating JavaScript Using Page Designer](#)
Include JavaScript on a page by editing the page attributes in the JavaScript group.
- [Configuring Rejoin Sessions for a Page](#)
Configure the Rejoin Sessions attribute to determine whether URLs to this application page contain session IDs.
- [Configuring Dialog Attributes](#)
Configure Dialog attributes in Page Designer.
- [Configuring Pages to Warn Users of Unsaved Changes](#)
Enable the Warn on Unsaved Changes page attribute to warn users if they navigate away from a page containing unsaved changes.

**See Also:**

"Right Pane of Page Designer (Property Editor)"

7.4.1 Editing Page Attributes

Edit page attributes by viewing the page in Page Designer and selecting the the page name.

1. To edit page attributes:
1. View the page in Page Designer:

- a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
- Page Designer appears.
2. In either the Rendering tab or the Layout tab, select the page name.
 3. Edit the appropriate attributes in the Property Editor.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

4. To save your changes, click **Save** or **Save and Run Page**.

 **See Also:**

"[Right Pane of Page Designer \(Property Editor\)](#)" and "[Viewing Help](#)"

7.4.2 Incorporating JavaScript Using Page Designer

Include JavaScript on a page by editing the page attributes in the JavaScript group.

Including JavaScript on a page is a good approach for functions that are very specific to a page and a convenient way to test a function before you include it in a .js file.

1. To add JavaScript code to a page:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, select the page name.

The Property Editor displays the Page attributes.
 3. In the Property Editor, find the **JavaScript** group.
 4. Under JavaScript, edit following attributes:
 - a. **File URLs** - Enter JavaScript file URLs for code to be loaded on this page. Each URL has to be written into a new line. If you provide a minified version of your file you can use the substitution string `#MIN#` to include `.min` or `#MIN_DIRECTORY#` to include `dignified/` in your file URL for a regular page view and an empty string if the page is viewed in debug mode. You also have access to the substitution string `#APP_VERSION#` if you want to include the application's version in the file URL.
 - b. **Function and Global Variable Declaration** - Enter JavaScript code such as functions or global variable declarations referenced on this page. If the same

JavaScript is required on multiple pages, consider putting the code into an external JavaScript file to avoid duplication and to leverage browser caching of static files.

Code you enter here replaces the #PAGE_JAVASCRIPT# substitution string in the page template.

 **Tip:**

Do not to include opening or closing script tags. Just include the JavaScript code.

To reference a shortcut, use:

```
"SHORTCUTNAME"
```

- c. **Execute When Page Loads** - Enter JavaScript code to execute when the page loads. The code is executed after the JavaScript code generated by Oracle Application Express.

 **Tip:**

To learn more about an attribute and view examples, select the attribute and click the **Help** tab in the central pane.

For example, adding the following to the Function and Global Variable Declaration attribute would create a function called `test`, which you could then use from anywhere on the current page.

```
function test(){  
    alert('This is a test.');
```

5. Click **Save**.

7.4.3 Configuring Rejoin Sessions for a Page

Configure the Rejoin Sessions attribute to determine whether URLs to this application page contain session IDs.

The Rejoin Sessions attribute controls support for joining existing sessions (similar to deep linking).

 **Warning:**

Enabling rejoin sessions may expose your application to possible security breaches, as it can enable attackers to take over existing end user sessions. To learn more, see "[About Rejoin Sessions](#)."

To use Rejoin Sessions at the page-level, administrators must enable **Rejoin Sessions** at the instance-level. A more restrictive instance-level setting overrides application and page settings.

1. To configure Rejoin Sessions for a page:

1. View the page in Page Designer:

- a. On the Workspace home page, click the **App Builder** icon.
- b. Select an application.
- c. Select a page.

Page Designer appears.

2. In the Rendering tab, select the page name.

The Property Editor displays the Page attributes.

3. In the Property Editor, find the **Security** group.

4. Under Security, Rejoin Sessions, select an option:

- **Application Default** - Inherits the setting defined at application-level.
- **Disabled** - If the URL does not contain a session ID Application Express creates a new session.
- **Enabled for Public Sessions** - If the URL goes to a public page and does not contain a session ID, Application Express attempts to utilize the existing session cookie established for that application. Application Express only joins using the cookie when the session is not yet authenticated.

Enabled for Public Sessions requires that Embed In Frames be set to **Allow from same origin** or **Deny**. This is not tied to a condition about the URL payload, but also applies to session state protected URLs.

- **Enabled for All Sessions** - If the URL does not contain a session ID, Application Express attempts to utilize the existing session cookie established for that application, providing the following conditions are met:
 - Session State Protection is enabled for the application and the URL includes a valid checksum. For public bookmarks, the most restrictive item level protection must be either **Unrestricted** or **Checksum Required - Application Level**.
 - The URL does not contain payload (a request parameter, clear cache or data value pairs).

This setting also requires that Embed In Frames is set to Allow from same origin or to **Deny** for the application.

 **Tip:**

The option **Application Default** inherits the setting defined at application-level. See "[Browser Security](#)."

5. Click **Save**.

 **See Also:**

- ["About Rejoin Sessions"](#)
- ["Session Management"](#) to configure Rejoin Sessions at the application-level
- ["Configuring Rejoin Sessions for an Instance"](#) in *Oracle Application Express Administration Guide*

7.4.4 Configuring Dialog Attributes

Configure Dialog attributes in Page Designer.

 **Tip:**

Creating a dialog page is a multiple step process. To learn more, see ["Creating Dialog Pages."](#)

1. To configure Dialog attributes:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
Page Designer appears.
 2. In the Rendering tab, select the page name.
The Property Editor displays the Page attributes.
 3. In the Property Editor, find **Appearance** and verify that the Page Mode is set to either **Modal Dialog** or **Non-Modal Dialog**.
 4. Find **Dialog** and configure these attributes:
 - a. Width
 - b. Height
 - c. Maximum Width
 - d. Attributes
 - e. CSS Classes
 - f. Chained

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. To save your changes, click **Save** or **Save and Run Page**.



See Also:

["Creating Dialog Pages"](#) and ["Right Pane of Page Designer \(Property Editor\)"](#)

7.4.5 Configuring Pages to Warn Users of Unsaved Changes

Enable the Warn on Unsaved Changes page attribute to warn users if they navigate away from a page containing unsaved changes.

1. To enable the Warn on Unsaved Changes page attribute:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, select the page name.
The Property Editor displays the Page attributes.
 3. In the Property Editor, find the **Navigation** group.
 4. For **Warn on Unsaved Changes**, select **On** to warn users if they navigate away from a page that contains unsaved changes.
 5. Click **Save**.



Tip:

The **Warn on Unsaved Changes** attribute is implemented using the `apex.page.warnOnUnsavedChanges` API.



See Also:

- ["Configuring Button Attributes to Warn Users of Unsaved Changes"](#)
- ["Configuring Item Attributes to Warn Users of Unsaved Changes"](#)
- ["warnOnUnsavedChanges"](#) in *Oracle Application Express JavaScript API Reference*

7.5 Running a Page from Page Designer

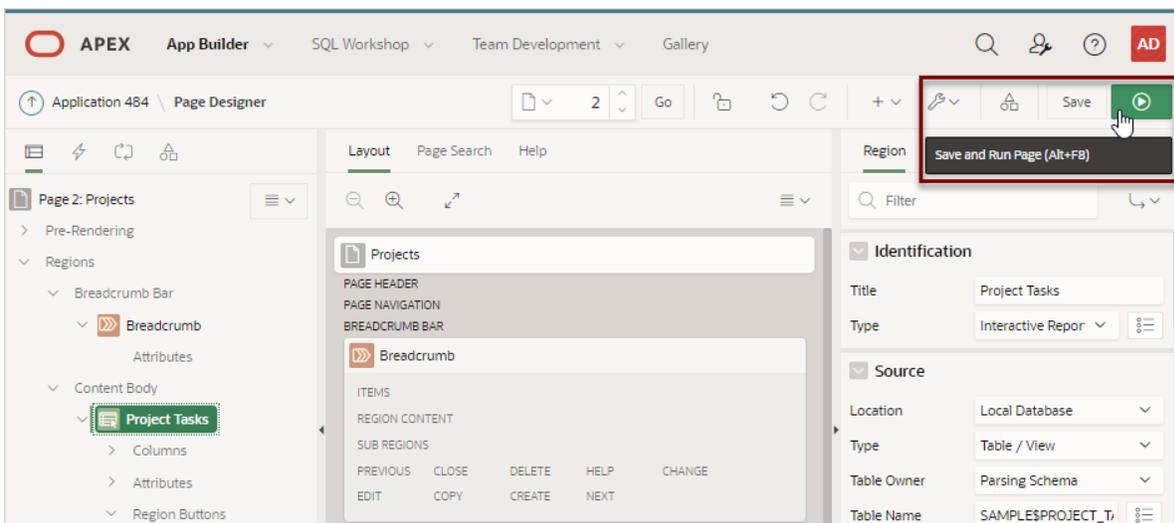
The Application Express engine dynamically renders and processes pages based on data stored in database tables. To view a rendered version of an application, you run or submit it to the Application Express engine.

 **Tip:**

You cannot run Modal and Non-Modal dialog pages directly using the Save and Run Page button. To view a Modal and Non-Modal dialog page, run the normal page that is responsible for opening the dialog page and access it from there.

To run a page in Page Designer:

1. View the page in Page Designer. See "[Viewing a Page in Page Designer.](#)"
You preview a page by running it. Running an application page displays the rendered version as end users would see it.
2. Click the **Save and Run Page** button in the upper right corner. The Save and Run Page button resembles a green right-facing arrow.



A rendered version of the application page appears.

 **See Also:**

"[Running an Application or Page](#)" and "[Runtime Developer Toolbar](#)"

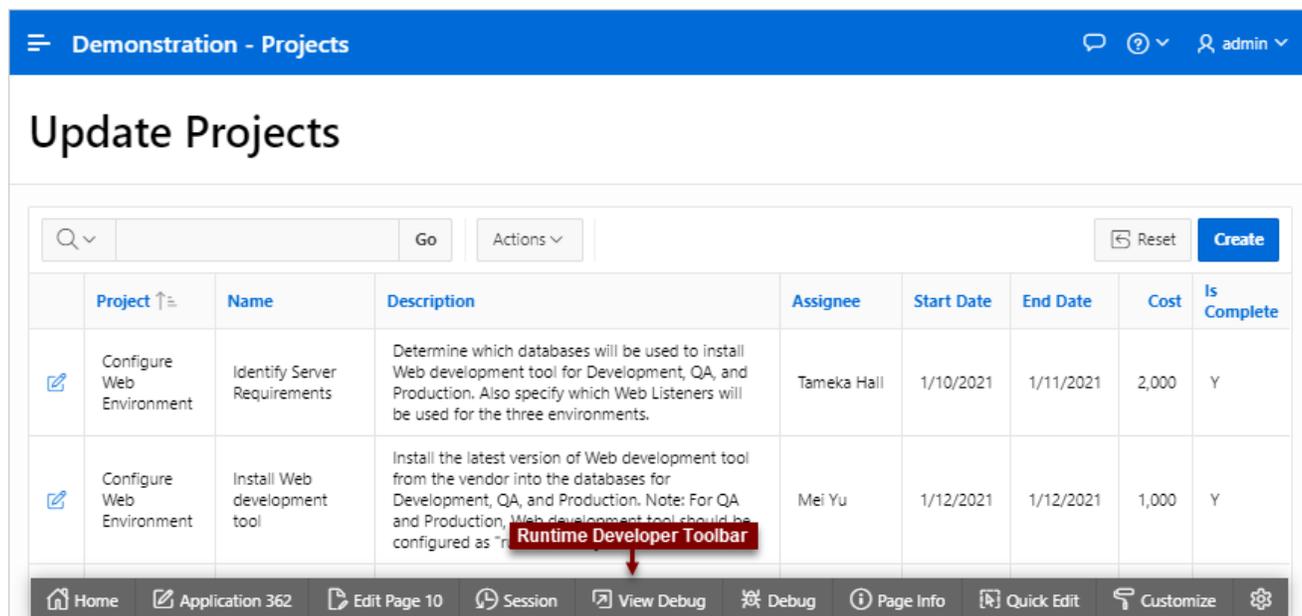
7.6 Runtime Developer Toolbar

Use the Runtime Developer toolbar to quickly edit the current application or currently running page, or view session state.

When you run an application from App Builder and view a page, the Runtime Developer toolbar displays at the bottom of any editable page.

Tip:

The Runtime Developer toolbar only displays if the Availability, Status attribute on the Application Definition page is set to **Available with Developer Toolbar**. See "[Editing the Application Definition](#)."



Project	Name	Description	Assignee	Start Date	End Date	Cost	Is Complete
Configure Web Environment	Identify Server Requirements	Determine which databases will be used to install Web development tool for Development, QA, and Production. Also specify which Web Listeners will be used for the three environments.	Tameka Hall	1/10/2021	1/11/2021	2,000	Y
Configure Web Environment	Install Web development tool	Install the latest version of Web development tool from the vendor into the databases for Development, QA, and Production. Note: For QA and Production, Web development tool should be configured as "Runtime Developer Toolbar"	Mei Yu	1/12/2021	1/12/2021	1,000	Y

Note:

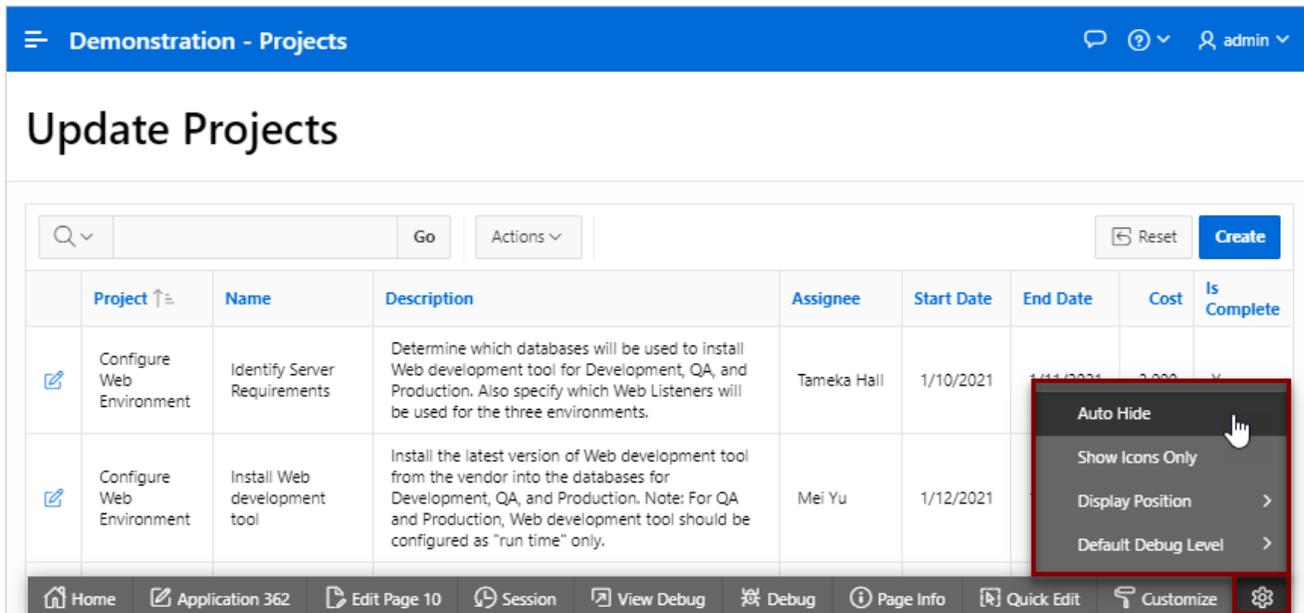
The Runtime Developer toolbar does not display on locked packaged applications pages or on desupported jQuery Mobile Smartphone pages.

The Runtime Developer toolbar contains of the following controls:

- **Home** links to the Workspace home page. See "[Understanding the Workspace Home Page](#)."
- **Application** links to the Application home page. See "[Understanding the App Builder Home Page](#)."
- **Edit Page** displays the currently running page ID. Click the page ID to view the page in Page Designer and then edit the page.

- **Session** links you to session state information for the current page. See "[Viewing Session State](#)."
- **View Debug** displays the Debug reports. See "[Viewing Session State](#)."
- **Debug** toggles the page between **Debug** and **No Debug** mode. See "[Utilizing Debug Mode](#)."
- **Page Info:**
 - **Show Layout Columns** toggles between **Show Layout Columns** and **Hide Layout Columns**. This option only applies if a layout is used and that layout supports showing layout columns and the page has more than one column.
 - **Show Page Timing** displays the Page Performance Timing dialog. Click **Copy** to copy the data in table form and then paste it into another application. Click **Clear** to remove the current timing events.
- **Quick Edit** enables developers to enter either Quick Edit mode or access Live Template Options.
 - **Access Quick Edit Mode** - Click **Quick Edit** and then select the desired component to instantly access the component in Page Designer. Press `ESCAPE` or click outside a component to exit quick edit mode.
 - **Edit Live Template Options** - Click **Quick Edit** and then move the mouse over the component for which you want to modify template options and click the Wrench icon in the upper right corner. See "[Using Quick Edit to Modify Live Template Options](#)."
- **Customize** - The Customize menu includes two options:
 - **Theme Roller** is a live CSS editor that enables you to quickly change the theme style, colors, rounded corners and other application attributes. This option only displays for themes supporting Theme Roller.
 - **Edit Logo** offers a quick way to change the logo users see at runtime.
See "[Using Theme Roller and Edit Logo](#)."
- **Developer Toolbar Options** displays on the far right and resembles a mechanical gear. Click **Developer Toolbar Options** to control how the Runtime Developer Toolbar displays.

About Developer Toolbar Options



Clicking **Developer Toolbar Options** displays a submenu containing the following controls:

- **Auto Hide** - Hides the toolbar, making more of the page visible.
- **Show Icons Only** - Removes the labels from the buttons to make the toolbar smaller.
- **Display Position** - Controls the placement of the Developer toolbar. Options include: **Top**, **Left**, **Bottom**, or **Right**.
- **Default Debug Level** - Specifies the level of detail included in the Debug log when you click **Debug**.
 - **Info (default)** - The debug log contains the default or normal amount of information. This corresponds with a log level of 4 and a Debug URL argument of `YES`.
 - **App Trace** - The debug log contains messages up to level 6. This corresponds with a Debug URL argument of `LEVEL6`.
 - **Full Trace** - The log will contain the maximum amount of information. This corresponds with a Debug URL argument of `LEVEL9`. **Full Trace** can slow request processing but provides the most amount of detail.

About JavaScript Error Detection

If a page has one or more JavaScript errors, a red error button displays on the left side of the Runtime Developer toolbar. If you have enabled **Auto Hide**, the Runtime Developer toolbar displays indicating the error.

Click the red error button to view an alert dialog which explains you should view the Browser console. The red error button persists until error has been resolved, the Browser console is cleared, and you refresh the page.

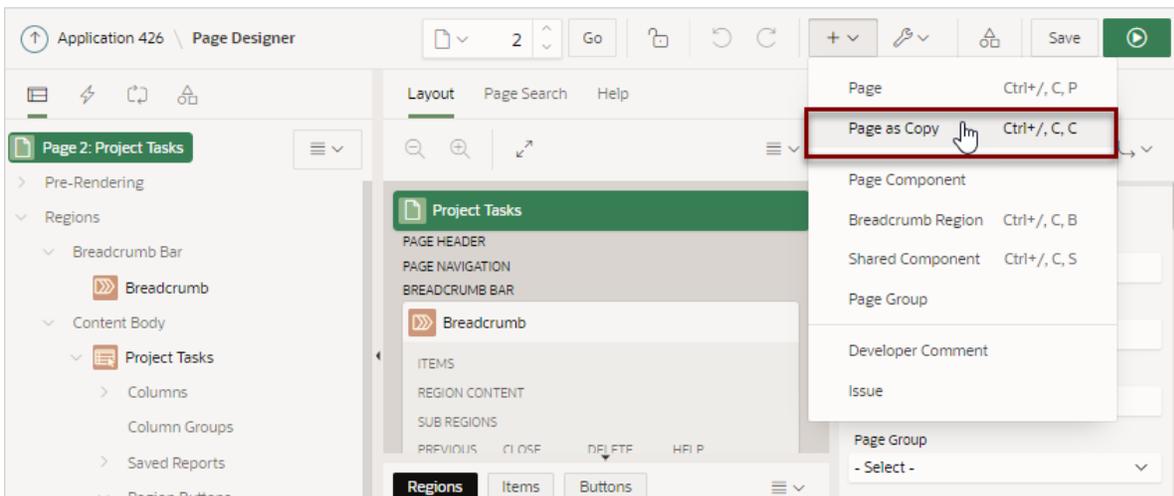
 **See Also:**
"Utilizing Debug Mode"

7.7 Copying a Database Application Page

You can copy a page from the current application or from another application. During the copy process, you can also copy shared components or change mappings to shared components in the target application.

To copy a page:

1. View the page you want to copy in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
 Page Designer appears.
2. On the Page Designer toolbar, click the **Create** menu and then select **Page as Copy**.



3. On Copy Page Option, select one of the following and click **Next**:
 - **Page in this application**
 - **Page in another application**
4. Follow the on-screen instructions.

7.8 Deleting Pages

Deleting a page deletes the corresponding tabs, breadcrumbs, and list entries.

- [Deleting a Page](#)

- [Deleting Multiple Pages](#)
- [Deleting a Range of Pages](#)



See Also:

["Locking and Unlocking a Page"](#)

7.8.1 Deleting a Page

To delete a page in Page Designer:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. Verify the page number.
3. On the Page Designer toolbar, select the **Utilities** menu and click **Delete Page**.
The Confirm Page Delete page appears.
4. Click **Permanently Delete Page**.



See Also:

["Page Designer Toolbar"](#)

7.8.2 Deleting Multiple Pages

To delete multiple pages:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click **Utilities**.
4. From Page Specific Utilities, click **Cross Page Utilities**.
5. Click **Delete Multiple Pages**.
6. Select the pages to be deleted and click **Delete Pages**.

7.8.3 Deleting a Range of Pages

To delete a range of pages:

1. On the Workspace home page, click the **App Builder** icon.

2. Select an application.
3. Click **Utilities**.
4. From Page Specific Utilities, click **Cross Page Utilities**.
5. Click **Delete Multiple Pages**.
6. Click the **Delete Pages by Range** tab.
7. Enter the pages to be deleted and click **Delete Pages**.

8

Developing Reports

In Oracle Application Express, a report is the formatted result of a SQL query. You can generate the SQL query by selecting a table or view in a wizard, or by defining the SQL query manually.



Tip:

To view examples, install the sample app, *Sample Reporting*. To learn more, see [Sample Apps](#).

- [Creating a Report Using the Create Application Wizard](#)
Run the Create Application Wizard to create a new application containing one or more pages. Supported report pages include cards, faceted search, interactive grid, interactive report, and classic report.
- [Creating a Report Using the Create Page Wizard](#)
Run the Create Page Wizard from an existing application to create a variety of different reports.
- [Creating a Report by Dragging and Dropping from the Gallery](#)
Create a report by dragging and dropping a report type from the Gallery.
- [Managing Cards](#)
A cards page features colorful blocks, which resemble index cards, laid out on a page.
- [Managing Faceted Search](#)
A faceted search page features a faceted search region on the left side of the page and report on the right side of the page.
- [Managing Interactive Grids](#)
An interactive grid presents users a set of data in a searchable and customizable report.
- [Managing Interactive Reports](#)
An interactive report is the formatted result of a SQL query. End users can customize the report layout and data displayed by selecting options on the Actions menu.
- [Managing Classic Reports](#)
A classic report is the formatted result of a SQL query.
- [Printing Report Regions](#)
Configure a report region to print by exporting it to several different formats.
- [Understanding BLOB Support in Forms and Reports](#)
Oracle Application Express includes declarative BLOB support to enable developers to declaratively upload files in forms, and download or display files in reports.

**See Also:**

["Developing Forms"](#) and ["Managing Database Application Components"](#)

8.1 Creating a Report Using the Create Application Wizard

Run the Create Application Wizard to create a new application containing one or more pages. Supported report pages include cards, faceted search, interactive grid, interactive report, and classic report.

- [Report Options When Running the Create Application Wizard](#)
Learn about supported report options available when running the Create Application Wizard.

8.1.1 Report Options When Running the Create Application Wizard

Learn about supported report options available when running the Create Application Wizard.

Available Reports When Creating Applications

The Create Application Wizard supports the following report types.

Table 8-1 Create Application Wizard - Available Reports

Report Type	Description
Cards	<p>A cards page consists of individual boxes, which resemble index cards, laid out on a page. Each card displays three pieces of information: Card Title, Description Column, and Additional Text Column. First, you select a table or view on which to build the page. Second, you select the Card Title, Description Column, and Additional Text Column.</p> <p>See Also:</p> <ul style="list-style-type: none"> • "Example Cards Page" • "Creating a Cards Page Using the Create Application Wizard"
Faceted Search	<p>Creates a faceted search region and report. First, you select a report type (Report or Cards). Second, you select the Table or View on which to build the faceted search region and report.</p> <p>If you select a Table, facets are auto discovered using APEX Data Dictionary Cache. If you select a View, facets are not auto-discovered. Developers can create the faceted report page based on a View, but the facets region will only contain a search field, which searches the VARCHAR2 columns.</p> <p>See Also:</p> <ul style="list-style-type: none"> • "Example Faceted Search" • "Creating Faceted Search Using the Create Application Wizard"

Table 8-1 (Cont.) Create Application Wizard - Available Reports

Report Type	Description
Interactive Grid	<p>An interactive grid presents users a set of data in a searchable, customizable report. Functionally, an interactive grid includes most customization capabilities available in interactive reports plus the ability to rearrange the report interactively using the mouse.</p> <p>First, you select a page source (that is, Table or View or SQL Query). Second, you determine if the interactive grid is editable by selecting Allow Editing or Read Only.</p> <p>If you select Allow Editing, users can add to, modify, and refresh the data set directly on the page. Functionally, an interactive grid includes most customization capabilities available in interactive reports plus the ability to rearrange the report interactively using the mouse or keyboard. You choose a table on which to build the interactive grid.</p> <p>See Also:</p> <ul style="list-style-type: none"> • "Example Interactive Grid" • "Creating an Interactive Grid Using the Create Application Wizard" • "Managing Interactive Grids"
Interactive Report	<p>Creates a page that contains the formatted result of a SQL query. First, you select a page source (that is, Table or View or SQL Query). Second, you select a report type, Interactive Report. To include a form page for creating or updating records, select Include Form.</p> <p>Select Include Form to include a form page for creating or updating records.</p> <p>If the report is based on table which has a foreign key constraints to another table, the developer can also define Lookup Columns. Use Lookup Columns to replace identifiers with a display column, such as showing the department name instead of the department number.</p> <p>See Also:</p> <ul style="list-style-type: none"> • "Example Interactive Report" • "Creating an Interactive Report Using the Create Application Wizard" • "Managing Interactive Reports"
Multiple Reports	<p>Creates multiple report pages containing an interactive report with form. For each page, you choose a table on which to build the interactive report with form. Click Edit to change the default options (such as providing a custom SQL Query), specifying another report type (such as, selecting Classic Report instead of Interactive Report).</p> <p>Select Include Form to include a form page for creating or updating records.</p> <p>See Also:</p> <ul style="list-style-type: none"> • "Example Classic Report" • "Managing Classic Reports"

Table 8-1 (Cont.) Create Application Wizard - Available Reports

Report Type	Description
Classic Report	<p>Creates a page that contains the formatted result of a SQL query. First, you select a page source (that is, Table or View or SQL Query). Second, you select the report type Classic Report. To include a form page for creating or updating records, select Include Form.</p> <p>If the report is based on table which has a foreign key constraints to another table, the developer can also define Lookup Columns. Use Lookup Columns to replace identifiers with a display column, such as showing the department name instead of the department number.</p> <p>See Also:</p> <ul style="list-style-type: none"> • "Example Classic Report" • "Creating a Classic Report Using the Create Application Wizard" • "Managing Classic Reports"

**See Also:**

["Creating an Interactive Report Using the Create Application Wizard"](#) and ["Available Page Types in the Create Application Wizard"](#)

8.2 Creating a Report Using the Create Page Wizard

Run the Create Page Wizard from an existing application to create a variety of different reports.

- [Report Options When Running the Create Page Wizard](#)
Learn about report options when running the Create Page Wizard.
- [Creating a Report on New Page](#)
Use the Create Page Wizard to create a wide variety of reports on a local database or on an external data source.

8.2.1 Report Options When Running the Create Page Wizard

Learn about report options when running the Create Page Wizard.

**Tip:**

Universal Theme - 42 is optimized to work equally well in either a mobile or desktop environment. In previous releases and in earlier themes, the Mobile user interface is based on jQuery Mobile. Oracle recommends migrating existing mobile applications to the Universal Theme as soon as possible.

Available Reports in the Create Page Wizard

The Create Page Wizard supports the following reports when running the Create Page Wizard with the Universal Theme.

Table 8-2 Create Page Wizard — Available Reports

Report Type	Description
Interactive Report	<p>Creates an interactive report based on the data source (local or external) you specify.</p> <p>An interactive report is a formatted result of a SQL query. Developers choose a table on which to build a report, or provide a custom SQL SELECT statement. Developers also select the columns to display in the report.</p> <p>If the report is based on table which has a foreign key constraints to another table, the developer can also define Lookup Columns. Use Lookup Columns to replace identifiers with a display column, such as showing the department name instead of the department number.</p> <p>End users can customize the report layout and data displayed by selecting options on the Actions menu.</p> <p>See Also: "Managing Interactive Reports"</p>
Interactive Grid	<p>Creates an interactive grid on the data source (local or external) you specify.</p> <p>An interactive grid is a formatted result of a SQL query. Developers choose a table on which to build the report, or provide a custom SQL query.</p> <p>End users can alter the report layout using Column menus and sort options, rearrange columns by dragging and dropping, and change how data displays using options on the Actions menu.</p> <p>Interactive grids can be editable or non-editable. In an editable interactive grid, end users can edit the underlying data, add rows, and delete rows. To create an editable interactive grid when running the Create Page Wizard, enable the Editing Enabled option.</p> <p>See Also:</p> <ul style="list-style-type: none">• "Managing Interactive Grids"• "Making an Existing Interactive Grid Editable"
Faceted Search	<p>Creates a faceted search region and report. First, you select a Data Source (Local Database, REST Enabled SQL Service, or REST Data Source).</p> <p>If you select a REST Enabled SQL Service or REST Data Source, facets are not auto-discovered. Developers can create the faceted report page, but the facets region will only contain a search field which searches the VARCHAR2 columns.</p> <p>Second, you select the Source Type on which to build the search region and report (Table or SQL Query).</p> <p>If you select a Table, facets are auto discovered using APEX Data Dictionary Cache. If you select a SQL Query, facets are not auto-discovered. Developers can create the faceted report page, but the facets region will only contain a search field which searches the VARCHAR2 columns.</p> <p>See Also:</p> <ul style="list-style-type: none">• "Example Faceted Search"• "Managing Faceted Search"

Table 8-2 (Cont.) Create Page Wizard — Available Reports

Report Type	Description
Classic Report	<p>Creates a classic report on the data source (local or external) you specify.</p> <p>Formatted result of a SQL query. Developers choose a table on which to build a report, or provide a custom SQL SELECT statement. Developers also select the columns to display in the report.</p> <p>If the report is based on table which has a foreign key constraints to another table, the developer can also define Lookup Columns. Use Lookup Columns to replace identifiers with a display column, such as showing the department name instead of the department number.</p> <p>With the exception of sorting and simple filtering, end users cannot customize a classic report.</p> <p>See Also: Managing Classic Reports</p>
Report with Form	<p>Creates a report and form based on the data source (local or external) you specify. For the report, you choose a report type (Interactive Report, Interactive Grid, or Classic Report).</p>
List View	<p>Optimized for mobile applications. Features a responsive design to display data and provide easy navigation on Smartphones.</p> <p>Creates a page that contains the formatted result of a SQL query based on the data source (local or external) you specify. List view regions can be based on table or a SQL query you provide. You choose a table on which to build the List view and select a database column to be used for the List view entry.</p>
Column Toggle Report	<p>Optimized for mobile applications. Creates a responsive report designed for mobile applications and Smartphones.</p> <p>Creates a page that contains the formatted result of a SQL query based on the data source (local or external) you specify. Column Toggle regions can be based on table or a SQL query you provide.</p> <p>By default, column toggle reports are created with all columns set to the same priority. However, the developer can edit the report column attributes and rank columns by importance. Columns with a lesser priority (larger number) are hidden at narrower screen widths. The report includes a Columns button which enables end users to select which columns they want to view.</p>
Reflow Report	<p>Optimized for mobile applications. Creates a responsive report designed for mobile applications and Smartphones.</p> <p>Creates a page that contains the formatted result of a SQL query based on the data source (local or external) you specify. Reflow Report regions can be based on table or a SQL query you provide.</p> <p>When there is not enough space available to display the report horizontally, the report responds by collapsing the table columns into a vertical value pairs layout where each column displays on a separate row.</p>

8.2.2 Creating a Report on New Page

Use the Create Page Wizard to create a wide variety of reports on a local database or on an external data source.

The component(s) described in this topic include built-in support for REST Enabled SQL and REST Data Sources which enables read and write access to remote data sources. In order to build a component on a remote data source, you must first create the application and configure the external data source.

 **Tip:**

To learn more about external data sources, see "[Managing REST Enabled SQL References](#)" and "[Managing REST Data Sources](#)."

1. To add a report on a new page by running the Create Page Wizard:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select the application.
 3. Click **Create Page**.
 4. For Create a Page:
 - a. Page Type - Select **Component** and then **Report**.

 **Tip:**

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- b. Select a report type. Options include:
 - **Interactive Report**
 - **Interactive Grid**
 - **Faceted Search**
 - **Cards**
 - **Classic Report**
 - **Report with Form**
 - **List View** (Optimized for mobile apps)
 - **Column Toggle Report** (Optimized for mobile apps)
 - **Reflow Report** (Optimized for mobile apps)

 **Tip:**

To learn more about each report type, see "[Report Options When Running the Create Page Wizard](#)."

- c. Click **Next**.
5. What displays next changes based on your selection. Follow the on-screen instruction. To learn more about an attribute, see field-level Help.

 **Tip:**

When prompted to select a Data Source, select **Local Database**, **REST Enabled SQL** or **REST Data Source**.

6. To view the report, click **Save and Run Page**.
The rendered page appears.

 **Tip:**

You can also run the Create Page Wizard in Page Designer by clicking the **Create** menu and selecting **Page**.

8.3 Creating a Report by Dragging and Dropping from the Gallery

Create a report by dragging and dropping a report type from the Gallery.

 **Tip:**

When you drag and drop a report region from the Gallery, you must provide the underlying SQL query.

To add a report by dragging and dropping from the Gallery:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
Page Designer appears.
2. In the Gallery at the bottom of the central pane, locate the report type you want to create.

The Gallery lists all controls or components you can add to a page. Passing the cursor over a control or component displays a tooltip that describes it.

Tip:

In addition to dragging and dropping components from the Gallery, you can also right-click a component in the Gallery to view a context menu. Select **Add To** and then the location where you want to add the component.

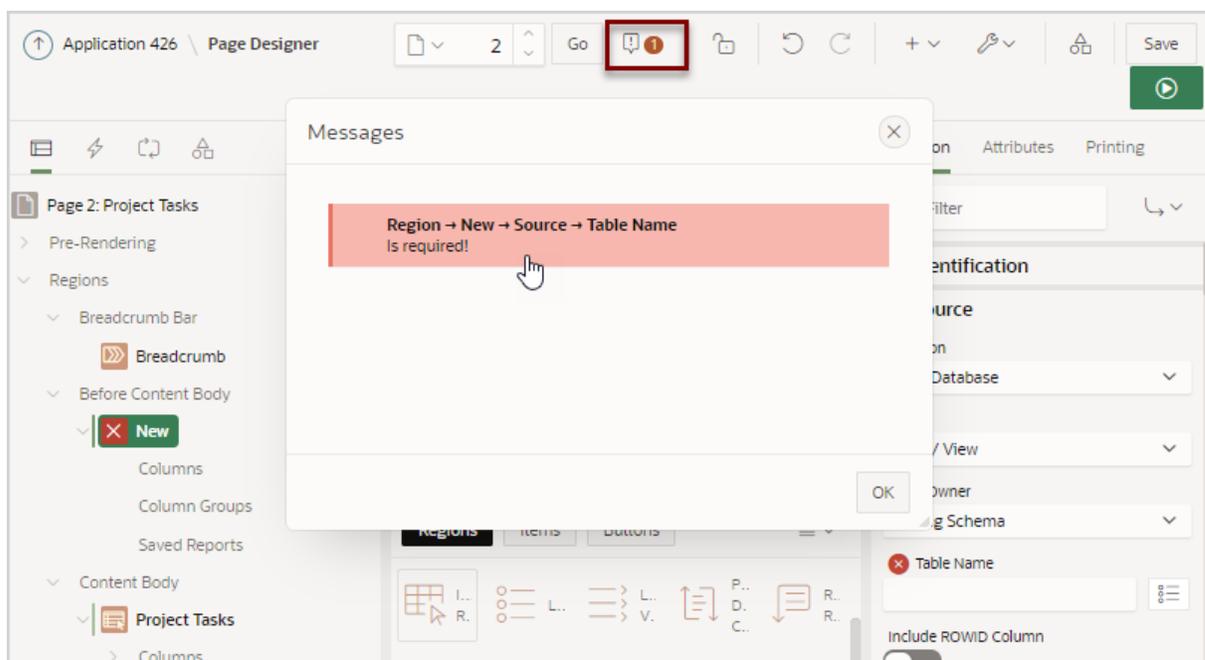
3. Click and hold the mouse on the component to be created and drag it the desired location in the Layout tab.

When the mouse is over the appropriate location, the Layout tab displays as a darkened yellow tile. Release the mouse to drop the component. You can only drop components into appropriate drop positions, as determined by the component type.

4. Page Designer indicates what to do next. If there is an error, the Show Messages icon displays in the Page Developer toolbar.

- a. Click the **Show Messages** icon on the Page Designer toolbar.

The Messages dialog displays errors that must be addressed.



- b. Select an error to highlight the associated attribute in the Property Editor.

5. Edit the appropriate attributes in the Property Editor.

Tip:

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

6. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.4 Managing Cards

A cards page features colorful blocks, which resemble index cards, laid out on a page.

A cards report region declaratively supports customizations of layout and appearance and the inclusion of icons, badges, media, and actions. Use cards to embed and share media sourced from BLOB column, URL or video in iFrame.

- [Example Cards Page](#)
View an example cards page.
- [Creating a Cards Page Using the Create Application Wizard](#)
Run the Create Application Wizard to create a new application that contains a cards page.
- [Creating a Cards Page Using the Create Page Wizard](#)
Run the Create Page Wizard to add a new cards page to an existing application.
- [Editing Cards Region Attributes](#)
Edit region attributes to alter the SQL source, change the region layout and appearance, or create region conditions.
- [Editing Card Attributes](#)
Edit card specific attributes by clicking the Attributes tab in the Property Editor.
- [Using Actions to Link from a Cards Page](#)
Create actions to link from a cards page.

8.4.1 Example Cards Page

View an example cards page.

A cards page consists of colorful blocks, which resemble index cards, laid out on a page. Each card can display a variety of information pulled from columns in the underlying table. Both the Create Application Wizard and Create Page Wizard support the creation of cards pages. First, you select a table or view or provide a SQL query on which to build the page. Then, you specify the general page layout, for example, Grid, Float, or Horizontal (Row). Finally, you specify the Title Column, Body Column, and optionally Icon Initials Column.

The following is an example of a cards page built on the `EBA_PROJECTS` table.

The screenshot shows a 'Demo Projects' interface with a grid of four project cards. Each card contains the following information:

- Configure Web Environment** (Title) by Lucille Beatie (Subtitle) with icon 'CW'. Description: Determine the hardware and software required to develop with Web development tool.
- Train Developers** (Title) by Lucille Beatie (Subtitle) with icon 'TD'. Description: Insure all developers who will be developing with the new tool get the appropriate training.
- Migrate Legacy Applications** (Title) by Miyazaki Yokohama (Subtitle) with icon 'ML'. Description: Move the data and redevelop the applications currently running on top of legacy servers.
- Develop Partner Portal POC** (Title) by Bernard Jackman (Subtitle) with icon 'DP'. Description: Develop a proof of concept that partners can use to work more collaboratively with us.

In this card example, each card displays the following attributes:

- **Title** - Maps to the `NAME` column.
- **Subtitle** - Maps to the `PROJECT_LEAD` column.
- **Body** - Maps to the `DESCRIPTION` column.
- **Icon and Badge** - Maps to the `NAME` column.



Tip:

To view an example, install the sample app, *Sample Reporting*. To learn more, see [Sample Apps](#).



See Also:

["Editing Card Attributes"](#)

8.4.2 Creating a Cards Page Using the Create Application Wizard

Run the Create Application Wizard to create a new application that contains a cards page.

A cards page consists of individual boxes, which resemble index cards, laid out on a page. Each card displays three pieces of information.

1. To create an application that contains a cards page:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Click the **Create** button.
 3. Click **New Application**.
 4. For Name, enter the name used to identify the application to developers.

5. For Appearance, accept the default Theme Style and menu layout (Vita, Side Menu), or change it by clicking the **Set Appearance** icon adjacent to the Appearance field.
6. Under Pages:
 - a. Click **Add Page**.
 - b. Select **Cards**.
7. On Add Card Page:
 - a. Page Name - Enter a name for this page.
 - b. Set Icon - Select an icon to display in the navigation menu for this page.
 - c. Table or View - Select a table or view on which to build the page.
 - d. Select a layout. Options include: **Grid**, **Float**, or **Horizontal (Row)**
 - e. Select the information to display on each card. Options include:
 - Title Column
 - Body Column
 - Icon Initials Column
 - Badge Column

The Title Column and Body Column are pre-selected from the Data Dictionary Cache. Developers can change these defaults.
 - f. Advanced - Expand **Advanced** to configure these options:
 - Set as Home Page - Enable this to make this page the home page for the application.
 - Set as Administration Page - Enable this to have this page display under Administration.
 - Page Help - Enter text to be displayed when the user selects Page Help.
 - g. Click **Add Page**.
8. Features - Select features to include with the application. Features provide application-level functionality and can only be added once per application. To learn more, click the Help icon adjacent to **Features**.
9. Settings - Specify settings used to generate this application. To learn more about an attribute, click the Help icon adjacent to **Settings**.
10. Click **Create Application**.

 **See Also:**

"Accessing the Data Dictionary Cache Report from Workspace Administration" or "Accessing the Data Dictionary Cache Report from Administration Services" in *Oracle Application Express Administration Guide*

8.4.3 Creating a Cards Page Using the Create Page Wizard

Run the Create Page Wizard to add a new cards page to an existing application.

1. To create a cards page by running the Create Page Wizard:
1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.
3. Click **Create Page**.
4. For Create a Page:
 - a. Page Type - Select **Component** and then **Report**.

 **Tip:**

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- b. Select **Cards**.
5. On Create Cards:
 - a. Page Number - If you enter a new page number, the wizard creates a new page. If you enter an existing page number, the wizard adds the component to that page.
 - b. Page Name - Specify a name for the page.
 - c. Page Mode - Identify the page mode. Options include Normal and Modal Dialog.
 - d. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page. If you elect to include breadcrumb navigation, additional attributes appear.
 - e. Click **Next**.
6. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
7. For Data Source, select a Data Source for the page:
 - **Local Database** - Data is sourced from the local database.
 - **REST Enabled SQL Service** - Data is sourced from a remote database, where the connection is defined using REST Enabled SQL. To create or maintain REST Enabled SQL references, navigate to **Shared Components, REST Enabled SQL**.
 - **REST Data Source** - Data is sourced from a RESTful web service defined using REST Data Sources. To create or maintain REST Data Sources, navigate to **Shared Components, REST Data Sources**.

 **Tip:**

The steps that follow differ depending upon the selected Data Source. This task assumes the Data Source is **Local Database**.

8. For Source Type, specify the source of the new page:
 - a. Select a Source Type. Options include:

- **Table:**
 - Table / View Owner - Select the owner of the table on which you are building the faceted search page.
 - Table/View Name - Select the table or view on which the page will be based.
 - **SQL Query:**
 - Enter a SQL SELECT statement - Enter the SQL query. To see an example, expand the **SQL Query Example** region.
 - b. Click **Next**.
9. On Card Attributes:
- a. Select a layout. Options include: **Grid**, **Float**, or **Horizontal (Row)**
 - b. Select the information to display on each card. Options include:
 - Title Column
 - Body Column
 - Icon Initials Column
 - Badge Column
- If Local Data Source selected, the Title Column and Body Column are pre-selected from the Data Dictionary Cache. Developers can change these defaults.
10. Click **Create**.

 **Tip:**

To learn more about external data sources, see "[Managing REST Enabled SQL References](#)" and "[Managing REST Data Sources](#)."

 **See Also:**

"Accessing the Data Dictionary Cache Report from Workspace Administration" or "Accessing the Data Dictionary Cache Report from Administration Services" in *Oracle Application Express Administration Guide*

8.4.4 Editing Cards Region Attributes

Edit region attributes to alter the SQL source, change the region layout and appearance, or create region conditions.

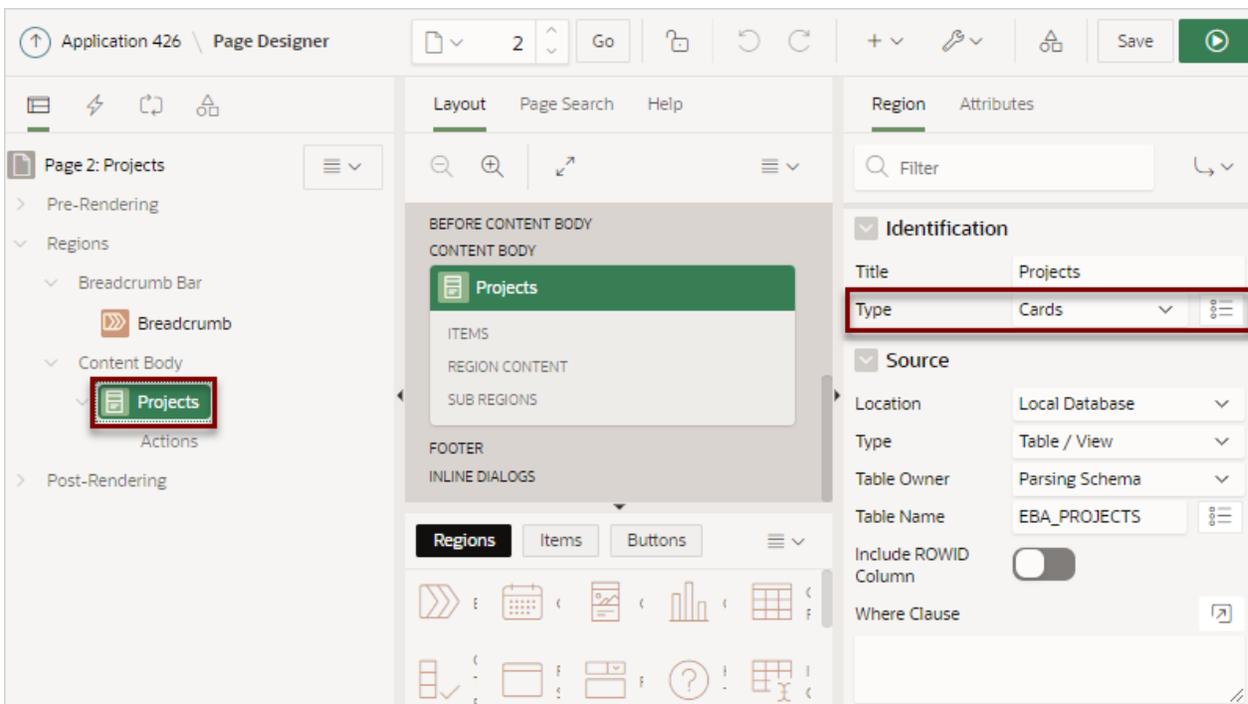
1. To edit a region attributes:
1. View the cards page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.

- b. Select an application.
- c. Select a page.

Page Designer appears.

2. In the Rendering tab under Content Body, locate and select the cards region (for example, **Projects**).

In the Property Editor, the **Region** tab displays the attributes. Attributes are organized in groups.



In the previous example, note that the **Type** attribute indicates that **Projects** is a **Cards** region.

3. Edit the appropriate attributes.

Tip:

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

4. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
 - **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
5. Click **Save** or **Save and Run Page**.

8.4.5 Editing Card Attributes

Edit card specific attributes by clicking the Attributes tab in the Property Editor.

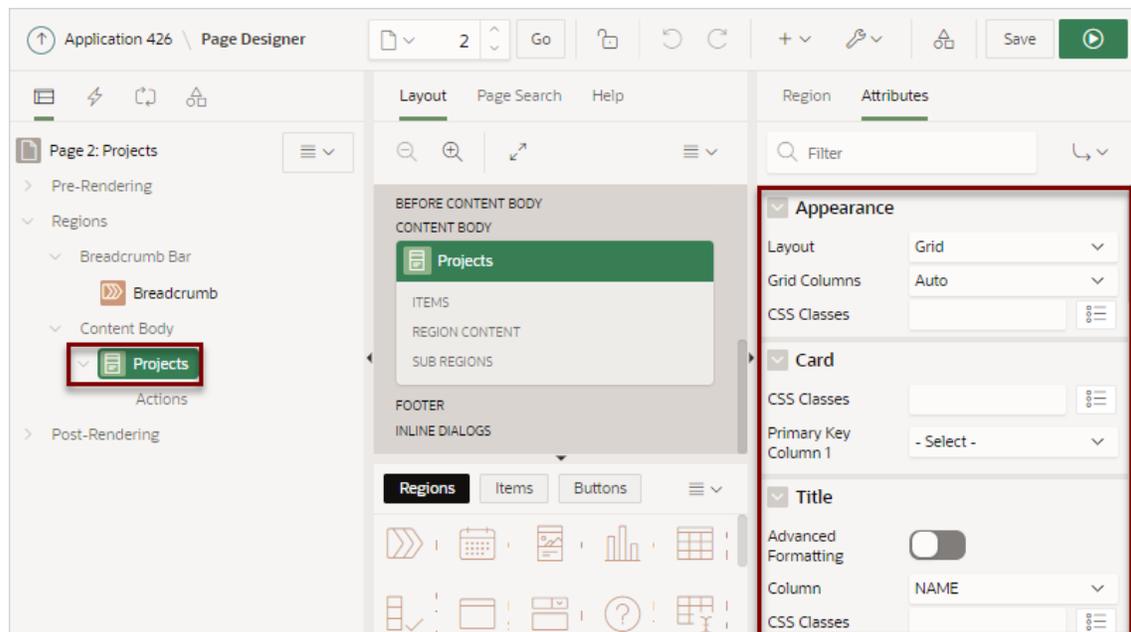
Customize a cards page by editing the following attribute groups: **Appearance**, **Title**, **Subtitle**, **Body**, **Secondary Body**, **Icon and Badage**, or **Media**.

1. To edit a cards Attributes:
 1. View the cards page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, select the Cards region.
 3. In the Property Editor, select the **Attributes** tab.

The Property Editor displays the attributes. Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

4. Select the cards region:
 - a. In the Rendering tab under Content Body, locate and select the cards region (for example, **Projects**).
 - b. In the Property Editor, select the **Attributes** tab.

In the Property Editor, the **Attributes** tab displays the card page attributes. Attributes are organized in groups.



5. Edit the appropriate attributes.

Title, **Subtitle**, **Body**, **Secondary Body**, and **Media** include an **Advanced Formatting** option which enables support for HTML expressions and supported substitution strings. All free form text attributes, such as CSS Classes, Icon or Image Description, or Badge Label, support column substitutions through standard substitution string syntax (for example, `&ENAME.` or `&DNAME.`).

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

6. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
 - **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
7. Click **Save** or **Save and Run Page**.

**See Also:**

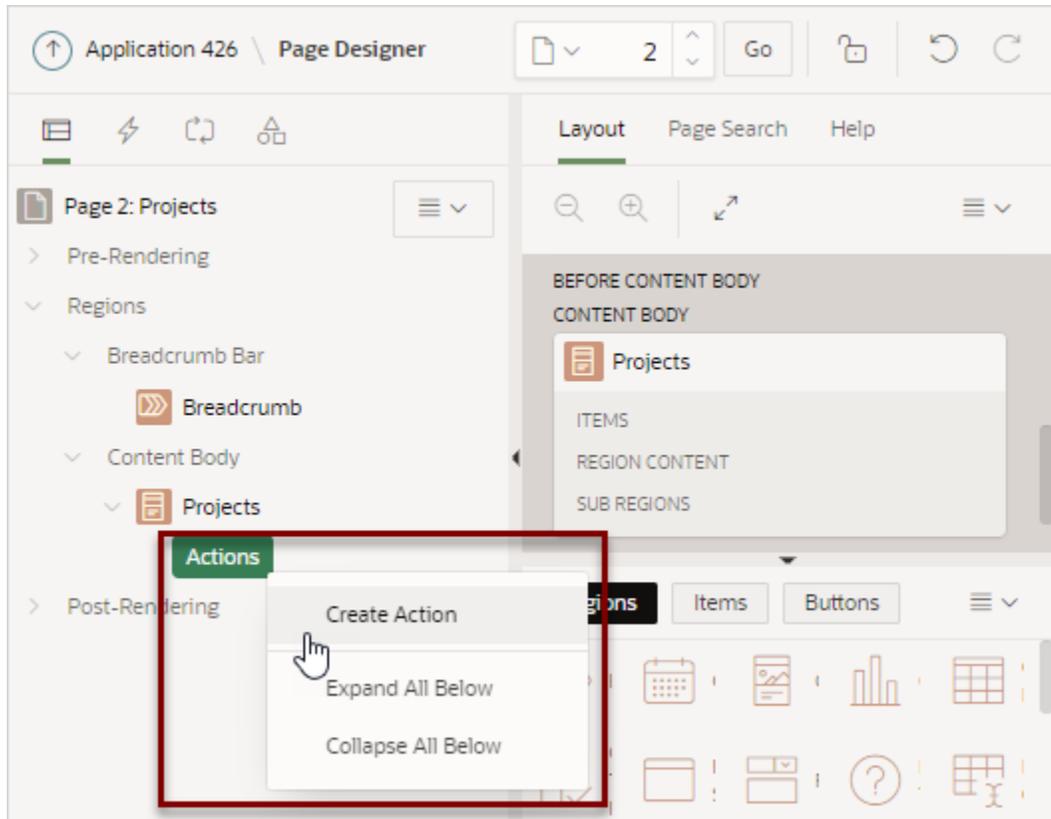
["Using Substitution Strings"](#)

8.4.6 Using Actions to Link from a Cards Page

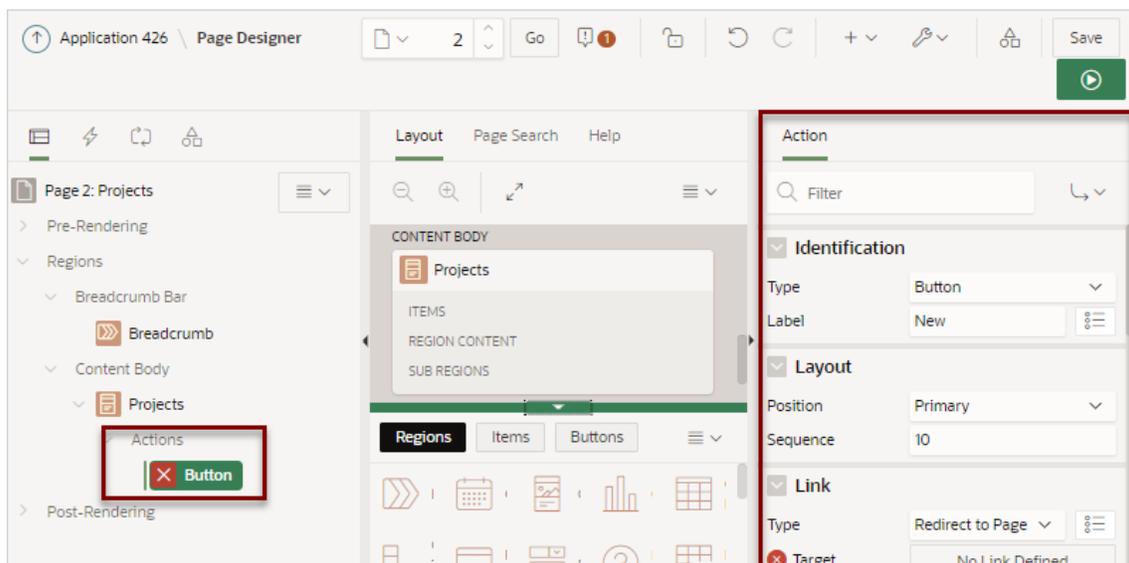
Create actions to link from a cards page.

A cards page functions as a colorful way to display a subset of information and then enable the user to link to more detail. To create a link from a cards page, you create an action and then select an action type. You can create an action to link from a full card, a title, a subtitle, media, or a button.

1. To create an action:
 1. View the Cards page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select the Cards page.Page Designer appears.
 2. Add an action:
 - a. In the Rendering tab under Content Body, locate the cards region.
 - b. Under the cards region, right-click **Actions** and select **Create Action**.



A new Action appears and the **Action** tab displays in Property Editor.



Edit the action in the Property Editor (right pane).

3. Identification, Type - Select the type of action to add to the card:
 - **Button** - Adds button to the card.

- **Full Card** - Adds link to the full card.
- **Title** - Adds link to the card title.
- **Subtitle** - Adds link to the card subtitle.
- **Media** - Adds link to the card media.

You can define multiple actions of the same type. However, only button actions are rendered multiple times. For all other action types, the first TRUE display condition gets rendered, and the rest are ignored. If defining multiple action, add a display condition based on the column value and set it to check for each row.

4. Identification, Label - (Button only) Enter the text to display on the button. If button display type is icon, this text becomes the ALT text for the icon image.
5. Define the Link:
 - a. Link, Type - Select the action to be performed when the specified action type is clicked. Options include:
 - **Redirect to Page in this Application** - Redirect to a page in the current application, with optional additional attributes for resetting pagination, setting the request value, clearing cache and setting item values, on the target page.
 - **Redirect to Page in a different Application** - Redirect to a page in a different application, with optional additional attributes for resetting pagination, setting the request value, clearing cache and setting item values, on the target page.

 **Tip:**

Redirecting to a page in different application relies on deep linking being enabled in the target application. To enable deep linking, go to the application's Security attributes and enable **Deep Linking**. See "[Configuring Security Attributes](#)."

- **Redirect to URL** - Redirect to the target URL you specify.
- b. Link, Target - Click **No Link Defined**.

The Link Builder Target dialog appears. The attributes that display differs depending upon the Link Type. When redirecting to a page, the following attributes appear:

- Target, Page - Enter a page number or page alias, or select the page number from the select list.
- Set Items, Name - Enter or select page items (for example, P3_ID), application items (for example, LAST_PAGE) or interactive report filters (for example, IR_EMPNO) to be set into session state.
- Set Items, Value - Enter or select a report column (for example, &ID.), enter an application or page item (for example, &P2_EMPNO.), or enter a static value (for example, 2).
- Clears/Reset, Clear Cache - Enter a comma-delimited list of page numbers (for example, 2, 3), items (for example, P3_EMPNO, LAST_PAGE), and report settings to be cleared. To reset pagination for a report enter RP. To clear or reset interactive report settings enter CR or RR.
- Action - Select **None**, **Clear Regions**, **Reset Regions**, or **Reset Pagination**.

Reset Pagination resets the pagination back to the first set of records, for reports on the target page. This has the same affect as passing **RP** in Clear Cache.

- Advanced: Request - Enter the request to be used.
 - Click **OK** to save your changes and exit the dialog.
6. Server Side Condition, Type - Select a condition type that must be met in order for this component to be rendered or processed.

If you refer to Columns in your condition, you must specify For Each Row in order for the condition to be evaluated for each card. Otherwise, set to Once to evaluate the validations one time for the region.

7. Click **Save** or **Save and Run Page**.
The Cards page loads.
8. Click a project to view the Maintain Project form.

8.5 Managing Faceted Search

A faceted search page features a faceted search region on the left side of the page and report on the right side of the page.

You can create a faceted search page with either the Create Application Wizard or Create Page Wizard.

- [Example Faceted Search](#)
View an example faceted search page.
- [About Creating Facet Search Pages](#)
Create a faceted search page by running either the Create Application Wizard or Create Page Wizard.
- [Creating Faceted Search Using the Create Application Wizard](#)
Run the Create Application Wizard to create a new application that contains a faceted search page.
- [Creating Faceted Search Using the Create Page Wizard](#)
Run the Create Page Wizard to add a new faceted search page to an existing application.
- [Creating a Faceted Search Manually](#)
Create a faceted search page by manually adding the page and facet components.
- [Editing a Faceted Search Page](#)
Learn about how attributes can change faceted search page behavior.



See Also:

["Creating a Report Using the Create Page Wizard"](#)

8.5.1 Example Faceted Search

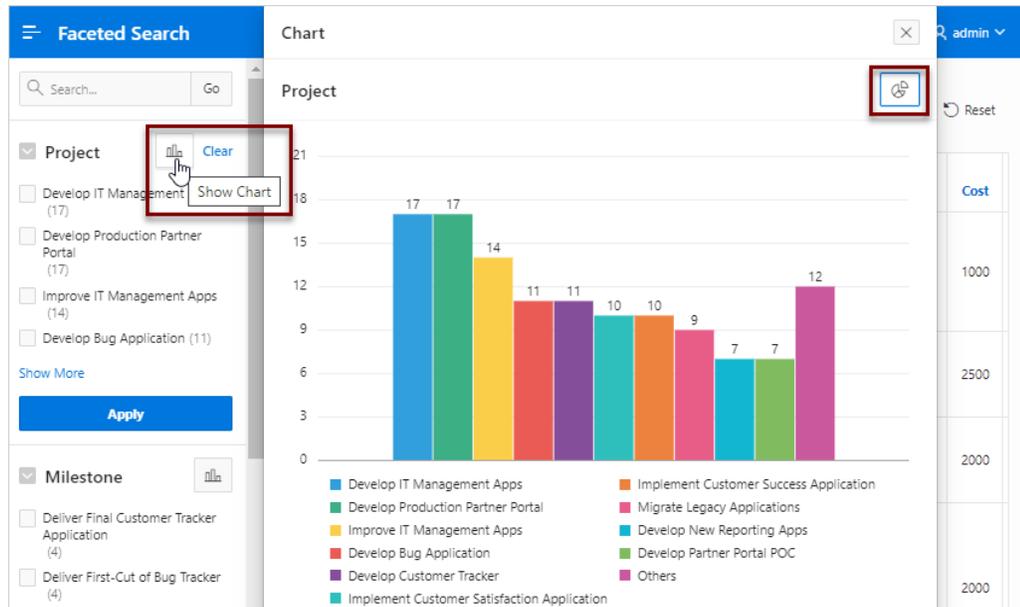
View an example faceted search page.

A faceted search page features a faceted Search region and report. The Search region displays on the left side of the page and enables users to narrow down the search result by selecting facet values. Narrowing the search result, makes it easier for users to find the data they want. The right side of the page features a Search Results region which can display as a classic report or cards report.

The following shows a faceted search page built on the `EBA_PROJECT_TASKS` table. In this example the Project, **Develop Bug Application**, is selected and the report displays 11 rows.

Project	Milestone	Name	Description	Assignee	Start Date	End Date	Cost	Is Complete
Develop Bug Application	Review Bug Tracker Productivity App	Install Bug Tracker Productivity App	Install the Productivity app and turn on the appropriate options.	Miyazaki Yokohama	8/18/2020	7/19/2020	1000	Y
Develop Bug Application	Review Bug Tracker Productivity App	Define external bug data feeds	Specify the data sources for bug data.	Mei Yu	8/19/2020	8/20/2020	2500	Y
Develop Bug Application	Review Bug Tracker Productivity App	Design Bug Tracker Look and Feel	Define how data will be displayed on bugs.	Madison Smith	8/19/2020	8/21/2020	2000	Y
Develop Bug Application	Deliver First-Cut of Bug Tracker	Define necessary customizations to the Bug Tracker app	Add the additional attributes required based on the bug information being delivered.	Miyazaki Yokohama	8/21/2020	8/22/2020	2000	Y

By default, when you create a facet that computes counts with a wizard, each facet that computes counts includes a chart based on the facet counts. Clicking **Show Chart** displays a chart based on the facet counts in a popup dialog. You can toggle between a bar chart or a pie chart by clicking the chart icon in the upper right of the popup window.



Tip:

To view an example, install the sample app, *Sample Reporting*. To learn more, see [Sample Apps](#).

8.5.2 About Creating Facet Search Pages

Create a faceted search page by running either the Create Application Wizard or Create Page Wizard.

Both the Create Application Wizard and Create Page Wizard support the creation of a faceted search page which contains a left Search region and a report. You choose if the report is a classic report or a cards report.

About Auto-Discovered Facets

When you build a faceted search page with either wizard, you can select a table or view on which to build the page. If you create the page based on a table, the facets are auto discovered using the Data Dictionary Cache. In contrast, if you build the page on a view or a SQL query, the facets are not auto-discovered. Instead, the wizard creates a facet region which only searches VARCHAR2 columns.

About the Data Dictionary Cache

The Data Dictionary Cache report displays statistics and a data analysis of schema tables and caches in a workspace. Both the Create Application Wizard and Create Page Wizard use the Data Dictionary Cache when creating new applications and pages. You can preview how the wizards will render facets on the Data Dictionary Cache page by viewing the Table Column Cache report. The wizard uses the first top five facet search score columns with score greater than or equal to 20.

If a table changes due to DDL or DML modifications, the Oracle Application Express nightly job ORACLE_APEX_DICTIONARY_CACHE refreshes the Data Dictionary Cache.

However, you can refresh the cache manually by navigating to the Data Dictionary Cache and clicking either **Gather Statistics and Refresh Cache** or **Refresh Cache Only** at the workspace or table-level.

 **See Also:**

"Accessing the Data Dictionary Cache Report from Workspace Administration" or "Accessing the Data Dictionary Cache Report from Administration Services" in *Oracle Application Express Administration Guide*

8.5.3 Creating Faceted Search Using the Create Application Wizard

Run the Create Application Wizard to create a new application that contains a faceted search page.

 **Tip:**

If you are creating a faceted search page that displays as a report, clicking **Include Form** automatically creates a form page for creating or updating records. This option is not available in the Create Page Wizard.

1. To create an application that faceted search page:
1. On the Workspace home page, click the **App Builder** icon.
2. Click the **Create** button.
3. Click **New Application**.
4. For Name, enter the name used to identify the application to developers.
5. For Appearance, accept the default Theme Style and menu layout (Vita, Side Menu), or change it by clicking the **Set Appearance** icon adjacent to the Appearance field.
6. Click **Add Page** and select **Faceted Search**.
7. In the Add Faceted Search Page dialog:
 - a. Page Name - Enter a name for this page.
 - b. Set Icon - Select an icon to display in the navigation menu for this page.
 - c. Select a report type: **Report** or **Cards**.
 - d. Table - Select a table or view.

The behavior differs depending upon your selection:

 - **Table** - If you select a **Table**, facets are auto discovered using APEX Data Dictionary Cache.
 - **View** - If you select a **View**, only Search facets will be created.
 - e. What appears next depends upon whether you selected **Report** or **Cards**.
 - **Report** - Select **Include Form** to include a form page for creating or updating records.

- **Cards** - Select the information to display on each card: **Card Title**, **Description Column**, and **Additional Text Column**.
- f. **Advanced** - Expand **Advanced** to configure these options:
 - **Set as Home Page** - Enable this to make this page the home page for the application.
 - **Set as Administration Page** - Enable this to have this page display under Administration.
 - **Page Help** - Enter text to be displayed when the user selects Page Help.
- g. Click **Add Page**.
- 8. **Features** - Select features to include with the application. Features provide application-level functionality and can only be added once per application. To learn more, click the Help icon adjacent to **Features**.
- 9. **Settings** - Specify settings used to generate this application. To learn more about an attribute, click the Help icon adjacent to **Settings**.
- 10. Click **Create Application**.

8.5.4 Creating Faceted Search Using the Create Page Wizard

Run the Create Page Wizard to add a new faceted search page to an existing application.

The Create Page Wizard offers more flexibility. For all Data Sources (Local Database, REST Enabled SQL Service, or REST Data Source) and Source Types (Table/View or SQL Query), you can select the facet columns you want to include. If you choose a local table, the facets are auto-discovered and the wizard pre-selects facets columns based on Data Dictionary Cache.

1. To create a faceted search page using the Create Page Wizard:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select the application.
 3. Click **Create Page**.
 4. For Create a Page:
 - a. **Page Type** - Select **Component** and then **Report**.



Tip:

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- b. Select **Faceted Search**.
 5. On Page Attributes:
 - a. **Page Number** - If you enter a new page number, the wizard creates a new page. If you enter an existing page number, the wizard adds the component to that page.

8.5.5 Creating a Faceted Search Manually

Create a faceted search page by manually adding the page and facet components.

Using the Create Application Wizard or Create Page Wizard is the easiest way to create a faceted search page. However, you can create a faceted search page manually. At a minimum, creating a faceted search page manually involves the following steps:

- Create a classic report or cards region.
- Add a faceted search region.
- Add individual facets or facet groups to the search region.
- Add a reset button.

The following example creates a faceted search page which contains a classic report built on the `EMP` table. The `EMP` table is available in the sample dataset, `EMP / DEPT`.

1. To create a faceted search manually.
 1. Run the Create Application Wizard:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Click the **Create** button.
 - c. Click **New Application**.

The Create Application Wizard appears.
 2. On Create an Application:
 - a. Name - Enter a name to identify the application. For example, enter `Faceted Search - Manual`
 - b. Appearance - Accept the default Theme Style and menu layout (Vita, Side Menu). To change it, click the **Set Appearance** icon adjacent to the Appearance field.
 - c. Under Pages, click **Add Page**. Expand **Additional Pages** at the bottom of the window and select **Classic Report**.
 - d. On Add Report Page:
 - Page Name - Enter a name for this page. For example, enter `Employees`
 - Set Icon - Accept the default, or select an icon to display in the navigation menu for this page.
 - Table or View - Select a table or view on which to build the page. Select **EMP**.
 - Click **Add Page**.
 - e. Click **Create Application**.

The Application home page appears.
 3. View the new page.
 - a. On the Application home page, select the new page, **2 - Employees**.

The page displays in Page Designer.

- b. Click **Save and Run Page** on the right side of the Page Designer toolbar.
- c. When prompted, enter your workspace username and password and click **Sign In**.
A Employees report appears.

Employee Name	Job	Manager	Hired ↑	Salary	Commission	Department
SMITH	CLERK	FORD	12/17/1980	800		RESEARCH
ALLEN	SALESMAN	BLAKE	2/20/1981	1,600	300	SALES
WARD	SALESMAN	BLAKE	2/22/1981	1,250	500	SALES
JONES	MANAGER	KING	4/2/1981	2,975		RESEARCH
BLAKE	MANAGER	KING	5/1/1981	2,850		SALES
CLARK	MANAGER	KING	6/9/1981	2,450		ACCOUNTING
TURNER	SALESMAN	BLAKE	9/8/1981	1,500	0	SALES
MARTIN	SALESMAN	BLAKE	9/28/1981	1,250	1400	SALES
KING	PRESIDENT		11/17/1981	5,000		ACCOUNTING
FORD	ANALYST	JONES	12/3/1981	3,000		RESEARCH
JAMES	CLERK	BLAKE	12/3/1981	950		SALES
MILLER	CLERK	CLARK	1/23/1982	1,300		ACCOUNTING

- d. Return to Page Designer. Click **Edit Page X** on the Runtime Developer toolbar where X is the page number.
4. Add a search region:
 - a. In the Rendering tab (or left pane), right-click **Content Body** and select **Create Region**.
 - b. Select the new region. Edit the following Region attributes in the Property Editor (or right pane):
 - Identification, Title - Enter *Search*
 - Identification, Type - Select **Faceted Search**.
 - Source, Filtered Region - Select **Employees**.
 - c. Update the region appearance:
 - Appearance, Template Options - Click **Use Template Defaults, Scroll - Default**. The Template Options dialog appears.
 - Common, General - Select **Remove Body Padding**.
 - Common, Header - Select **Hidden but accessible**.
 - Click **OK**.
 5. Add a facet to search multiple columns:

- a. In the Rendering tab (or left pane), right-click **Facets** and select **Create Facet**.
 - b. Select the new facet and edit the following Facet attributes in the Property Editor:
 - Identification, Name - Enter `PX_SEARCH` where `X` represents the page number.
 - Identification, Type - Select **Search**.
 - Source, Database Column(s) - Enter `ENAME, JOB, MGR, DEPTNO`
 - c. Save your changes. Click **Save**.
6. Add a facet to filter the `DEPTNO` column:
- a. In the Rendering tab, right-click the **Facets** and select **Create Facet**.
 - b. Select the new facet and edit the following attributes in the Property Editor:
 - Identification, Name - Enter `PX_DEPTNO` where `X` represents the page number.
 - Identification, Type - Accept the default, **Checkbox Group**.
 - Label, Label - Enter `Department`
 - List of Values, Type - Select **SQL Query**.
 - List of Values, SQL Query - Enter `SELECT dname, deptno FROM dept`
 - c. Save your changes. Click **Save**.
7. Add a facet to filter the `MGR` column:
- a. In the Rendering tab, right-click the **Facets** and select **Create Facet**.
 - b. Select the new facet and edit the following Facet attributes in the Property Editor:
 - Identification, Name - Enter `PX_MGR` where `X` represents the page number.
 - Identification, Type - Accept the default, **Checkbox Group**.
 - Source, Database Column - Verify that the column is **MGR**.
 - Label, Label - Enter `Manager`
 - List of Values, Type - Select **Shared Component**.

The Create Application Wizard created a lookup list of values named `EMP.ENAME` so that the `MGR` column displays the manager name instead of the employee number.
 - List of Values, List of Values - Select **EMP.ENAME**.
 - c. Save your changes. Click **Save**.
8. Add a facet to filter the `JOB` column:
- a. In the Rendering tab, right-click the **Facets** and select **Create Facet**.
 - b. Select the new facet and edit the following Facet attributes in the Property Editor:
 - Identification, Name - Enter `PX_JOB` where `X` represents the page number.
 - Identification, Type - Accept the default **Checkbox Group**.
 - Source, Database Column - Verify that the column is **JOB**.

- Label, Label - Enter Job
 - List of Values, Type - Select **Static Values**.
 - c. Save your changes. Click **Save**.
9. Add a facet to filter the SAL column:
- a. In the Rendering tab, right-click the **Facets** and select **Create Facet**.
 - b. Select the new facet and edit the following Facet attributes in the Property Editor:
 - Identification, Name - Enter `PX_SAL` where *X* represents the page number.
 - Identification, Type - Select **Range**.
 - Label, Label - Enter `Salary`
 - Source, Database Column - Verify that the column is **SAL**.
 - Source, Data Type - Select **NUMBER**.
 - Settings, Select Multiple - Enable **Select Multiple**.
 - c. Define the facet as a static list of values:
 - List of Values, Type - Select **Static Values**.
 - List of Values, Static Value - Click **Display1, Display2**.

In the Static Values dialog, define the following:

- Row 1:
 - Display Value - Enter `< 1000`
 - Return Value - Enter `|1000`
- Row 2:
 - Display Value - Enter `1000 to 3000`
 - Return Value - Enter `1000|3000`
- Row 3:
 - Display Value - Enter `3000 to 4500`
 - Return Value - Enter `3000|4500`
- Row 4:
 - Display Value - Enter `> 4500`
 - Return Value - Enter `4000|`

Static Values ✕

Values

Display Value	Return Value			
< 1000	1000	✕		▼
1000 to 3000	1000 3000	✕	▲	▼
3000 to 4500	3000 4500	✕	▲	▼
> 4500	4000	✕	▲	▼
		✕	▲	

Sort

Cancel OK

- Click **OK** to save your changes.
- d. Save your changes. Click **Save**.

Notice that in the Layout tab, the Search region displays below the Employees region.

Next, move the Employees report so it displays adjacent to the Search region.

Tip: The procedure that follows explains how to reposition a region by editing Region attributes. You can also move components by selecting them in the Layout tab (central pane) and dragging and dropping them to a new position.

10. Select the **Employees** region and update the following Region attributes:

- a. Layout, Sequence - Enter 20
- b. Start New Row - Disable this option.

In the Layout tab, notice the Search and Employees regions now display adjacent to one another.

11. Make the Search region narrower and then update region appearance. Select the **Search** region and update the following Region attributes:

- a. Layout, Column - Enter 1
- b. Layout, Column Span - Select **3**.
- c. Save your changes. Click **Save**.

12. View the page.

- a. Click **Save and Run Page** in the upper right corner.
- b. If prompted, enter your workspace username and password and click **Sign In**.

The revised page appears. Notice that the Search region contains the following facets: Search, Department, Manager, and Salary.

The screenshot shows a web application titled 'Faceted Search - Manual' with a user 'admin'. The main content is an 'Employees' table. On the left, there are search filters for 'Department' and 'Manager'. The table has columns for Employee Name, Job, Manager, Hired, Salary, Commission, and Department. The 'Edit Page 2' button in the bottom toolbar is highlighted with a red box.

Employee Name	Job	Manager	Hired	Salary	Commission	Department
CLARK	MANAGER	KING	6/9/1981	2,450		ACCOUNTING
JONES	MANAGER	KING	4/2/1981	2,975		RESEARCH
BLAKE	MANAGER	KING	5/1/1981	2,850		SALES
ALLEN	SALESMAN	BLAKE	2/20/1981	1,600	300	SALES
WARD	SALESMAN	BLAKE	2/22/1981	1,250	500	SALES
MARTIN	SALESMAN	BLAKE	9/28/1981	1,250	1400	SALES
TURNER	SALESMAN	BLAKE	9/8/1981	1,500	0	SALES
JAMES	CLERK	BLAKE	12/3/1981	950		SALES
MILLER	CLERK	CLARK	1/23/1982	1,300		ACCOUNTING
SCOTT	ANALYST	JONES	12/9/1982	3,000		RESEARCH
FORD	ANALYST	JONES	12/3/1981	3,000		RESEARCH
ADAMS	CLERK	SCOTT	1/12/1983	1,100		RESEARCH

c. Return to Page Designer. Click **Edit Page X** on the Runtime Developer toolbar.

Next, add a button to refresh the page.

13. Add a region to contain a reset button:

- a. In the Rendering tab, right-click **Content Body** and select **Create Region**.
- b. Select the new region. In the Property Editor under **Region**, edit the following attributes:
 - Identification, Title - Enter `Button Bar`
 - Identification, Type - Accept the default **Static Content**.
 - Layout, Sequence - Enter 10

- Appearance, Template - Select **Buttons Container**.
 - c. Update the Appearance attributes:
 - Appearance, Template Options - Click **Use Template Defaults**.
The Template Options dialog appears.
 - Common, Body Padding - Select **No Padding**.
 - Common, Style - Select **Remove UI Decoration**.
 - Click **OK**.
14. Add a button:
- a. In the Rendering tab, right-click the Button Bar region and select **Create Button**.
 - b. Edit the button. Select the button and edit the following attributes in the Property Editor:
 - Identification, Button Name - Enter `RESET`
 - Layout, Button Position - Select **Next**.
 - c. Update the Appearance attributes:
 - Appearance, Button Template - Select **Text with Icon**.
 - Appearance, Template Options - Click **Use Template Defaults**.
In the Template Options dialog:
 - Common, Style - Select **Remove UI Decoration**.
 - Click **OK**.
 - Appearance, Icon - Click **List of Values - Icon** and find and select **fa-undo**.
 - d. Update the Behavior attributes:
 - Behavior, Action - Select **Redirect to Page in this Application**.
 - Behavior, Target - Click **No Link Defined**.
In the Link Builder - Target dialog:
 - Target, Page - Select the current page. For example, select **2**.
 - Clear/Reset, Clear Cache - Select the current page. For example, select **2**.
 - Clear/Reset, Action - Select **Reset Regions**.
 - Click **OK**.
 - e. Save your changes. Click **Save**.
15. View the revised page.
- a. Click **Save and Run Page**.
 - b. If prompted, enter your workspace username and password and click **Sign In**.
The faceted search page appears. Notice the new Reset button displays in the upper right above the report.

Employees

Reset 

Department 

SALES (6)

RESEARCH (5)

ACCOUNTING (3)

Manager 

BLAKE (5)

KING (3)

JONES (2)

CLARK (1)

FORD (1)

SCOTT (1)

Employee Name	Job	Manager	Hired	Salary	Commission	Department
SMITH	CLERK	FORD	12/17/1980	1,079		RESEARCH
ALLEN	SALESMAN	BLAKE	2/20/1981	1,600	300	SALES
WARD	SALESMAN	BLAKE	2/22/1981	1,250	500	SALES
JONES	MANAGER	KING	4/2/1981	4,010		RESEARCH
MARTIN	SALESMAN	BLAKE	9/28/1981	1,288	1400	SALES
BLAKE	MANAGER	KING	5/1/1981	3,842		SALES
CLARK	MANAGER	KING	6/9/1981	3,302		ACCOUNTING
SCOTT	ANALYST	JONES	12/9/1982	4,043		RESEARCH
KING	PRESIDENT		11/17/1981	6,739		ACCOUNTING
TURNER	SALESMAN	BLAKE	9/8/1981	1,500	0	SALES
ADAMS	CLERK	SCOTT	1/12/1983	1,483		RESEARCH
JAMES	CLERK	BLAKE	12/3/1981	1,281		SALES

- c. Test the page. Select facets and then click **Reset**.

8.5.6 Editing a Faceted Search Page

Learn about how attributes can change faceted search page behavior.

Tip:

The examples in this section are built on the `EBA_PROJECT_TASKS` table available in the sample dataset, Project Data, or the `EMP` table available in the sample dataset, EMP / DEPT. To install a sample dataset, see "Using Sample Datasets" in *Oracle Application Express SQL Workshop Guide*.

- [Editing a Faceted Search](#)
Review the components that comprise a faceted search page by viewing attributes in Page Designer.
- [Understanding a Faceted Search Page](#)
Learn about the regions that comprise a faceted search page.
- [Editing Faceted Search Region Attributes](#)
Edit region Attributes to change general search facet region behavior.
- [Editing Facet Attributes](#)
Edit facet attributes to change facet behavior.
- [Adding a New Facet](#)
Add new facets in Page Designer by right-clicking Facet and selecting Add Facet from the context menu.
- [Creating Facet Groups](#)
Create facet groups for data models having multiple flag columns.

- [Configuring Single Facet Charts](#)
Configure region and facet attributes to declaratively control how and if single facet charts display in the facet search region.
- [Editing the Static List of Values for a Range Facet](#)
Edit a range facet that displays as a static list of values.

8.5.6.1 Editing a Faceted Search

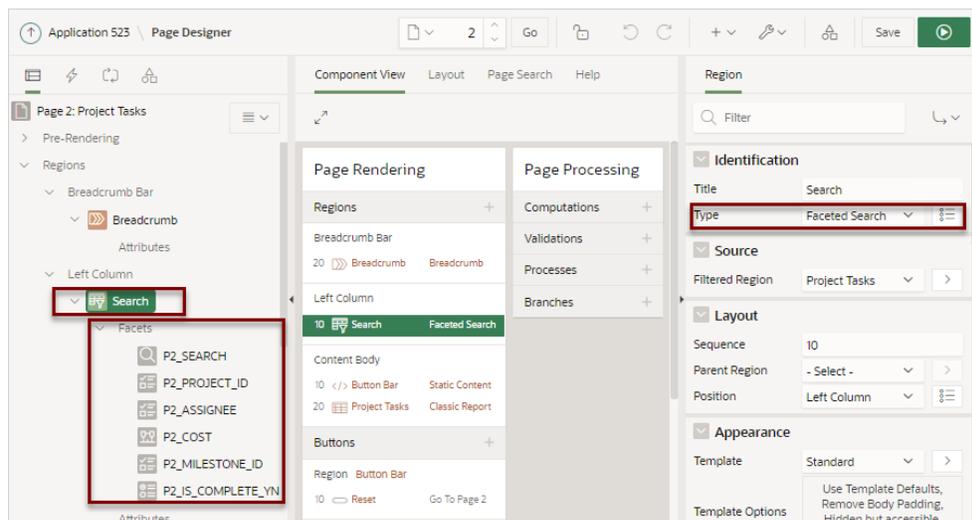
Review the components that comprise a faceted search page by viewing attributes in Page Designer.

A faceted search page features a faceted region that enables users to narrow down the search results and displays the results in either a report or cards view.

 **Note:**

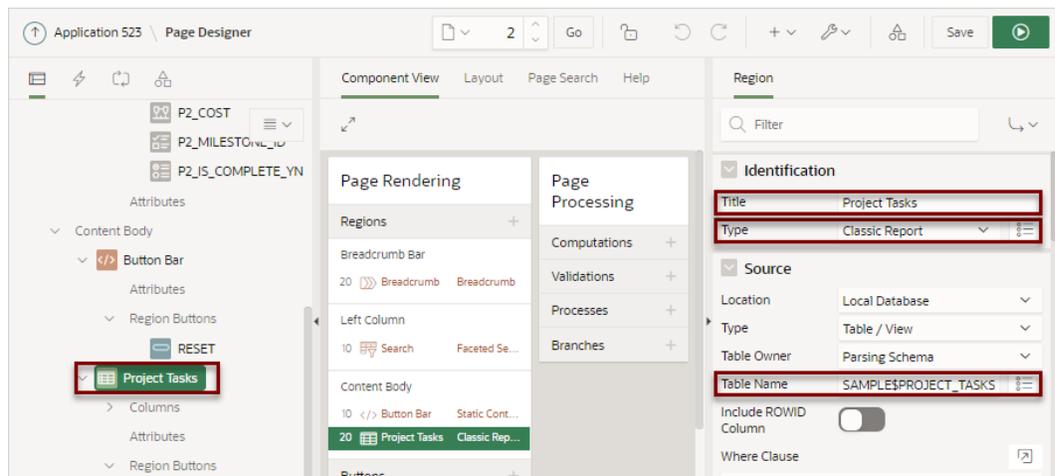
The SQL query for a cards page includes special aliases such as `CARD_MODIFIERS` and `CARD_LINK`. To link a card to a new page, you must update `CARD_LINK` in the underlying SQL query to point to the appropriate target. To see an example, see "[Using Actions to Link from a Cards Page.](#)"

1. To review the components of a faceted search page:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
 Page Designer appears.
 2. Review the Search region. In the Rendering tab under Left Column, locate and select the **Search** region.



Note the Search region Type is **Faceted Search**. The search fields display under **Facets**. Facets are similar to items but feature the following unique characteristics:

- **Naming Conventions** - Facets use the same naming convention as items. By default, wizards prefix facet names with P<page no>_<item name> (for example, P5_SEARCH).
 - **Filtering on More Than One Column** - Search facet type can filter based on more than one column and, when not external, is always at the top of the facets region.
 - **Associated with a Column** - Facets are associated with a column from the report region.
 - **Differences with Checkbox or Select List Facets** - The facet types such as Checkbox or Select List specify the UI for selecting or entering the facet values. They are not implemented the same as page items even if they have the same type name. For this reason, most dynamic actions do not apply to facets.
3. Select a facet and explore the configurable options.
To view Help, select the attribute and click the **Help** tab.
 4. Review the report region. In the Rendering tab, locate and select the report region (for example, **Project Tasks**).



In the previous example, note that the attributes indicate the report Type is a **Classic Report** built on the SAMPLE\$PROJECT_TASKS table in a local database:

See Also:

["About Item Naming Conventions"](#)

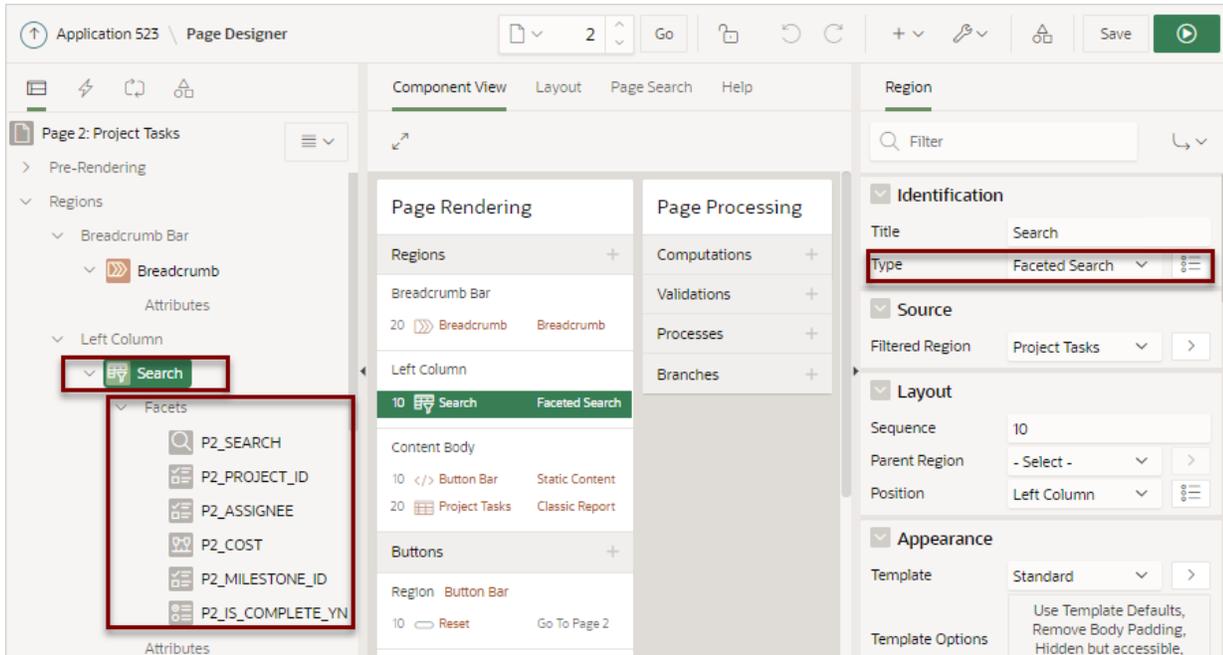
8.5.6.2 Understanding a Faceted Search Page

Learn about the regions that comprise a faceted search page.

About the Search Region

A faceted search page features a Search region which enables users to narrow down the search result and a Search Results region which displays as either a classic report or cards report.

The **Search** region displays in the left pane or Rendering tab. Selecting the Search region displays attributes in the Property Editor. In the following image, the Search region **Type** is defined as **Faceted Search**. The **Filtered Region** attribute identifies the Search Results region. In this example, **Filtered Region** is as a classic report named **Search Results**.



Tip:

Remember that each attribute in the Property Editor has associated Help. To view Help, select the attribute in the Property Editor and then click the **Help** tab in the central pane. Help describing the attribute appears in the central pane.

About Facets

Search facets display under **Facets** in the Rendering tab. When you select a facet, the associated attributes display in the Property Editor. Facets use the same naming convention as items. By default, wizards prefix facet names using the following convention: P<page no>_<item name>. For example, in the previous example, the first facet is named P2_SEARCH).

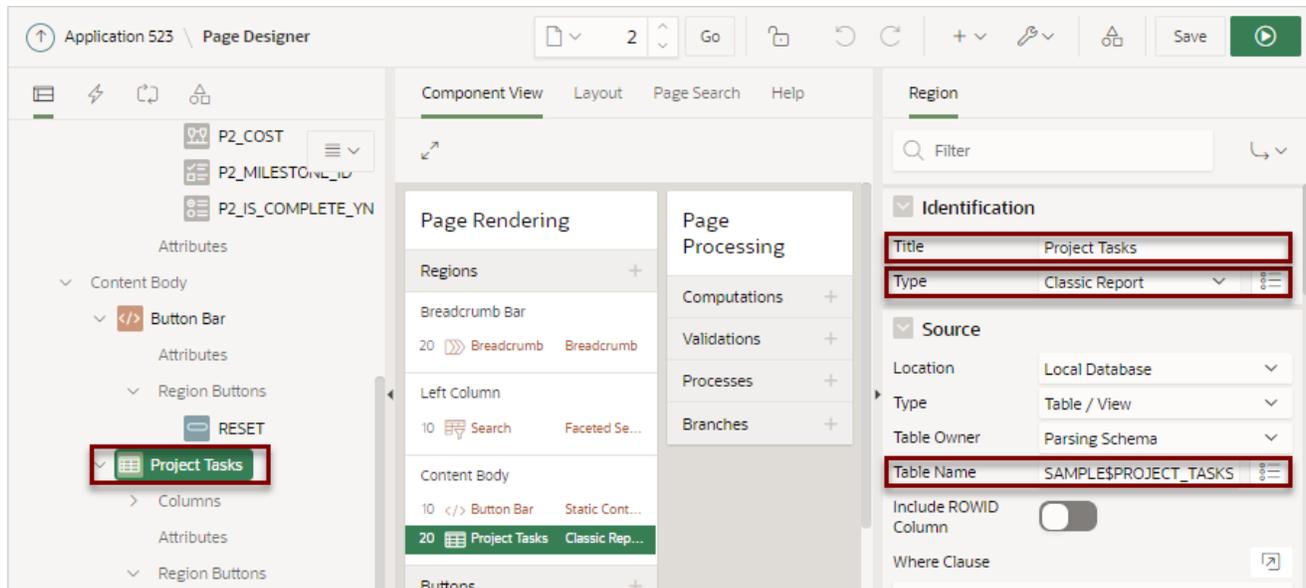
Facets are similar to items but feature the following unique characteristics:

- **Filtering on More Than One Column** - The facet of type Search, generally called **Search**, can filter based on more than one column and, when not external always displays at the top of the facets region.
- **Associated with a Column** - The facets are associated with a column from the report region.

- **Differences with Checkbox or Select List Facets** - The facet types, such as Checkbox or Select List, indicate how UI enables the user to select or filter data. Facets are not implemented the same as page items even if they have a similar naming convention. For this reason, most dynamic actions do not apply to facets.

About the Search Results

A faceted search page includes a Search Results region which displays as either a classic report or cards report. In the following example, Search Results is a **Classic Report** built on the `EBA_PROJECT_TASKS` table.



About Cards Page Search Results

The Search Results in a faceted search page can display as a cards report. The SQL query for a cards page includes special aliases such as `CARD_MODIFIERS` and `CARD_LINK`. To link a card to a new page, you must update `CARD_LINK` in the underlying SQL query to point to the appropriate target. To see an example, see ["Using Actions to Link from a Cards Page."](#)



See Also:

["About Item Naming Conventions"](#)

8.5.6.3 Editing Faceted Search Region Attributes

Edit region Attributes to change general search facet region behavior.

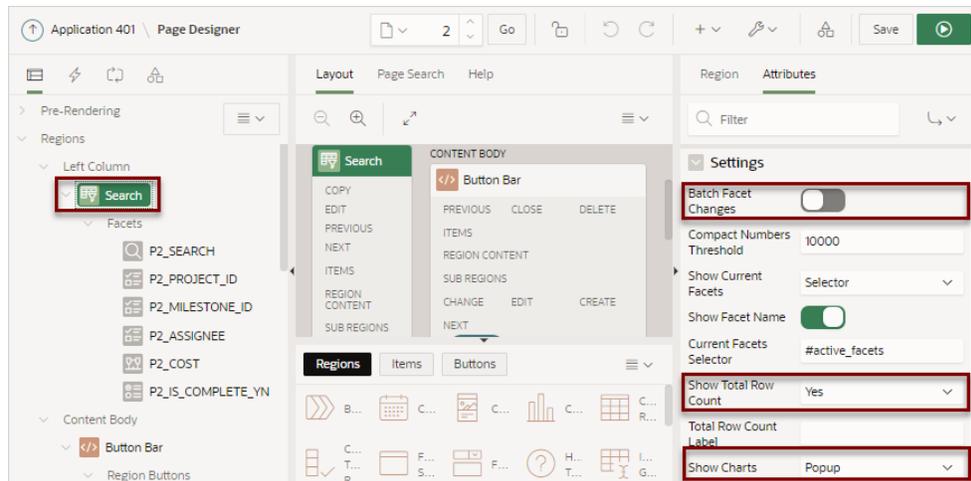
The following example demonstrates how to review and edit the region Attributes **Batch Facet Changes** and **Show Total Row Count**. **Batch Facet Changes** controls whether the report filtering executes as soon as a facet value changes, or individually by clicking an Apply button. **Show Total Row Count** determines if a row count value displays on the page. The

following example built on the `EBA_PROJECT_TASKS` table available in the sample dataset, Project Data.

Tip:

To view help for an attribute, select the attribute in the Property Editor and click the Help tab in the central pane.

1. To edit Search facet region Attributes:
1. View the faceted search page in Page Designer.
2. View the Search region Attributes:
 - a. In the Rendering tab (or left pane), select the **Search** region.
 - b. In the Property Editor, select the **Attributes** tab.



3. Enable **Batch Facet Changes**:

Batch Facet Changes controls how report filtering executes. When enabled and a user selects a facet, an Apply button appears under the facet. The user must click the Apply button to apply the facet and filter the report. When disabled, the report filtering executes as soon as the facet value changes.

- a. In the Rendering tab (or left pane), select the **Search** region.
- b. In the Property Editor, select the **Attributes** tab.
- c. Under **Settings**, enable **Batch Facet Changes**.
- d. Click **Save and Run Page**.

A rendered version of the application appears.

Project	Milestone	Name	Description	Assignee	Start Date	End Date
Configure Web Environment		Identify Server Requirements	Determine which databases will be used to install Web development tool for Development, QA, and Production. Also specify which Web Listeners will be used for the three environments.	Tameka Hall	6/9/2020	6/10/2020
			Install the latest version of Web development tool from the vendor into the databases for			

- e. In the Search region, select a project, such as **Develop Production Partner Portal**. An Apply button appears.

Project	Milestone	Name	Description	Assignee
Configure Web Environment		Identify Server Requirements	Determine which databases will be used to install Web development tool for Development, QA, and Production. Also specify which Web Listeners will be used for the three environments.	Tameka Hall
			Install the latest version of Web development tool from the vendor into the	

- f. Click **Apply**.
A revised report appears and a filter displays above report.

The screenshot shows the 'Faceted Search' interface. At the top, there is a search bar and a 'Go' button. Below the search bar, the 'Total Row Count 17' is displayed in a red box. The main content area shows a table of results for the 'Develop Production Partner Portal' project. The table has the following columns: Project, Milestone, Name, Description, Assignee, Start Date, End Date, and Cost. The table contains two rows of data.

Project	Milestone	Name	Description	Assignee	Start Date	End Date	Cost
Develop Production Partner Portal	Define Production App Scope	Define production scope of Partner Portal App.	Define the scope and timelines for the development of the production app.	Lucille Beatie	9/21/2020	9/22/2020	0
Develop Production Partner Portal	Define Production App Scope	Finalize Partner App Data Model	Refine the data model for new and existing entities required to support the Partner Portal	Daniel James Lee	9/21/2020	9/22/2020	0

- g. Return to Page Designer by clicking **Edit Page XX** on the Runtime Developer Toolbar.
4. Review the **Show Total Row Count** attribute.

When set to Yes, the total row count displays above the report. In the previous illustration, this displays as Total Row Count 17.

- a. In the Rendering tab (or left pane), select the **Search** region.
- b. In the Property Editor, select the **Attributes** tab.
- c. Find **Settings, Show Total Row Count**. Options include:
 - **No** - If **No**, the total row count does not display.
 - **Yes** - If **Yes**, the total row count displays at the top of the current facets as shown in the previous illustration.

If Show Current Facets is a selector, the total row count displays wherever that selector is defined. The wizards by default create an element on the page called `active_facets` and that is above the report. If Show Current Facets is **No** and Show Total Row Count is **Yes**, the total row count displays at the top of the facets region.

- **Selector** - If **Selector**, the total row count displays wherever the selector is defined. This option enables you to place the total row count anywhere on the page.
- d. Return to Page Designer by clicking **Edit Page XX** on the Runtime Developer Toolbar.
 5. Click **Save** or **Save and Run Page**.

8.5.6.4 Editing Facet Attributes

Edit facet attributes to change facet behavior.

The following example demonstrates how to review and edit the facet attributes **Client-Side Filtering** and **Depending On** attributes and change facet behavior. Enabling **Client-Side Filtering** adds a search field which enables users to filter the

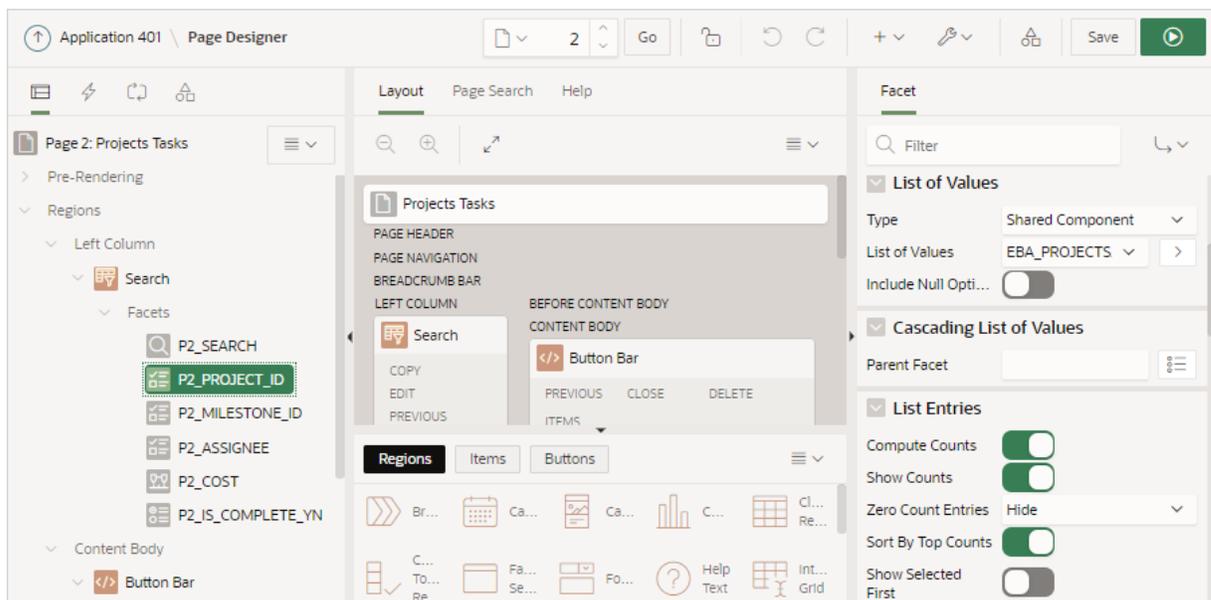
facet list. **Depending On** makes the display of one facet dependent upon another. The following example is also built on the `EBA_PROJECT_TASKS` table available in the sample dataset, Project Data.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the Help tab in the central pane.

1. To view and edit facet attributes:
 1. View the faceted search page in Page Designer.
 2. View the facet attributes for the facet, **P2_PROJECT_ID**:
 - a. In the Rendering tab (or left pane) locate the **Search** region and select the facet, **P2_PROJECT_ID**.
 - b. In the Property Editor (or right pane) find the **List of Values** group.

The **List of Values** group indicates that the `P2_PROJECT_ID` facet is a List of Values created as a Shared Component.

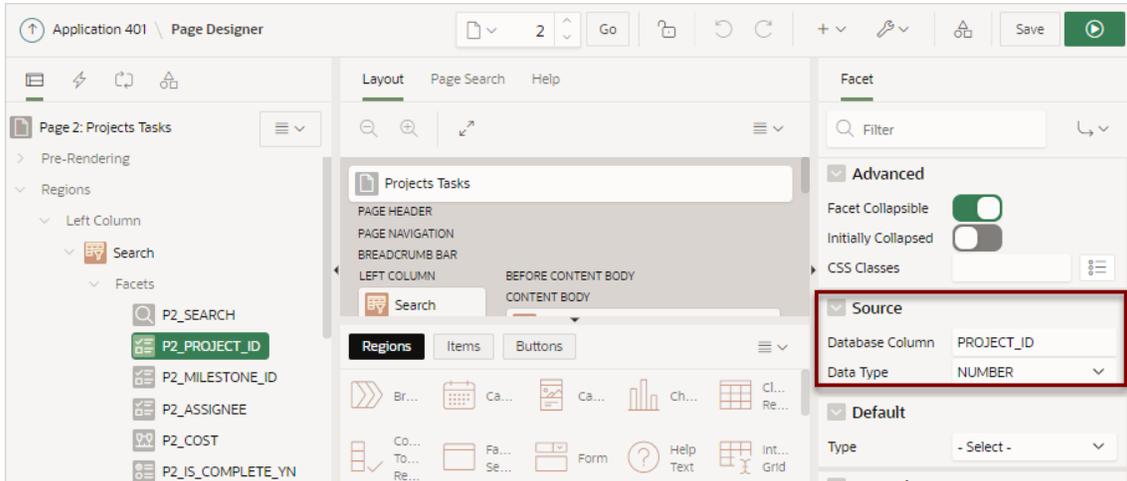


 **Tip:**

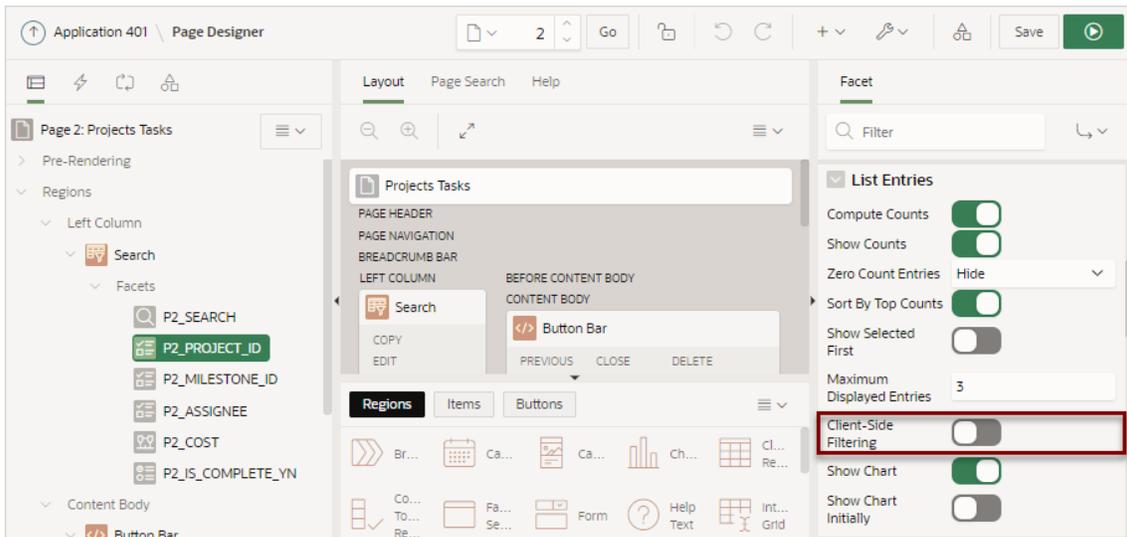
The maximum amount of items which can be returned by an LOV, or by Distinct Values, is 5,000. If an LOV returns more than 5,000 items, faceted search cuts the LOV silently at 5,000 values. When logged in as a developer, Application Express raises a runtime error, once more than 2,000 LOV items are returned. These errors indicate that the LOV returns too many values for a useful faceted search UI.

- c. In the Property Editor, find the **Source** group.

The **Source** group indicates that the P2_PROJECT_ID facet is based on the PROJECT_ID column which has a data type of Number.



- 3. Add a Project filter to the Search region by enabling the Client-Side Filtering attribute:
 - a. In the Rendering tab, select the **P2_PROJECT_ID** facet (if not already selected).
 - b. In the Property Editor, find **List Entries** and enable **Client-Side Filtering**.



Tip:

In the **List Entries** group, note the **Show Chart** and **Show Chart Initially** attributes. Use these attributes to declaratively control if a specific facet includes the **Show Chart** icon.

- c. Review your changes. Click **Save and Run Page**.

The faceted search page appears and a new **Filter Project** field appears.

The screenshot shows the 'Faceted Search' interface. On the left, there is a sidebar with two filter sections: 'Project' and 'Milestone'. The 'Project' section has a search field labeled 'Filter Project' which is highlighted with a red box. Below it are three checkboxes for project categories: 'Develop IT Management Apps (17)', 'Develop Production Partner Portal (17)', and 'Improve IT Management Apps (14)'. The 'Milestone' section has three checkboxes: 'Build First Cut of Executive Dashboard (4)', 'Build Proof-of-Concept (4)', and 'Complete Final Development of IT Management apps'. The main area is a table with the following columns: Project, Milestone, Name, Description, Assignee, Start Date, End Date, and Cost. The table contains two rows of data.

Project	Milestone	Name	Description	Assignee	Start Date	End Date	Cost
Configure Web Environment		Identify Server Requirements	Determine which databases will be used to install Web development tool for Development, QA, and Production. Also specify which Web Listeners will be used for the three environments.	Tameka Hall	6/9/2020	6/10/2020	2000
Configure		Install Web	Install the latest version of Web development tool from the vendor into the databases for Development, QA, and				

- d. Test the new Filter Project field. For example, entering the keyword "develop" will update the Project list to only include search facets containing that phrase.
- e. Click **Edit Page XX** on the Runtime Developer Toolbar to return to Page Designer.
4. Only show Milestones for the selected Project by enabling the **Depending On** attribute.
- In the Rendering tab locate the **Search** region and select the **P2_MILESTONE_ID** facet.
 - In the Property Editor find **Depending On** and for **Facet** and select **P2_PROJECT_ID**.
 - Review your changes. Click **Save and Run Page**.

The faceted search page appears. Note that the Milestones list no longer displays.

The screenshot shows a 'Faceted Search' interface. On the left, there are two filter sections: 'Project' and 'Assignee'. The 'Project' section is highlighted with a red box and contains a search box 'Filter Project' and three checkboxes: 'Develop IT Management Apps (17)', 'Develop Production Partner Portal (17)', and 'Improve IT Management Apps (14)'. The 'Assignee' section contains five checkboxes: 'Madison Smith (19)', 'Bernard Jackman (13)', 'Harold Youngblood (13)', 'Tyson King (13)', and 'Eva Jelinek (12)'. The main table on the right has columns for Project, Milestone, Name, Description, and Assignee. The table contains two rows of data.

Project	Milestone	Name	Description	Assignee
Configure Web Environment		Identify Server Requirements	Determine which databases will be used to install Web development tool for Development, QA, and Production. Also specify which Web Listeners will be used for the three environments.	Tameka Hall
Configure Web Environment		Install Web development tool	Install the latest version of Web development tool from the vendor into the databases for Development, QA, and Production. Note: For QA	Mei Yu

- d. Select a project such as **Develop Production Partner Portal**.

Note that the Milestones list now appears but only displays Milestones associated with the **Develop Production Partner Portal** project.

The screenshot shows a 'Faceted Search' interface. On the left, there are two filter sections: 'Project' and 'Milestone'. The 'Project' section has a search box 'Filter Project' and three checkboxes: 'Develop IT Management Apps (17)', 'Develop Production Partner Portal (17)' (checked), and 'Improve IT Management Apps (14)'. The 'Milestone' section has three checkboxes: 'All Developers Trained', 'Build Final Phase of IT Management Apps', and 'Build First Cut of Executive Dashboard'. On the right, there is a search bar with 'Project' selected and 'Develop Production Partner Portal' entered. Below the search bar is a table with four columns: 'Project', 'Milestone', 'Name', and 'Description'. The table contains three rows of results.

Project	Milestone	Name	Description
Develop Production Partner Portal	Define Production App Scope	Define production scope of Partner Portal App.	Define the scope and timelines for the development of the production app.
Develop Production Partner Portal	Define Production App Scope	Finalize Partner App Data Model	Refine the data model for new and existing entities required to support the Partner Portal
Develop Production Partner Portal	Define Production App Scope	Finalize User Experience for Partner Portal app	Write developer standards on UX and development standards on how partners will interact

8.5.6.5 Adding a New Facet

Add new facets in Page Designer by right-clicking Facet and selecting Add Facet from the context menu.

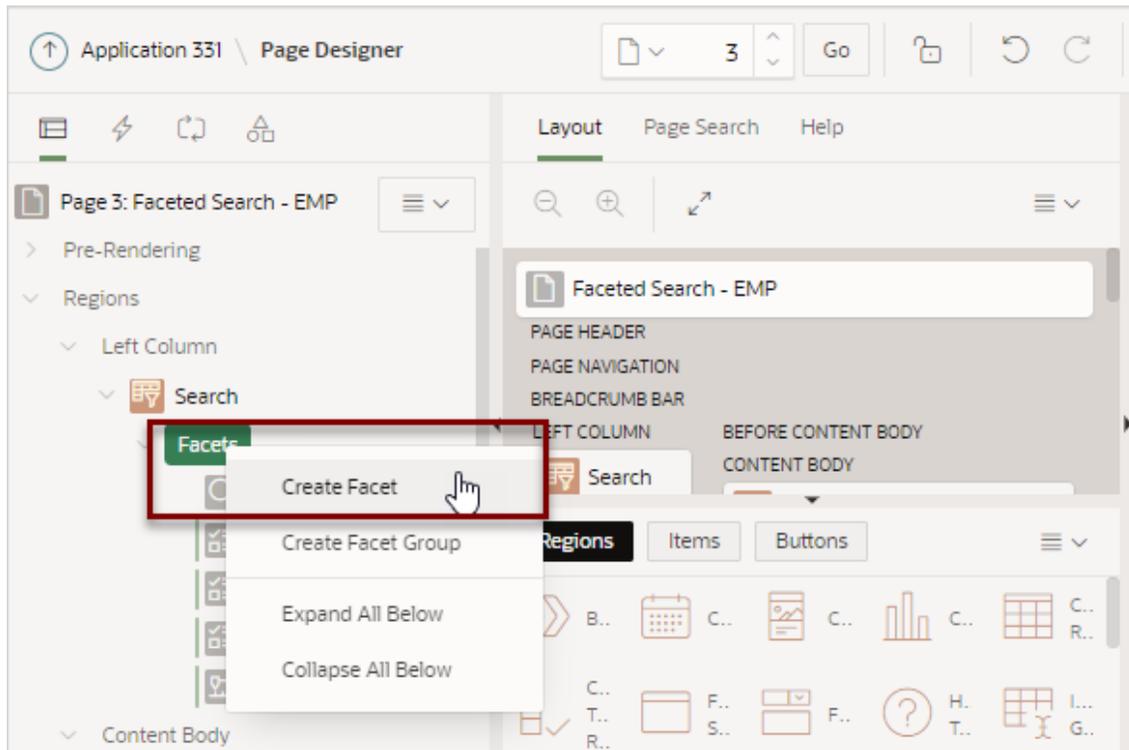
Facets map to specific database column. When creating a new facet, you can create the following types: Checkbox Group, Input Field, Radio Group, Range, Search field, or Select List.

You can control the facet order in the UI by reordering the facets in the Rendering tab. Note that you can only have one Search facet and it must display at the top of the facets region no matter where it resides in the Rendering tab.

The following example demonstrates how to create Input Field facet to filter employee salary that is less than or equal to the provided dollar amount. In this example, the Input Field facet maps to the `SAL` column in the `EMP` table available in the sample dataset, `EMP / DEPT`.

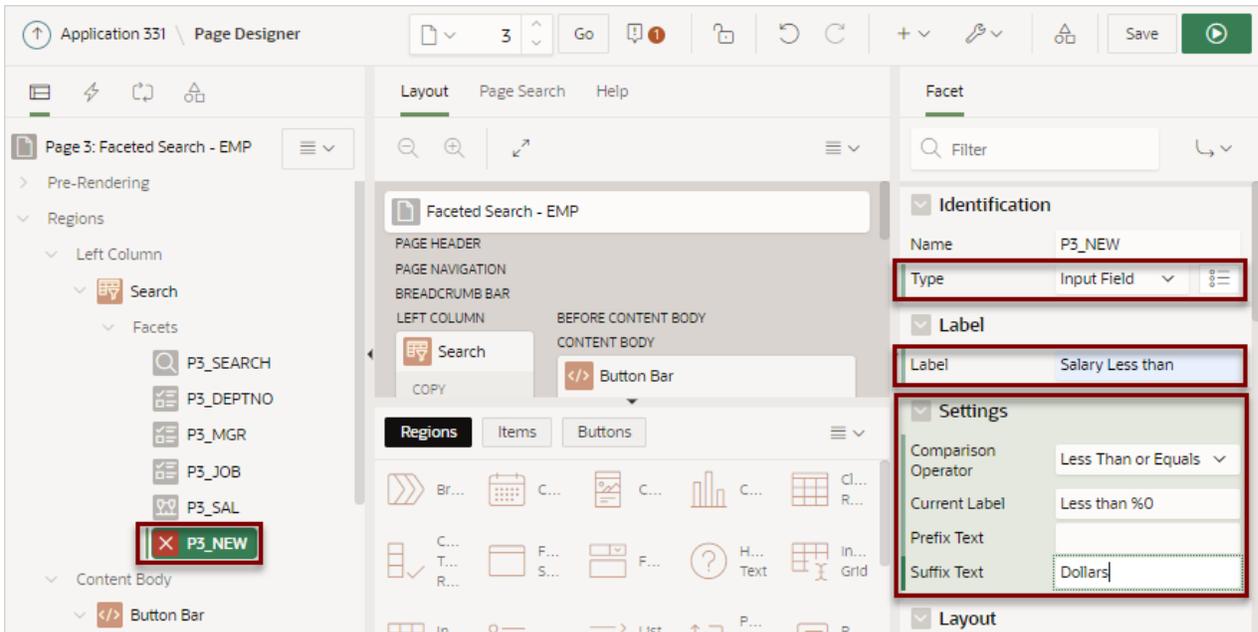
1. To create an Input Field facet:
 1. View the faceted search page in Page Designer.
 2. Create the new fact:
 - a. In the Rendering tab (or left pane), find the **Search** region.

- b. Right-click **Facets** and select **Create Facet** from the context menu.



A new facet appears in the Rendering tab. In this example, the facet is named **P3_NEW**.

3. In the Rendering tab, select the new facet and then update the following attributes in the Property Editor (right pane):
 - a. Identification, Type - Specify how this item is rendered. Select **Input Field**.
 - b. Label, Label - Enter the label for the facet. The label displays on the page only if the facet displays. Enter:
Salary Less than
 - c. Settings, Comparison Operator - Select a comparison operation. Select **Less Than or Equals**.
 - d. Settings, Current Label - Provide the text to be displayed for this facet in the current facets area. The current value must be referenced with the %0 placeholder. Enter:
Less than %0
 - e. Settings, Suffix Text - Provide text to be displayed after the input field. Enter:
Dollars



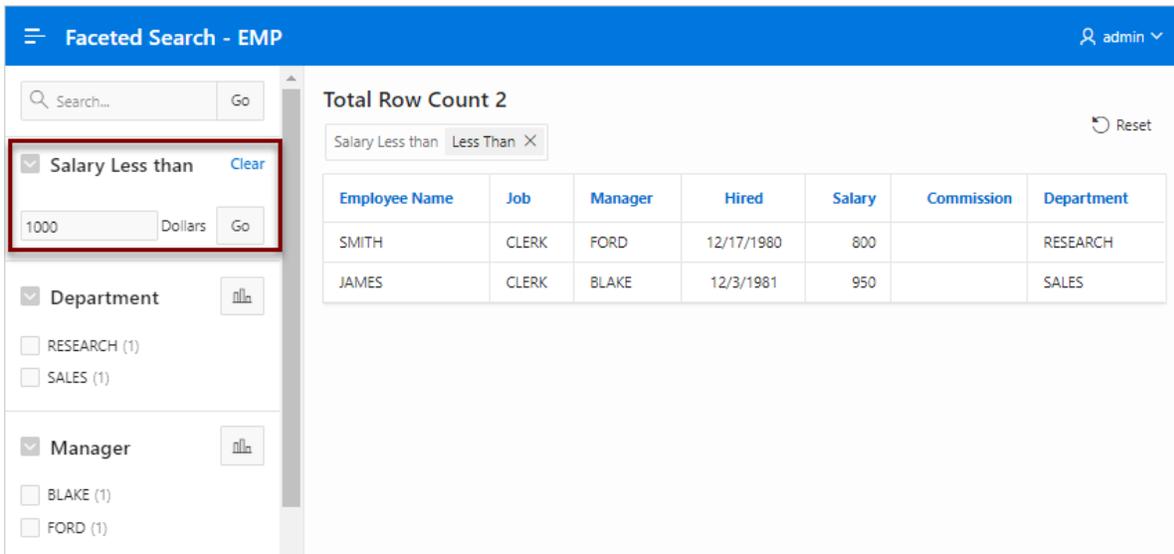
4. Map the facet to the appropriate database column.
 - Source, Database Column - Enter the case sensitive database column name used as the source for this facet. Since this facet maps to the SAL column, enter: SAL
5. Change the facet position so it displays after the **Search** facet.
 - Layout, Sequence - Enter: 30

Tip:

You can also drag and drop the **P3_NEW** facet in the Rendering tab to the appropriate location.

6. Review your changes. Click **Save and Run Page**.

The following example shows the new Input Facet in the Search region. In this example, the value 1000 is entered in the **Salary Less than** facet. The report in the Search Results region displays two employees that have a salary of less than \$1000.



The screenshot shows a web application titled "Faceted Search - EMP". It features a search bar at the top left with a "Go" button. Below the search bar, there are three filter sections: "Salary Less than" (highlighted with a red box), "Department", and "Manager". The "Salary Less than" filter has a text input field containing "1000" and a "Go" button. The "Department" filter has two checkboxes: "RESEARCH (1)" and "SALES (1)". The "Manager" filter has two checkboxes: "BLAKE (1)" and "FORD (1)".

On the right side, there is a "Total Row Count 2" section with a "Reset" button. Below this is a table with the following data:

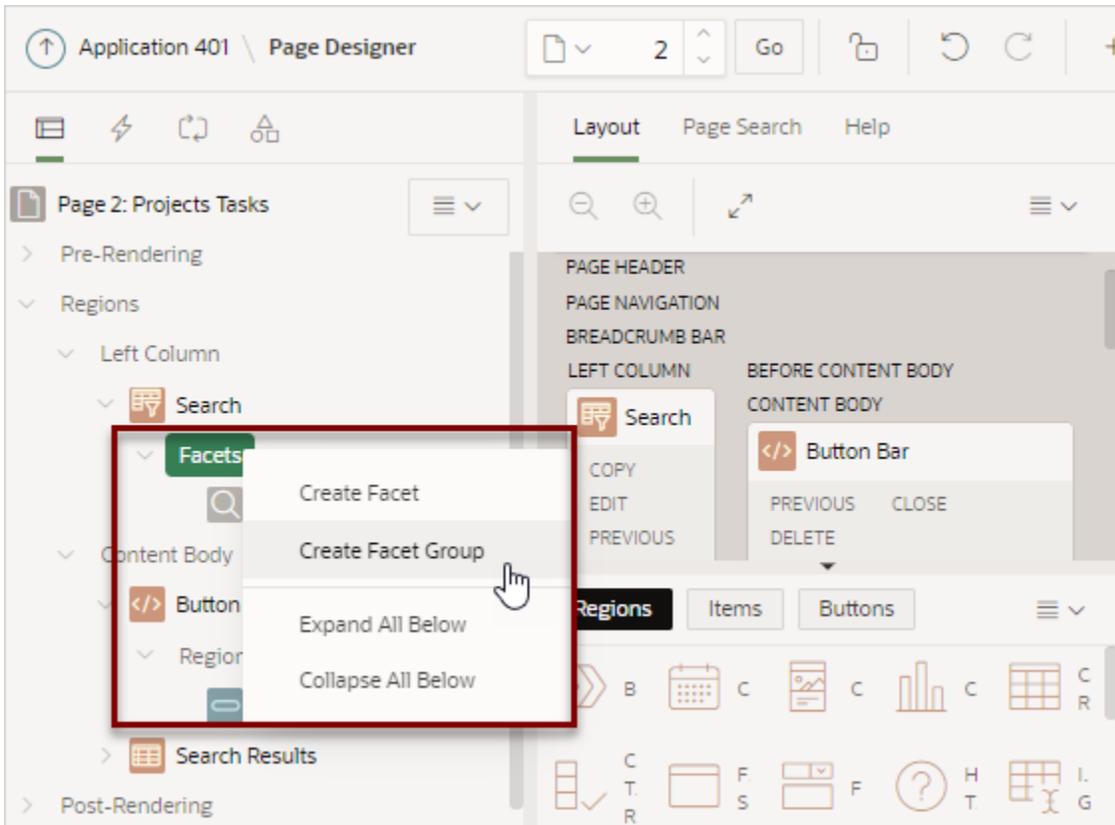
Employee Name	Job	Manager	Hired	Salary	Commission	Department
SMITH	CLERK	FORD	12/17/1980	800		RESEARCH
JAMES	CLERK	BLAKE	12/3/1981	950		SALES

8.5.6.6 Creating Facet Groups

Create facet groups for data models having multiple flag columns.

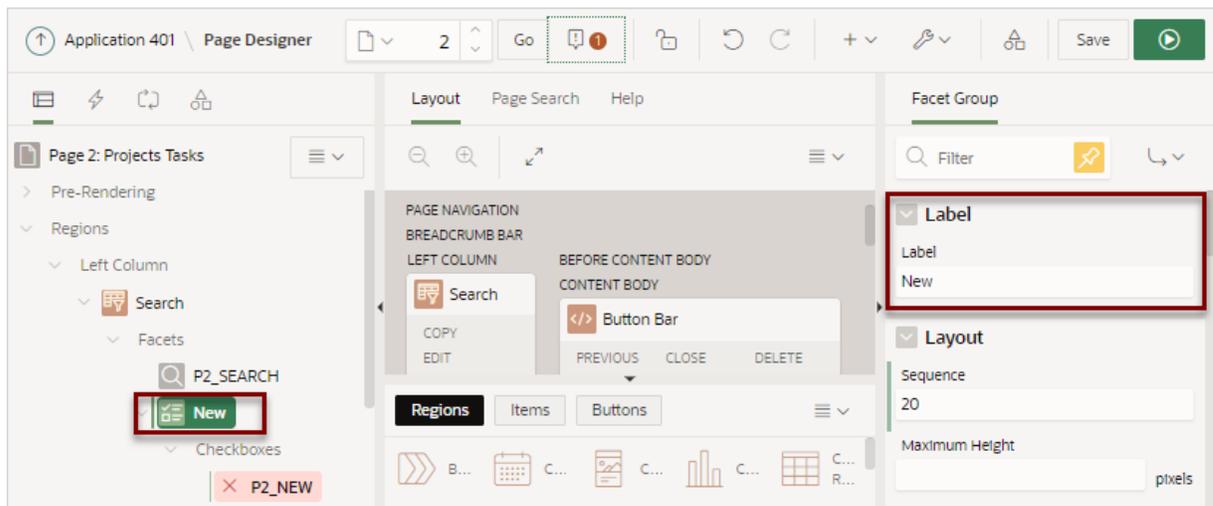
Data models having multiple flag columns can result in a busy faceted search UI. Flag columns typically display two values such as *Yes* or *No* (for example, *In Stock*, *Orderable*, and so on). To streamline your faceted search UI, you can create a facet group which displays one facet that contains multiple check boxes.

1. To create a facet group:
 1. View the faceted search page in Page Designer.
 2. In the Rendering tab (or left pane), find the **Search** region.
 3. In the Rendering tab (or left pane), right-click **Facets** and select **Create Facet Group** from the context menu.

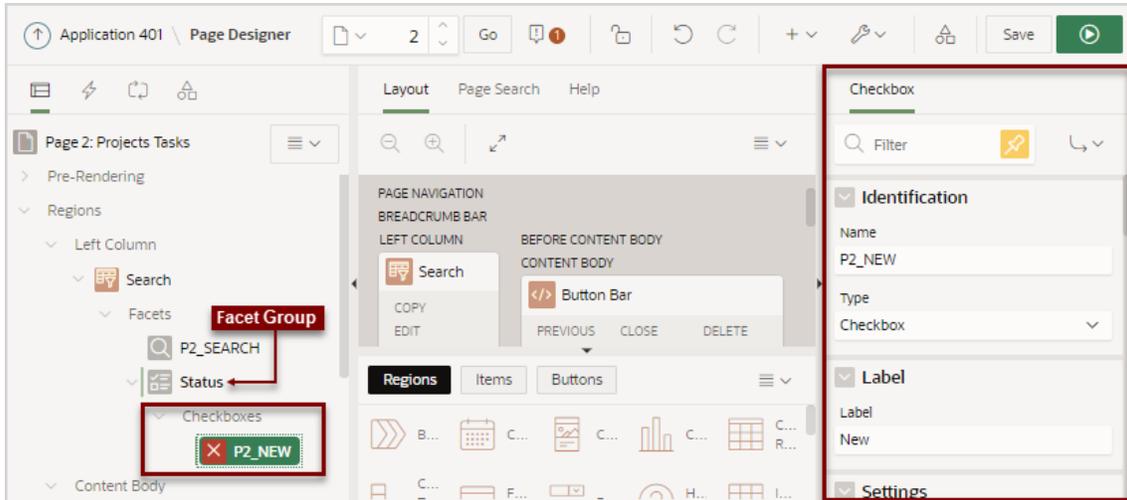


A Facet Group appears in the Rendering tab and a new checkbox named PX_NEW.

4. Update the label for the new facet group:
 - a. In the Rendering tab, select the new facet group, **New** (if not already selected).
 - b. In the Property Editor, edit the **Label** attribute.



5. Edit the checkbox, **PX_NEW**
 - a. In the Rendering tab, select the checkbox facet, **PX_NEW**.



- b. In the Property Editor, edit the following Checkbox attributes:
 - Identification, Name - Update the name of this item.
 - Settings, Use Defaults - Disable **Use Defaults**.
The Checked Value attribute appears.
 - Settings, Checked Value - Enter the value stored in the page item if the user checks the checkbox. The value can be up to 255 characters long.
 - Source, Database Column - Enter the case sensitive database column name used as the source for this facet.
 - Source, Data Type - Select the data type of the underlying database column.
6. Add more facet check boxes:
 - a. In the Rendering tab (or left pane), right-click **Checkboxes** and select **Create Checkbox**.
A new checkbox named **PX_NEW** appears.
 - b. In the Property Editor (or right pane), edit the following Checkbox attributes:
 - Identification, Name - Update the name of this item.
 - Settings, Settings - Select **Custom**.
 - Settings, Checked Value - Enter the value stored in the page item if the user checks the checkbox. The value can be up to 255 characters long.
 - Database Column - Enter the case sensitive database column name used as the source for this facet.
 - Data Type - Select the data type of the underlying database column.
7. Repeat the previous step until all facet checkboxes have been added.
8. Review your changes. Click **Save and Run Page**.

8.5.6.7 Configuring Single Facet Charts

Configure region and facet attributes to declaratively control how and if single facet charts display in the facet search region.

By default, when you create a facet that computes counts with a wizard, each facet that computes counts includes a chart based on the facet counts. When users click the **Show Chart** icon, a chart displays in a popup dialog. Users can toggle between a bar chart and pie chart by clicking the chart icon on the right side of the dialog. You can configure region and facet attributes to control if these charts appears.



Note:

To view an example of a single chart based on the facet counts, see "[Example Faceted Search](#)."

1. To configure region and facet attributes to control facet charts:
1. Edit faceted search region attributes:
 - a. In the Rendering tab (or left pane), select the **Search** region.
 - b. In the Property Editor (right pane), select the **Attributes** tab.
 - c. Settings, Show Charts - Options include:
 - **Popup** - Displays a **Show Chart** icon in the facet header. When the user clicks the **Show Chart** icon, a popup dialog displays the chart.
 - **No** - A Show Chart icon does not display in the facet header.
Also when this attribute is set to **No**, then the facet attributes **Show Chart** and **Show Chart Initially** are not applicable.
 - **Selector** - Specify the selector for an element you place somewhere on the page. When the user clicks the **Show Chart** icon, the chart is added to this element. This option enables you to place the charts in a dashboard like area just about anywhere on the page.
For example, suppose you added a static content region somewhere on the page and added a `<div>` with an `id` like this:

```
<div id='facetDashboardArea'></div>
```


Then in the Charts Selector attribute you would enter:

```
#facetDashboardArea
```
 - d. Settings, Display Chart for Top N Values - Use this attribute to control the maximum number of values to display in the chart for each facet. A value of 10 means that the facet charts will show at most the first 10 items. If the facet has the Sort By Top Counts attribute **On** then this will be the 10 largest count values.

 **Tip:**

You may need to reset the region before changes to **Display Chart for Top N Values** appear because the current set of visible charts is stored in browser session storage.

2. Configure facet attributes.
 - a. In the Rendering tab locate the **Search** region and select a facet.
 - b. In the Property Editor, review the following facet attributes:
 - List Entries, Compute Counts - Single facet charts are based on facet counts. Note that **Compute Counts** must be enabled for the **Show Chart** icon to display in the facet header.
 - List Entries, Show Chart - Enable or disable this option to show or hide the **Show Chart** icon in the facet header.
 - List Entries, Show Chart Initially - Enable this option to have the chart display initially. Charts can only display initially if the **Show Charts** attribute is set to **Selector**.

 **Tip:**

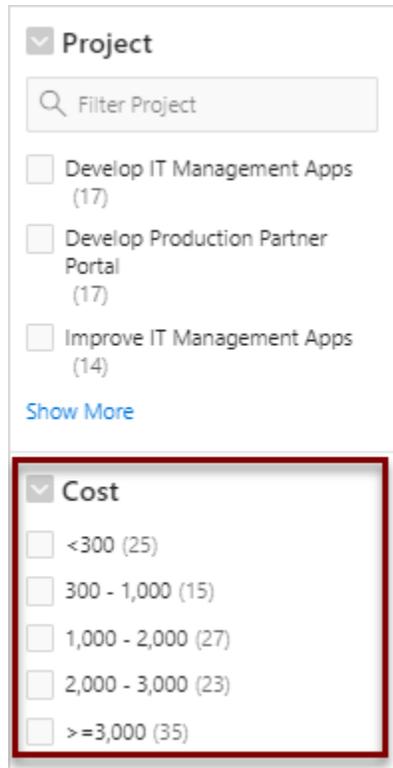
You may need to reset the region before changes to **Show Chart Initially** appear because the current set of visible charts is stored in browser session storage.

3. Click **Save** or **Save and Run Page**.

8.5.6.8 Editing the Static List of Values for a Range Facet

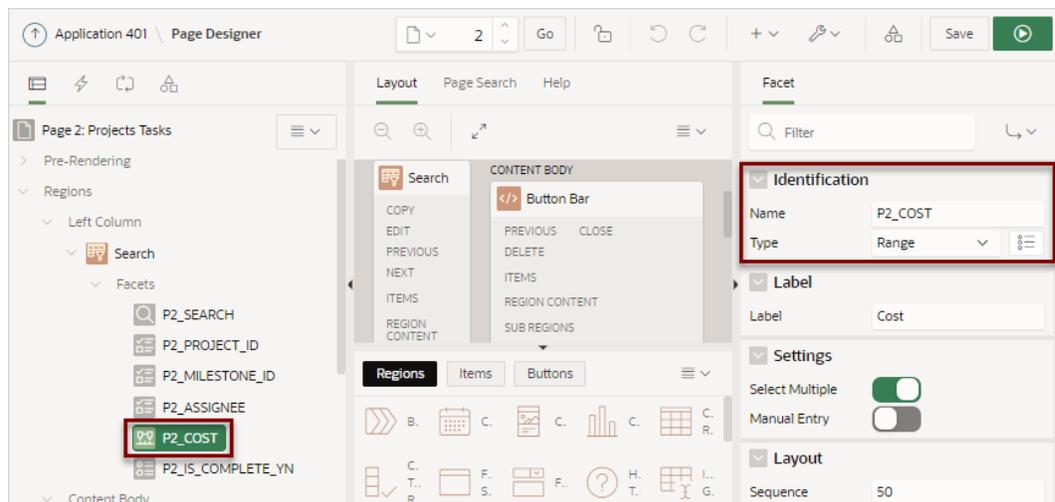
Edit a range facet that displays as a static list of values.

The following example demonstrates how to edit a facet that renders as a static list of values. The following example is built on the `COST` column of the `EBA_PROJECT_TASKS` table available in the sample dataset, Project Data. This example demonstrates how to update the Cost list shown in the following illustration so that the first two rows display in increments of 500 instead of 300.

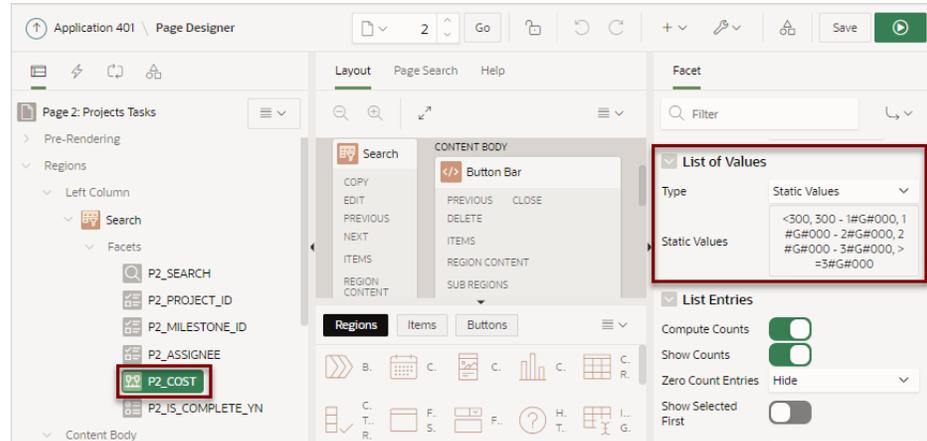


1. To edit a facet that displays as a static list of values:
1. View the faceted search page in Page Designer.
2. In the Rendering tab (or left pane) locate the **Search** region and select the facet, for example **P2_COST**.

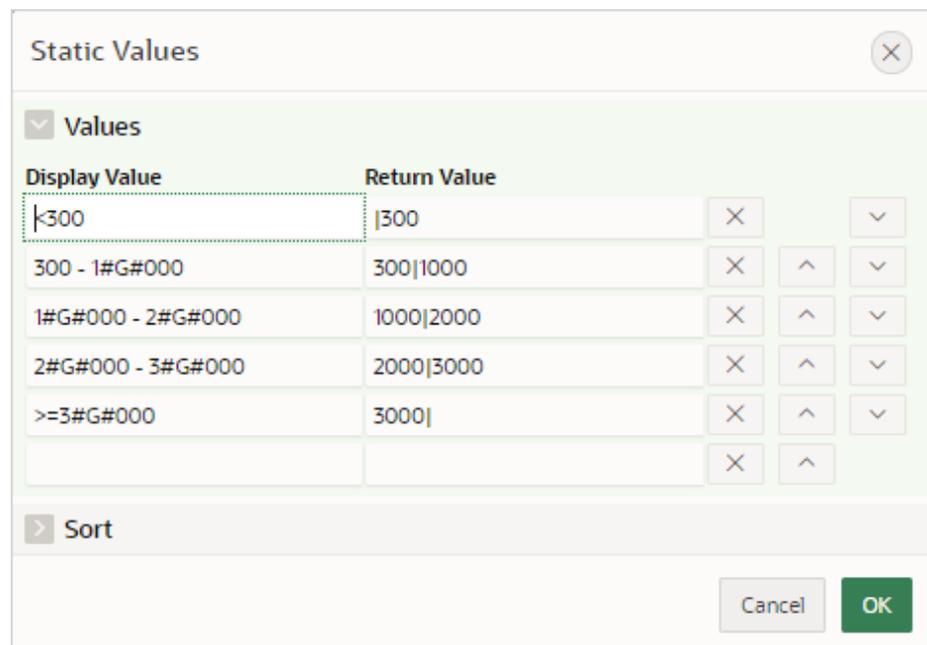
In the Property Editor (or right pane) note that the **Type** attribute indicates that P2_COST is defined as a **Range**.



3. Edit the List of Values:
 - a. Find the **List of Values** group.
 - b. Click **Static Values**.



The Static Values dialog appear.



To avoid hard-coding a specific separator in the Display Value, the Static Values dialog uses substitution strings which are replaced with the appropriate NLS separator at runtime.

In this example, the substitution string #G# is replaced with the NLS Group Separator, comma (,). Other lists can include a #D# substitution string which is replaced at runtime with the NLS Decimal Separator.

Therefore, in this example 1#G#000 - 2#G#000 displays at runtime as 1,000 - 2,000.

- c. Update the Display Values and Return Values of the first two facets to use increments of 500:
 - Row 1:
 - **Display Value** - Update <300 to <500
 - **Return Value** - Update | 300 to | 500
 - Row 2:
 - **Display Value** - Update 300 - 1#G#000 to 500 - 1#G#000

– **Return Value:** Update 300|1000 to 500|1000

Display Value	Return Value
<500	500
500 - 1#G#000	500 1000
1#G#000 - 2#G#000	1000 2000
2#G#000 - 3#G#000	2000 3000
>=3#G#000	3000

- d. Click **Ok** to accept the changes.
4. Review your changes. Click **Save and Run Page**.

The revised facets search page displays. Note the first two facets in the Cost list display as **<500** and **500 - 1,000**.

- Cost
- <500 (25)
- 500 - 1,000 (15)
- 1,000 - 2,000 (27)
- 2,000 - 3,000 (23)
- >=3,000 (35)

8.6 Managing Interactive Grids

An interactive grid presents users a set of data in a searchable and customizable report.

Interactive grids include the customization capabilities available in interactive reports plus the ability to rearrange the report interactively using the mouse and keyboard.

- [Example Interactive Grid](#)
View interactive grid examples.
- [Creating an Interactive Grid Using the Create Application Wizard](#)
Run the Create Application Wizard to create a new application that contains one or multiple interactive grid report pages.
- [Creating Master Detail from an Existing Interactive Grid](#)

- [Managing Interactive Grid Region Attributes](#)
Edit region attributes to alter the SQL source, change the region layout and appearance, define a region displays selector, and create region conditions.
- [Managing Interactive Grid Attributes](#)
Edit interactive grid Attributes to control how an interactive grid works.
- [Managing Interactive Grid Column Attributes](#)
Edit column attributes to control the display, features, and behavior of interactive grid columns.
- [About Customizing Interactive Grids in a Running Application](#)
When running an application, users can alter the report layout using Column menus and sort options, rearrange columns by dragging and dropping, and change how data displays using options on the Actions menu.
- [Saving Interactive Grid Reports](#)
After users customize an interactive grid they can save it as either a Private or Public report.
- [Linking to Interactive Grid Reports](#)
Developers can use the syntax in the `Request` value and `ItemNames` section of the URL to link to interactive grid report.

 **See Also:**

- ["Creating a Report Using the Create Page Wizard"](#)
- ["Using Interactive Grids" in *Oracle Application Express End User's Guide*](#)
- ["Making an Existing Interactive Grid Editable"](#)

8.6.1 Example Interactive Grid

View interactive grid examples.

An interactive grid presents users a set of data in a searchable, customizable report. Functionally, an interactive grid includes most customization capabilities available in interactive reports plus the ability to rearrange the report interactively using the mouse and keyboard. Users can lock, hide, filter, freeze, highlight, sort individual columns, and create control breaks on specific columns using the **Actions** and **Column Heading** menus. Advanced users can define breaks and aggregations against columns. Users can also directly customize the appearance of an interactive grid. Users can use the mouse and keyboard to resize the width of a column and drag and drop columns into different places in the grid. Once customized, the report can be saved as either a private or public report. Both the Create Application Wizard and Create Page Wizard support the creation of interactive grids.

The following is an example of an interactive grid.

The screenshot shows an interactive grid with a search bar at the top left containing 'Search: All Text Columns' and a 'Go' button. To the right is an 'Actions' dropdown menu. The grid has columns: Status Id, Name, Description, Project Lead, Completed, Created, and Updated. The 'Data' menu is open, showing options: Columns, Filter, Data (selected), Sort (highlighted), Format, Selection, Chart, Report, Download, and Help. The grid shows 12 rows of data. At the bottom, it says '1 rows selected' and 'Total 12'.

Editable Interactive Grid

Developers have the option of making an interactive grid editable. In an editable interactive grid, users can also add to, modify, and refresh the data set directly on the page. Editable interactive grids include additional controls. A Row Actions menu displays at the start of each row and enables users to add, edit, and refresh rows. Edit, Save, and Add Row buttons also display to the right of the Actions menu.

The following is an example of an editable interactive grid.

The screenshot shows an editable interactive grid. At the top, there is a search bar and a 'Go' button. To the right of the 'Actions' dropdown, there are three buttons: 'Edit', 'Save', and 'Add Row'. The grid has columns: Status Id, Name, Description, Project L..., Completed, Created, and Updated. A row is selected, and a context menu is open over it, showing options: Copy to Clipboard (Ctrl+C), Duplicate Rows, Delete Rows, Refresh Rows, Revert Changes, Copy Down, Fill, and Clear. The grid shows 12 rows of data. At the bottom, it says '1 rows selected' and 'Total 12'.

**Tip:**

To view interactive grid examples, install the sample apps, *Sample Reporting* and *Sample Interactive Grids*. To learn more, see [Sample Apps](#).

**See Also:**

- Using Interactive Grids in *Oracle Application Express End User's Guide*
- "[Making an Existing Interactive Grid Editable](#)"

8.6.2 Creating an Interactive Grid Using the Create Application Wizard

Run the Create Application Wizard to create a new application that contains one or multiple interactive grid report pages.

1. To create an interactive grid using the Create Application Wizard:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Click the **Create** button.
 3. Click **New Application**.
 4. For Name, enter the name used to identify the application to developers.
 5. For Appearance, accept the default Theme Style and menu layout (Vita, Side Menu), or change it by clicking the **Set Appearance** icon adjacent to the Appearance field.
 6. To add a report, click **Add Page** and select then select **Interactive Grid**.
 7. On Add Interactive Grid Page:
 - a. Page Name - Enter a name for this page.
 - b. Set Icon - Select an icon to display in the navigation menu for this page.
 - c. Page Source - Select the source for the report:
 - **Table or View**
 - **SQL Query**What you select determines what displays next. Follow the on-screen instructions. To learn more about an attribute, click the Help icon in the lower left corner.
 - d. Determine if the report is editable. Select either:
 - **Allow Editing**
 - **Read Only**
 - e. Advanced - Expand **Advanced** to configure these options:
 - Set as Home Page - Enable this to make this page the home page for the application.

- Set as Administration Page - Enable this to have this page display under Administration.
 - Page Help - Enter text to be displayed when the user selects Page Help.
- f. Click **Add Page**.
8. Features - Select features to include with the application. Features provide application-level functionality and can only be added once per application. To learn more, click the Help icon adjacent to **Features**.
 9. Settings - Specify settings used to generate this application. To learn more about an attribute, click the Help icon adjacent to **Settings**.
 10. Click **Create Application**.

**See Also:**

["Creating a Report Using the Create Page Wizard"](#)

8.6.3 Creating Master Detail from an Existing Interactive Grid

A single page master detail features two editable interactive grids based on two related tables or views. You can define any number of master detail relationships on a single page by simply adding a related interactive grid to the page. If you have an existing interactive grid, you can add another related interactive grid by doing the following:

- Create the parent interactive grid.
- Define the primary key (if needed).
- Create the child interactive grid.
- For the child interactive grid, specify the Master Region and Master Column.

The following example demonstrates how to create an interactive grid on the departments table, `OEHR_DEPARTMENTS` by running the Create Page Wizard. This wizard creates the parent interactive grid and enables you to define the primary key. Then, you create a child interactive grid on the employees table, `OEHR_EMPLOYEES`.

1. To add a related interactive grid below an existing grid:
 1. Create an application.
 2. Run the Create Page Wizard. On the Application home page, click **Create Page**
 3. In the Create Page Wizard:
 - a. Select a Page Type - Select **Report** and then select **Interactive Grid**.
 - b. Page Attributes - For Page Name enter 47 and click **Next**
 - c. Navigation Menu - Select how you want this page integrated into the Navigation Menu and click **Next**.
 - d. On Report Source:
 - Editing Enabled - Select **On**.
 - Source Type - Select **Table**.

- Table / View Name - Select **OEHR_DEPARTMENTS (table)**.
- Click **Create**.

Page Designer appears.

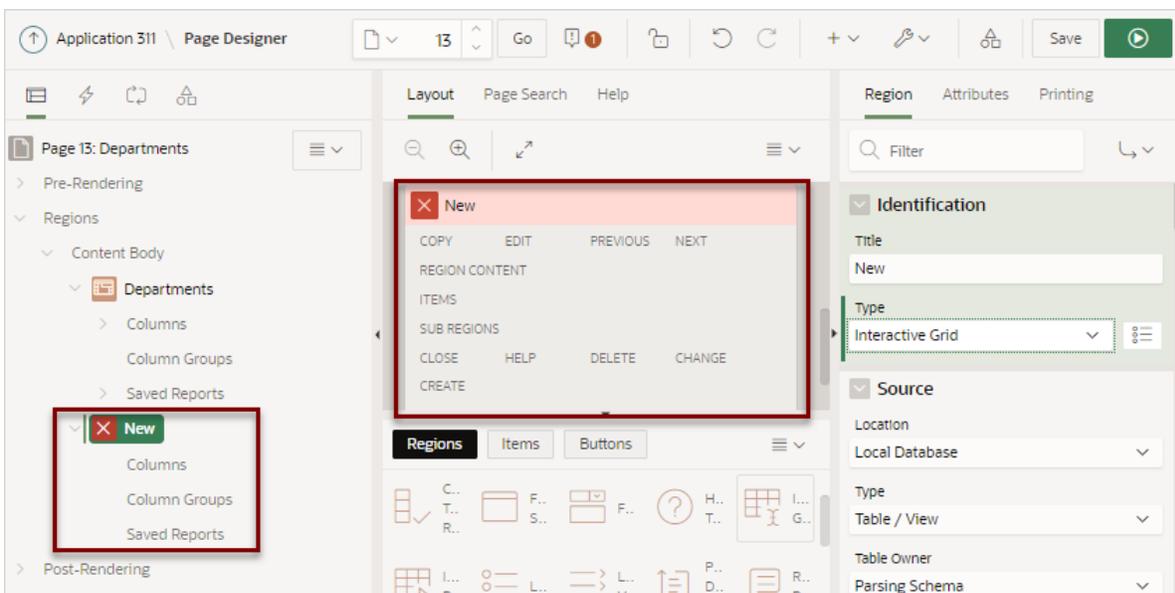
4. Click **Save and Run Page** to view a rendered version of the parent interactive grid.

This following illustration shows an editable interactive grid created on the OEHR_DEPARTMENTS table.

	Department Id	Department Name	Manager Id	Location Id
<input checked="" type="checkbox"/>	10	Administration	200	1700
<input type="checkbox"/>	20	Marketing	201	1800
<input type="checkbox"/>	30	Purchasing	114	1700
<input type="checkbox"/>	40	Human Resources	203	2400
<input type="checkbox"/>	50	Shipping	121	1500
<input type="checkbox"/>	60	IT	103	1400
<input type="checkbox"/>	70	Public Relations	204	2700
<input type="checkbox"/>	80	Sales	145	2500

5. Return to Page Designer. Click **Edit Page X** on the Runtime Developer toolbar.
6. Create the child interactive grid on the OEHR_EMPLOYEES table:
 - a. In the Gallery, locate the Regions tab.
 - b. Under Regions, find and then right-click **Interactive Grid**.
 - c. Select **Add To, Content Body**, the region, **Departments**, and then **After**.

The Rendering tab and Layout tab both display a new region in red.



7. Edit the New child region:
 - a. In the Rendering tab, select the **New** region (if not already selected).

- b. In the Property Editor, edit the region attributes:

 **Note:**

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.

- Identification, Title - Enter `Employees`.
- Source, Type - Select **SQL Query**.
- Source, SQL Query - Enter the query:

```
select OEHR_EMPLOYEES.EMPLOYEE_ID as EMPLOYEE_ID,  
       OEHR_EMPLOYEES.FIRST_NAME as FIRST_NAME,  
       OEHR_EMPLOYEES.LAST_NAME as LAST_NAME,  
       OEHR_EMPLOYEES.HIRE_DATE as HIRE_DATE,  
       OEHR_EMPLOYEES.EMAIL as EMAIL,  
       OEHR_EMPLOYEES.PHONE_NUMBER as PHONE_NUMBER,  
       OEHR_EMPLOYEES.JOB_ID as JOB_ID,  
       OEHR_EMPLOYEES.SALARY as SALARY,  
       OEHR_EMPLOYEES.DEPARTMENT_ID as DEPARTMENT_ID  
from OEHR_EMPLOYEES
```

- Layout, Start New Row - Select **On**.
 - Appearance, Template - Select **Standard**
 - Master Detail, Master Region - Select the region, **Departments**.
8. For the child interactive grid, `Employees`, define `DEPARTMENTS` as the Master Column:
- a. In the Rendering tab, under the child interactive grid, **Employees**, expand the Columns node and select **DEPARTMENT_ID**.
 - b. In Property Editor, edit the following:
 - Find **Master Detail**.
 - For Master Column, select **DEPARTMENT_ID**.
9. Click **Save**. To run the page, click **Save and Run Page**.

		Department Name ↓	Manager Id
<input type="checkbox"/>	☰	Construction	-
<input type="checkbox"/>	☰	Benefits	-
<input type="checkbox"/>	☰	Administration	200
<input checked="" type="checkbox"/>	☰	Accounting	205

1 rows selected
Total 27

Employees

Employee Id	First Name	Last Name	Hire Date	Email	Phone Num...	Job Id	Salary
205	Shelley	Higgins	07-FEB-2012	SHIGGINS	515.123.8080	AC_MGR	12000
206	William	Gietz	07-FEB-2012	WGIETZ	515.123.8181	AC_ACCOUNT	8300

Total 2

Note that parent, **Department**, filters the results in **Employees**, the child.

Next, make the child, **Employees**, editable.

10. Make **Employees** report editable:
 - a. Access Page Designer. Click the **Edit Page XX** on the Runtime Developer Toolbar.
 - b. In the Rendering tab, select the **Employees** region.
 - c. In the Property Editor, click the **Attributes** tab.
 - d. In the Property Editor, edit the following:
 - Edit, Enabled - Select **On**.
 - Allowed Operations - Verify the following operations are enabled: **Add Row**, **Update Row**, and **Delete Row**.
11. Define the **EMPLOYEE_ID** column as the Primary Key Column:
 - a. In the Rendering tab, under **Employees**, expand **Columns** and select **EMPLOYEE_ID**.
 - b. In the Property Editor, find **Source**, **Primary Key** and select **On**.
12. Click **Save**. To run the page, click **Save and Run Page**.

The child interactive grid, **Employees**, is now editable

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		Department Name ↓	Manager Id		
<input type="checkbox"/>	☰	Construction	-		
<input type="checkbox"/>	☰	Benefits	-		
<input type="checkbox"/>	☰	Administration	200		
<input checked="" type="checkbox"/>	☰	Accounting	205		

1 rows selected Total 27

Employees

		Employee Id	First Name	Last Name	Hire Date	Email	Phone Num...	Job Id		
<input checked="" type="checkbox"/>	☰	205	Shelley	Higgins	07-FEB-2012	SHIGGINS	515.123.8080	AC_MGR		
<input type="checkbox"/>	☰	206	William	Gietz	07-FEB-2012	WGIETZ	515.123.8181	AC_ACCOUNT		

8.6.4 Managing Interactive Grid Region Attributes

Edit region attributes to alter the SQL source, change the region layout and appearance, define a region displays selector, and create region conditions.

- [Editing Interactive Grid Region Attributes](#)
- [Displaying Interactive Grids Conditionally](#)



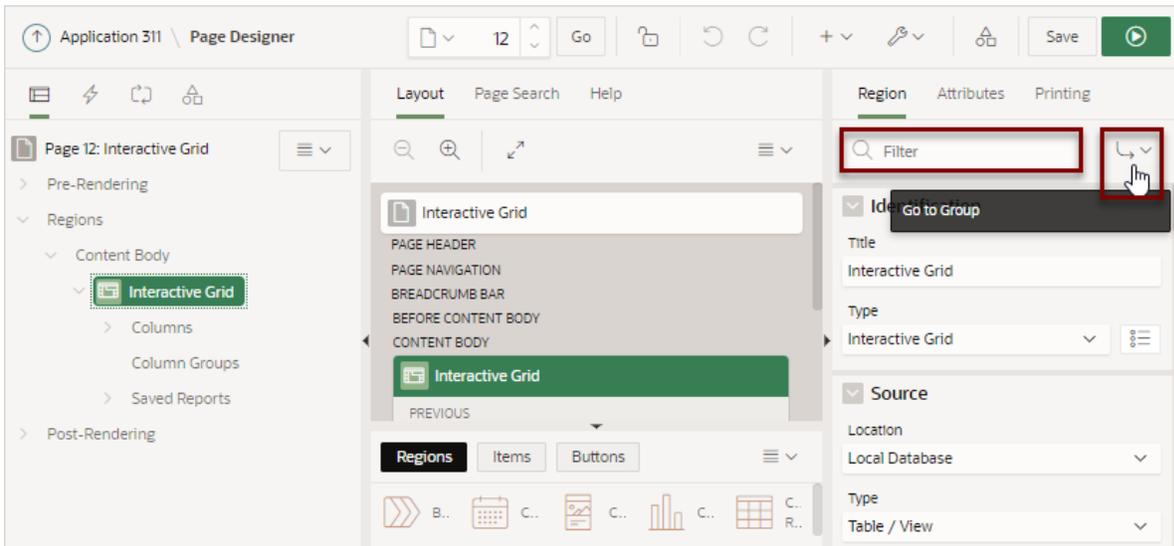
See Also:

["Editing Pages in Page Designer"](#)

8.6.4.1 Editing Interactive Grid Region Attributes

- To edit region attributes in Page Designer:
 - View the page in Page Designer:
 - On the Workspace home page, click the **App Builder** icon.
 - Select an application.
 - Select a page.
 Page Designer appears.
 - In the Rendering tab, select the region.

In the Property Editor, the **Region** tab displays the attributes. Attributes are organized in groups.



Use region attributes to alter the SQL source, change the region layout and appearance, create a master detail, define a region displays selector, or create conditions.

3. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
 - **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
4. Edit the appropriate attributes.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

 **See Also:**

"Right Pane of Page Designer (Property Editor)"

8.6.4.2 Displaying Interactive Grids Conditionally

You can choose to have interactive grids display conditionally by editing region attributes.

1. To display an interactive grid conditionally:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region.
The Property Editor displays the **Region** tab. Attributes are organized in groups.
 3. Edit **Server-side Condition**:
 - a. Find the **Server-side Condition** group.
 - b. **Type** -Select a condition type and follow the on-screen instructions.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

4. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.5 Managing Interactive Grid Attributes

Edit interactive grid Attributes to control how an interactive grid works.

- [Editing Interactive Grid Attributes](#)
- [Making an Existing Interactive Grid Editable](#)
- [Controlling Interactive Grid Pagination](#)
- [Customizing the Interactive Grid Toolbar](#)
- [Enabling Users to Save Interactive Grid Public Reports](#)
- [Enabling Flashback and Charts](#)
- [Configuring Interactive Grid Download Formats](#)
- [Enabling Icon View in an Interactive Grid](#)
- [Enabling Detail View in an Interactive Grid](#)

8.6.5.1 Editing Interactive Grid Attributes

1. To edit interactive grid Attributes:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
Page Designer appears.

2. In the Rendering tab, select the region containing the interactive grid.
3. In the Property Editor, select the **Attributes** tab.

The Property Editor displays the attributes. Attributes are organized in groups.

 **Tip:**

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

4. Edit the appropriate attributes.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

 **See Also:**

"Right Pane of Page Designer (Property Editor)"

8.6.5.2 Making an Existing Interactive Grid Editable

End users can alter the report layout of an interactive grid using Column menus and sort options, rearrange columns by dragging and dropping, and change how data displays using options on the Actions menu. However, developers determine whether the underlying data is read-only or editable by users. When an interactive grid is editable, end users can edit the underlying data, add rows, delete rows, and refresh rows. By default, editable interactive grids include a Save button on the toolbar.

1. To make an interactive grid editable:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the interactive grid.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. In the Property Editor **Attributes** tab, find the **Edit** group and update the following attributes:
 - a. **Enabled** - Select **On**.
Selecting **On** automatically creates a process to process the records.

- b. **Allowed Operations** - Select supported data manipulation operations. Options include: **Add Row, Update Row, Delete Row**
- c. **Allowed Row Operations Column** - Select a column where the column value indicates if the row can be updated and/or deleted.
- d. **Lost Update Type** - Select how to protect data against lost updates.

Lost updates occur when two or more users try to update the same data, and the last update overwrites updates made by the previous user. To prevent this, updates can check the existing column value(s) in the database with the value(s) retrieved when the record was originally queried. For an example, see Page Designer Help.

Lost Update Type options include:

- **Row Values** - A checksum value is calculated for each row, when initially querying the data. The checksum is calculated by concatenating all of the updateable columns into a string and then generating a unique value. When committing the updated record, this checksum is compared to the checksum value.
 - **Row Version Column** - If your database table includes a column which is incremented every time a record is updated, preferably by a database trigger, then this column can be used instead of calculating checksums. Oracle does not recommend this option if your interactive grid updates data in multiple tables.
- e. **Add Row If Empty** - Specify whether to add a new row if the interactive grid currently has no records returned. When enabled, the `No Data Found` message never displays since there will always be at least one record. If no updates are made to the record that was added it will not be inserted when the region is saved.
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.5.3 Controlling Interactive Grid Pagination

Pagination provides the end user with information about the number of rows displayed and the current position within the result set.

1. To change interactive grid pagination:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, locate the region containing the interactive grid.
 3. Under the region, select the **Attributes** node.

The Property Editor displays the attributes. Attributes are organized in groups.

Tip:

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, click **Go to Group** and select the group.

4. Find **Pagination**.

Pagination attributes provide the end user with information about the number of rows displayed and the current position within the result set.

Tip:

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. Under **Pagination**, edit the following attributes:

a. **Type** - Select an option:

- **Page** - Rows display based on what the end users select in the Actions menu, Format, Rows per Page option. If there are additional rows, controls are added to the report footer which enables users to navigate forwards and backwards between row sets.
- **Scroll** - Rows display to fill the height of the interactive grid. As the end user scrolls, additional rows display as needed.

b. **Show Total Row Count** - Select **Yes** or **No**.

Selecting **Yes** displays the total row count in the report footer. Enabling this option requires an additional query which may hinder performance on very large data sets

6. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.5.4 Customizing the Interactive Grid Toolbar

All interactive grids include a toolbar at the top of the page. Developers can customize what controls display on the toolbar or remove it.

Note:

Some of the options described in this procedure only apply if the interactive grid is editable. See "[Making an Existing Interactive Grid Editable](#)".

1. To customize the interactive grid toolbar:

1. View the page in Page Designer:

- a. On the Workspace home page, click the **App Builder** icon.
- b. Select an application.
- c. Select a page.

Page Designer appears.

2. In the Rendering tab, locate the region containing the interactive grid.

3. Under the region, select the **Attributes** node.

The Property Editor displays the attributes. Attributes are organized in groups.

 **Tip:**

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, click **Go to Group** and select the group.

4. In the Property Editor, find the **Toolbar** group and edit the following:
 - a. Show - Select **Yes** or **No** to determine if a toolbar displays above the report.
 - b. Controls - Configure the following:
 - **Search Column Selection** - Enables search for the selected column.
 - **Search Field** - Enables search for the selected field.
 - **Actions Menu** - Select this option to include the Actions menu in the report.
 - **Reset** - Removes any customizations (such as filters, column width, ordering, and so on) and reloads the report definition from the server.
 - **Save Button** - Saves changes made to the interactive grid, without needing to save the whole page. The **Save** button only displays when an interactive grid is editable and the end user has authorization to add, update or delete.
 - c. **Add Button Label** only displays when the interactive grid is editable. For **Add Button Label**, enter an alternative label for the Add button. The default label is **Add Row**.
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.5.5 Enabling Users to Save Interactive Grid Public Reports

Users can save an interactive grid as a Public report if the report developer enables that capability. Public reports display in a select list of available reports on the toolbar and are available to all users. However, only the user who creates a Public report can save, rename, or delete it. You can further restrict who can save Public reports by selecting an authorization scheme.

 **Tip:**

The Save Public Report attribute is only available to authenticated users and can be further restricted by the defined Authorization scheme. See "[Establishing User Identity Through Authentication](#)."

1. To enable end users to save Public reports:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the interactive grid.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. In the Property Editor, find the **Enable Users To** group and edit the following:

- a. **Save Public Report** - Select **On**. Selecting **Off** enables users to save the current report as a Public report.
 - b. **Save Public Report Authorization** - Only displays if **Save Public Report** is set to **On**. Select an authorization scheme to restrict who can save public report definitions. To enable an end user to save a public report, this authorization scheme must evaluate to TRUE for that user. If you do not select an authorization scheme, then any user may save public reports.
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.5.6 Enabling Flashback and Charts

Developers can enable flashback queries and support for Chart view by editing the interactive grid Attributes, Flashback and Define Chart View

1. To enable Flashback or Define Chart View:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the interactive grid.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. In the Property Editor, find the **Enable Users To** group and edit the following:
 - a. **Flashback** - Specify whether end users can utilize flashback queries for this interactive grid.

Flashback queries utilize the Oracle Flashback Technology and Database Point-in-Time Recovery to view data as it existed at a previous point in time. Users can only query this data, but can not rewind any data changes. How far back in time they can successfully perform a flashback query is determined by when the redo log files were last switched within the Oracle database, as this technology utilizes the RMAN backup.
 - b. **Define Chart View** - Specify whether end users can define a chart for this interactive grid.
 5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.5.7 Configuring Interactive Grid Download Formats

1. To configure interactive grid download formats:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the interactive grid.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. In the Property Editor **Attributes** tab, find **Enable User To** and edit the following:
 - **Download** - Select **On**.

 **Tip:**

Setting Download to **Off** prevents the Download menu from displaying on the Actions menu. To fully prevent users from downloading data, deselect all Download Formats described in the next step.

5. Find **Download** and edit the following:
 - a. **Authorization** - Select an authorization scheme to restrict who can download. To enable an end user to download, this authorization scheme must evaluate to TRUE for that user.
 - b. **Download Formats** - Select download formats:
 - **CSV**
 - **HTML**
 - **PDF**
 - **Excel**
 - c. **Send as Email** - Specify whether end users can send an email, with the report download included as a HTML attachment.

Email is only available to authenticated users, and requires the SMTP to be configured within Application Express Administration Services application (Administration Services), by an Instance Administrator.
 - d. **CSV Separator** - (CSV only) Define the column separator. If no value is entered, a comma or semicolon is used depending on your current NLS settings.
 - e. **CSV Enclosed By** - (CSV only) Enter a delimiter character. This character delineates the starting and ending boundary of a data value. Default delimiter is double quotation marks (" ").
 - f. **Filename** - Enter a name for the downloaded document. Do not specify a file extension, the extension is added automatically. If you leave this blank, the region name is used as the file name.
 - g. **Supplemental Text** - Enter text that displays at the top of the download file. Use this attribute to for data classification, legal, or warning messages about the data in the file.

 **WARNING:**

Do not use the Supplemental Text attribute with CSV download. If you enable **CSV** download, the defined text will invalidate the CSV file format.

6. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.5.8 Enabling Icon View in an Interactive Grid

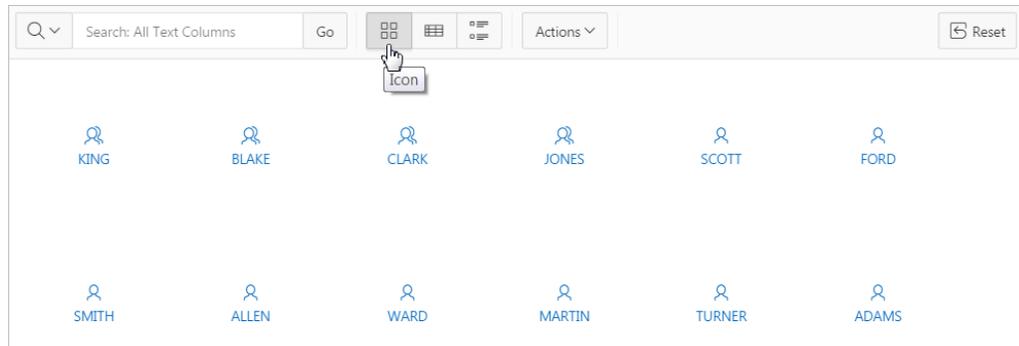
Interactive grids support different views of data. By default, interactive grids display data in a Grid view. Developers can optionally display data as icons. Enabling Icon view adds an Icon button to the select view button group.

- [About Icon View in an Interactive Grid](#)

- [Adding Icon View to an Interactive Grid](#)
- [Adding a Custom Icon View Link to an Interactive Grid](#)

8.6.5.8.1 About Icon View in an Interactive Grid

Interactive grids support different views of data. Users can switch between these views by clicking the buttons in the select view button group. The following illustration shows an interactive grid with Icon view enabled and the Icon button selected. To enable Icon view, you must identify the columns used to identify the icon, the label, and the target (that is, the link).



Viewing a Working Example of Icon View

To see a working example of this Icon view, install the sample application, *Sample Interactive Grids* and review **Reporting, Icon and Detail Views**.

8.6.5.8.2 Adding Icon View to an Interactive Grid

An important requirement of icon view is that each item in the view must have the same width and height and the item content must not overflow. The width and height are set with CSS rules on elements with a class of `a-IconList-item`.

1. To add an Icon view to an interactive grid:
 1. View the page in Page Designer:

Page Designer appears.
 2. In the Rendering tab, select the region containing the interactive grid.
 3. In the Property Editor, select the **Attributes** tab.

The Property Editor displays the attributes. Attributes are organized in groups
 4. In the Property Editor **Attributes** tab, find the **Icon View** group and edit the following:
 - a. **Show** - Specify whether the Icon View is enabled. Select **On**.
 - b. **Custom** - Select **On**. Selecting **On** provides full control over the icon view item markup but also requires a full understanding of HTML markup.
 - c. **Icon Type** - Select the column type that holds the icon image source. Select **Icon CSS Classes**. You must also add a column to your SQL statement that has a value that is a CSS class for an icon (for example, a Font APEX icon class name). As an alternative, you can also select **Image in URL** and then specify the column that contains the URL and Icon Attributes.

- d. **Icon** - Select the interactive grid column that returns the CSS classes for the icon image source.
 - e. **Link Target** - Click **No Link Defined** to display the Link Builder - Link Target dialog. The link target defined is followed when the user activates the icon link with mouse or keyboard.
 - f. **Link Attributes** - Enter HTML attributes that are associated with the display of each Link Target.
 - g. **Label Column** - Select the report column that returns the image label.
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.5.8.3 Adding a Custom Icon View Link to an Interactive Grid

A custom Icon View link provides greater flexibility in defining the content of the Icon View, including the ability to utilize more than one column.

1. To add custom Icon View link to an interactive grid:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the interactive grid.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. In the Property Editor **Attributes** tab, find the **Icon View** group and edit the following:
 - a. **Show** - Select **On**.
 - b. **Custom** - Select **Off**. Selecting **On** provides full control over the icon view item markup but also requires a full understanding of HTML markup..
 - c. **Icon Type** - Select the column type that holds the icon image source. Select **Icon CSS Classes**. You must also add a column to your SQL statement that has a value that is a CSS class for an icon (for example, a Font APEX icon class name). As an alternative, you can also select **Image in URL** and then specify the column that contains the URL and Icon Attributes.
 - d. **Icon** - Select the interactive grid column that returns the CSS classes for the icon image source.
 - e. **Link Target** - Click **No Link Defined** to display the Link Builder - Link Target dialog. The link target defined is followed when the user activates the icon link with mouse or keyboard.
 - f. **Link Attributes** - Enter HTML attributes that are associated with the display of each Link Target.
 - g. **Label Column** - Select the report column that returns the image label.
 5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

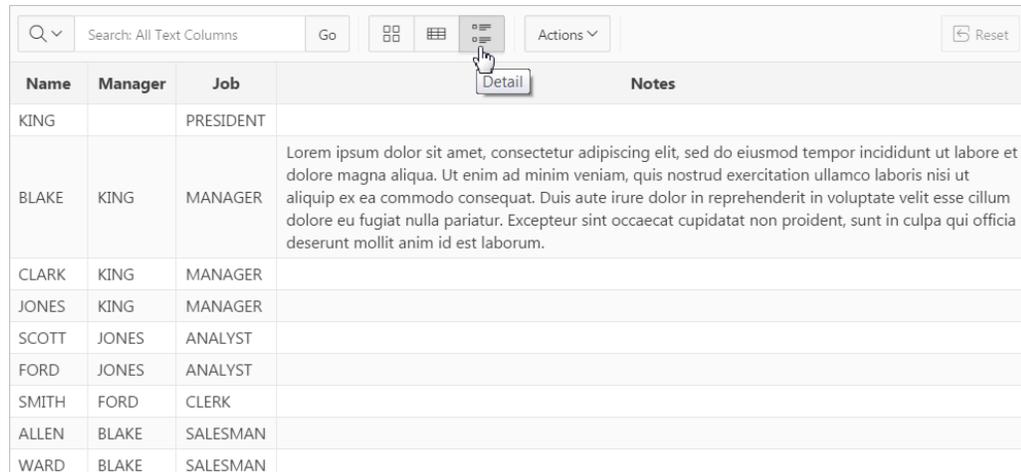
8.6.5.9 Enabling Detail View in an Interactive Grid

Interactive grids support different views of data. By default, interactive grids display data in a Grid view. Developers can optionally display data as in a Detail view. Enabling Detail view adds an Detail button to the select view button group.

- [About Detail View in an Interactive Grid](#)
- [Adding a Detail View to an Interactive Grid](#)

8.6.5.9.1 About Detail View in an Interactive Grid

Interactive grids support different views of data. Users can switch between these views by clicking the buttons in the select view button group. The following illustration shows an interactive grid with Detail view enabled and the Detail button selected. Detail view displays column values using developer defined HTML markup as shown in the following illustration.



Name	Manager	Job	Notes
KING		PRESIDENT	
BLAKE	KING	MANAGER	Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.
CLARK	KING	MANAGER	
JONES	KING	MANAGER	
SCOTT	JONES	ANALYST	
FORD	JONES	ANALYST	
SMITH	FORD	CLERK	
ALLEN	BLAKE	SALESMAN	
WARD	BLAKE	SALESMAN	

8.6.5.9.2 Adding a Detail View to an Interactive Grid

- To add a Detail view to an interactive grid:
 - View the page in Page Designer:

Page Designer appears.
 - In the Rendering tab, select the region containing the interactive grid.
 - In the Property Editor, select the **Attributes** tab.

The Property Editor displays the attributes. Attributes are organized in groups
 - In the Property Editor **Attributes** tab, find the **Detail View** group and edit the following:
 - Show** - Select **On**.
 - Before Rows** - Enter the HTML to be displayed before report rows.
 - For Each Row** - Enter the HTML template to use for each report row in the Detail View. Use #COLUMN_NAME# substitution strings for column names and column labels.

The following substitution strings are available:

- &COLUMN_NAME. - substitution strings for column labels and names.
- &APEX\$ROW_ID. - the record identifier for the row.
- &APEX\$ROW_INDEX. - the record display sequence number.

Example:

```
<tr><td align="right">&ENAME_LABEL. :</td><td>&ENAME.</td></tr>
<tr><td align="right">&JOB_LABEL. :</td><td>&JOB.</td></tr>
```

- d. **After Rows** - Enter the HTML to be displayed after report rows.
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.6 Managing Interactive Grid Column Attributes

Edit column attributes to control the display, features, and behavior of interactive grid columns.

Note:

Some settings are configured at runtime by the report developer and saved as part of the primary or alternate report (for example, column display order, the columns the report is sorted on, and column widths. To learn more about save options, see "[Saving Interactive Grid Reports](#)."

- [Editing Common Grid Column Attributes](#)
- [Enabling Hide, Sort, Control Breaks, and Aggregates](#)
- [Defining a Column as a List of Values for Filtering](#)
- [Creating a Column Link in an Interactive Grid](#)

See Also:

"[Editing Pages in Page Designer](#)"

8.6.6.1 Editing Common Grid Column Attributes

Edit grid columns attributes to change the column heading, determine how a column renders, specify if users can edit a column value, and control how users can manipulate a column.

1. To edit interactive grid Column attributes:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, locate the region and expand the Columns node.
The columns appear in the Rendering tab.
 3. Select a column to edit.

The Property Editor displays the attributes.

 **Note:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

4. Edit the appropriate attributes.
5. To edit the column heading:
 - a. Find **Heading**.
 - b. Heading - Enter the report column heading text.
 - c. Alignment - Select the heading alignment. Note that your alignment selection must be supported by the selected report template..
 - d. Alternative Label - Enter the alternative label to use in dialogs and in the Single Row View. Use an alternative label when the heading contains extra formatting, such as HTML tags, which do not display properly.
6. To control how column values display and for editable grids how the column value is edited:
 - a. Find **Identification**.
 - b. Type - Select how the column is rendered.

Different settings are available depending on the selected Type. For example, for an editable grid, select the Type **Display Only** to make a column uneditable. Choose the Type **Hidden** for primary key columns that should not be seen or other columns that are only used in templates such as icon or detail view, link targets, or columns of type HTML Expression.
7. To control how users can manipulate a column:
 - a. Find **Enable Users To**.
 - b. Sort/Control Break/Aggregate - Select whether end users can use this column in sorts, control breaks, and aggregates. Select **On** or **Off**.

 **Tip:**

Enabling these operations can cause performance issues, especially on large data sets or where appropriate column indexes are not available.

8. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.6.2 Enabling Hide, Sort, Control Breaks, and Aggregates

You can configure the Column attributes under **Enable Users To** to control whether end users can hide, sort, or use a column in control breaks and aggregates.

1. To enable hide, sort, control breaks, and aggregates:
 1. View the page in Page Designer:

- a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In the Rendering tab, locate the region and expand the Columns node.
The columns appear in the Rendering tab.
3. Select a column to edit.
The Property Editor displays the attributes for that column. Attributes are organized in groups.
4. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
 - **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
5. In the Property Editor, find **Enable Users To**. Specify **Yes** or **No** for the following:
 - a. Sort - Specify whether end users can use this column in sorts.
 - b. Control Break/Aggregate - Specify whether end users can use the column in control breaks and aggregates.
 - c. Hide - Specify whether end users can hide this column.Be aware that enabling these operations can lead to performance issues, especially on large data sets or where appropriate column indexes are not available.
6. To save your changes click **Save**.
7. To save and run the page, click **Save and Run Page**.

8.6.6.3 Defining a Column as a List of Values for Filtering

You can define an interactive grid column as a list of values to improve the speed of built-in filter tools.

1. To define a report column as a list of values:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, locate the region and expand the Columns node.
The columns appear in the Rendering tab.
 3. Select a column to edit.
The Property Editor displays the attributes for that column. Attributes are organized in groups.
 4. In the Property Editor, find the **Column Filter** group. Specify the following:

- a. Enabled - Specify whether end users can filter this column. Select **On** or **Off**.
- b. LOV Type - Select how to derive the list of values for the filter when a user clicks on the column header or in filter dialogs. Options include:
 - **None** - Disable any values being displayed in the filter. This option is appropriate on large columns, generally with most values being over 50 characters, or when a list would not be very usable for selecting a specific record. Instead the end user can just type in a partial value and then view the results.
 - **Distinct Column** - Distinct column values are displayed for VARCHAR2 and NUMBER columns. DATE and TIMESTAMP columns utilize the built-in predefined date ranges.
 - **SQL Query** - Values are derived from the SQL query definition.
 - Shared Component - Values are derived from an existing list of values.
 - **Static Values** - Values are derived from a static list of values.
 - **PL/SQL Function Body returning SQL Query**- Values are derived from the PL/SQL function body that returns a SQL Query.
 - **Use List of Values** - Values are derived from list of values.
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.6.4 Creating a Column Link in an Interactive Grid

Use Column Attributes to create a link from a report to another page in your application or to a URL.

1. To create a column link to another page:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, locate the region and expand the Columns node.
 3. Select the desired column.

The Column attributes appear in the Property Editor. Attributes are organized in groups.

 **Tip:**

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, click **Go to Group** and select the group.

4. Find **Identification**. From Type, select **Link**.
5. Find **Link** and click **No Link Defined**.

The Link Builder - Target dialog appears. The Target Type you select determines the steps that follow.

6. To create a link to another page, in the Link Builder - Target dialog:
 - a. Type - Select **Page in this application**.
 - b. Page - Specify the target page number.
 - c. Set Items - Select a Name and Value to specify session state for an item.
 - d. Clear/Reset, Clear Cache - Specify the page numbers on which to clear cache. To specify multiple pages, enter a comma-delimited list of page numbers.
 - e. Clear/Reset, Action - Select one of the following:
 - **None** - No clear or reset action when page loads.
 - **Clear Regions** - Clears all region settings on the page.
 - **Reset Regions** - Resets all regions on the page back to the default state, including sort orders, hidden columns and so on.
 - **Reset Pagination** - This option enables backwards compatibility.
 - f. Advanced, Request - Specify the request to be used.
 - g. Click **OK**.
7. To create a link to another page in another application, in the Link Builder - Target dialog:
 - a. Type - Select **Page in a different application**.
 - b. Application - Select the application.
 - c. Page - Specify the target page number.
 - d. Set Items - Select a Name and Value to specify session state for an item.
 - e. Clear/Reset, Clear Cache - Specify the page numbers on which to clear cache. To specify multiple pages, enter a comma-delimited list of page numbers.
 - f. Clear/Reset, Action - Select one of the following:
 - **None** - No clear or reset action when page loads.
 - **Clear Regions** - Clears all region settings on the page.
 - **Reset Regions** - Resets all regions on the page, including sort orders, hidden columns and so on, back to default state.
 - **Reset Pagination** - This option is for backwards compatibility.
 - g. Advanced, Request - Specify the request to be used.
 - h. Click **OK**.
8. To create a link to a URL, in the Link Builder - Target dialog:
 - a. Type - Select **URL**.
 - b. URL - Enter the URL address.
 - c. Click **OK**.
9. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.7 About Customizing Interactive Grids in a Running Application

When running an application, users can alter the report layout using Column menus and sort options, rearrange columns by dragging and dropping, and change how data displays using options on the Actions menu.

When an interactive grid is editable, users can also edit the underlying data, add rows, delete rows, and refresh rows. After users customize an interactive grid they can save it. However, the available save capabilities differ depending upon the user type.

See Also:

- ["Making an Existing Interactive Grid Editable"](#)
- ["Saving Interactive Grid Reports"](#)
- *Oracle Application Express End User's Guide*

8.6.8 Saving Interactive Grid Reports

After users customize an interactive grid they can save it as either a Private or Public report.

Only the user who creates a **Private** report can view, save, rename, or delete it. Report developers have additional save capabilities in that they can save the **Primary** report (that is, the report that displays to all users), or create an **Alternative** report to test multiple report layouts.

- [How the User Type Effects Available Save Options](#)
- [About Configuration Dependencies When Saving Interactive Grid Reports](#)
- [Saving a Private Interactive Grid Report](#)
- [Saving a Public Interactive Grid Report](#)
- [Saving or Renaming a Primary Interactive Grid Report](#)
- [Saving an Alternative Interactive Grid Report](#)
- [Renaming a Saved Interactive Grid Report](#)
- [Deleting a Saved Interactive Grid Report](#)
- [Resetting a Saved Interactive Grid Report](#)

8.6.8.1 How the User Type Effects Available Save Options

After users customize an interactive grid they can save it. However, the available save capabilities differ depending upon the user type.

End Users

End users can save an interactive grid as follows:

- **Private** report. Only the user who creates a Private report can view, save, rename, or delete it. All users (that is, end users and developers) can create interactive grid Private reports.
- **Public** report. All users can view a Public report. However, only the user who creates a Public report can save, rename, or delete it. All other users can view a Public report and save it under a new report name.

 **Tip:**

End users can only save Public reports if the report developer has enabled that capability. See "[Enabling Users to Save Interactive Grid Public Reports](#)."

Developers

In addition to Private and Public reports, a developer can save two other report formats:

- **Primary** report. The Primary report displays to all users. Only a developer can save a new Primary report, rename it, or delete it.
- **Alternative** report. An Alternative report enables developers to create multiple report layouts. Only developers can save, rename, or delete an Alternative report.

8.6.8.2 About Configuration Dependencies When Saving Interactive Grid Reports

To save a customized version of an interactive grid, users select the Actions menu and then click **Report** and then **Save** or **Save As**. End users can only access Save options if the application developer defines an authentication scheme at the application-level.

Other configuration issues that impact a user's ability to save an interactive grid include:

- **Interactive Grid Toolbar Availability.** Developers can edit the interactive grid Attribute, **Toolbar** to determine if an interactive grid includes a toolbar. If the toolbar is disabled, all the options on the Actions menu, including Save and Save As, are unavailable.
- **Support for Saving Public Reports.** By default, end users cannot save Public reports. To enable support for Public reports, developers edit the report Attribute, **Enables Users To, Save Public Report**.

 **See Also:**

- "[Establishing User Identity Through Authentication](#)"
- "[Customizing the Interactive Grid Toolbar](#)"
- "[Enabling Users to Save Interactive Grid Public Reports](#)"

8.6.8.3 Saving a Private Interactive Grid Report

All users (that is, both end users and developers) can save a Private interactive grid. Only the user who creates a Private interactive grid can view, save, rename, or delete it.

1. To save a Private interactive grid:

1. Run the interactive grid.
2. Customize the report (for example, show, hide, or move columns, create filters, and so on).
3. Click the **Actions** menu.
4. Select **Report** and then **Save As**.
5. In the Report - Save As dialog:
 - a. Type - Select **Private**.
 - b. Name - Enter a name for the report.
 - c. Click **Save**.

Private reports display on the Saved Reports list on the toolbar under the heading, Private.

8.6.8.4 Saving a Public Interactive Grid Report

All users (that is, both end users and developers) can save a Public interactive grid. However, only the user who creates a Public interactive grid can save, rename, or delete it. Users who did not create the public report can view it and also have the option to make their own copy of it using the Save As option.

Note:

End users can only save Public interactive grids if the report developer has enabled that capability. See "[Enabling Users to Save Interactive Grid Public Reports](#)".

1. To save a Public interactive grid:
 1. Run the interactive grid.
 2. Customize the report (for example, show, hide, or move columns, create filters, and so on).
 3. Click the **Actions** menu.
 4. Select **Report** and then **Save As**.
 5. In the Report - Save As dialog:
 - a. Type - Select **Public**.
 - b. Name - Enter a name for the report.
 - c. Click **Save**.

Public reports display on the Saved Reports list on the toolbar under the heading, Public.

8.6.8.5 Saving or Renaming a Primary Interactive Grid Report

A Primary interactive grid displays to all users. Only developers can save or rename Primary reports. It is impossible to delete a primary report.

1. To save or rename a Primary interactive grid:

1. Run the interactive grid as a developer.
2. To customize and then save a primary interactive grid:
 - a. Customize the report (for example, show, hide, or move columns, create filters, and so on).
 - b. Click the **Actions** menu.
 - c. Select **Report** and then **Save**.
3. To rename a primary report:
 - a. Click the **Actions** menu.
 - b. Select **Report** and then **Edit**.
The Report - Edit dialog appears.
 - c. In Name, enter a new name and click **Save**.
4. Select **Report** and then **Save**.

If multiple reports have been redefined, the Primary report displays on the Saved Reports list on the toolbar under the heading, Default.

8.6.8.6 Saving an Alternative Interactive Grid Report

Alternative reports enable a developers to optionally define multiple report layouts, which are available to all users (subject to any authorization scheme, if defined). Only developers can save, rename or delete an alternative report. Only the developer who creates an interactive grid can save, rename, or delete an Alternative report.

1. To save an Alternative interactive grid:
 1. Run the interactive grid as a developer.
 2. Customize the report (for example, show, hide, or move columns, create filters, and so on).
 3. Click the **Actions** menu.
 4. Select **Report** and then **Save As**.
 - Type - Select **Alternative**.
 - Name - Enter a name for the report.
 - Authorization - Select an alternative authorization scheme to restrict who can view this report.
 - Click **Save**.

An Alternative report displays on the Saved Reports list on the toolbar under the heading, Default.

8.6.8.7 Renaming a Saved Interactive Grid Report

All users can rename the interactive grid reports they create.

1. To rename an interactive grid report:
 1. Run the interactive grid.
 2. From the Saved Report list on the toolbar, select the report.
 3. Click the **Actions** menu and then select **Report** and then **Edit**.

4. In the Report - Edit dialog:
 - a. Type - Select the type of report to be edited.
 - b. Name - Enter a new name.
 - c. Click **Save**.

The new report name displays in the Saved Reports list on the toolbar.

8.6.8.8 Deleting a Saved Interactive Grid Report

All users can delete the interactive grid reports they create.

1. To delete an interactive grid report:
 1. Run the interactive grid.
 2. From the Saved Report list on the toolbar, select the report.
 3. Click the **Actions** menu and then select **Report** and then **Delete**.
A confirmation dialog appears.
 4. Confirm your request and click **OK**.

The report disappears from the Saved Reports list on the toolbar.

8.6.8.9 Resetting a Saved Interactive Grid Report

All users can reset an interactive grid report to the last saved version.

1. To reset an interactive grid report:
 1. Run the interactive grid.
 2. From the Saved Report list on the toolbar, select the report.
 3. Customize the report (for example, show, hide, or move columns, create filters, and so on).
 4. Reset the report to the last saved version. Click the **Actions** menu and then select **Report** and then **Reset**.

Tip:

Alternatively, you can also click the **Reset** button on the toolbar.
The revised report appears.

8.6.9 Linking to Interactive Grid Reports

Developers can use the syntax in the `Request` value and `ItemNames` section of the URL to link to interactive grid report.

Data in an interactive grid is driven by declarative filters. Developer can set report parameters by modifying interactive grid report settings for an end user. However, these settings only affect the end user's working report and do not affect any saved report settings. Developers can use the syntax described in this section to link to interactive grid reports.

 **Note:**

When you add additional interactive grid report regions, be sure to change the old single interactive grid report link syntax. Otherwise, the link generates an error. A link to a page with more than one interactive grid report region, the request or name syntax needs to fully qualify with region static ID. To open a link to an interactive grid report from outside of an application (for example, from an email), you may need to enable the Session Management, Deep Linking attribute in your application. See "[Session Management](#)."

- [Interactive Grid Request Syntax](#)
- [Interactive Grid Name and Value Syntax](#)
- [Interactive Grid ClearCache Syntax](#)
- [Restrictions When Linking to Interactive Grid Reports](#)
- [Valid Interactive Grid Linking Examples](#)
- [Invalid Interactive Grid Linking Examples](#)
- [Linking to Shared Interactive Grid Reports](#)

8.6.9.1 Interactive Grid Request Syntax

To link to a specific saved interactive grid report, use the following `Request` syntax:

```
IG[region static ID]._<report alias>
```

Consider the following example:

```
IG[EMP]_dept20
```

 **Note:**

The use of `Request` in the URL is optional. To link to multiple saved reports, separate each `Request` with comma.

8.6.9.2 Interactive Grid Name and Value Syntax

To create a filter, use the following `itemNames` and `itemValues` syntax:

```
IG[region static ID]<operator>.<target column alias>
```

Consider the following example:

```
IG[EMP]C_ENAME:KING
```

 **Note:**

If there is only one interactive grid report region on the page, the `itemName` does not need to be fully qualified with the region static ID. If an operator is not defined, a filter with equal operator is added.

To create a filter on an interactive grid report in a link, use the `itemNames` syntax described previously and add the filter value in the corresponding location in the item names section of the URL.

To create row text which contains a filter on an interactive grid, use `ROWFILTER` as the target column alias in the item name syntax and add a filter value in the `itemValues` of the URL. The link will add a Row Text Contains filter which searches all columns displayed in the report with type `STRING` or `NUMBER`.

Consider the following example:

```
IG[EMP]_ROWFILTER:SALES
```

Valid operators include:

- `C` = Contains
- `EQ` = Equals (this is the default)
- `GTE` = Greater than or equal to
- `GT` = Greater Than
- `LT` = Less than
- `LTE` = Less than or equal to
- `N` = Null
- `NC` = Not Contains
- `NEQ` = Not Equals
- `NN` = Not Null
- `NIN` = Not In (escape the comma separated values with a leading and trailing backslash, `\`)
- `IN` = In (escape the comma separated values with a leading and trailing backslash, `\`)
- `ROWFILTER` = Row Text Contains (this searches all columns displayed in the report with type `STRING` or `NUMBER`)

8.6.9.3 Interactive Grid ClearCache Syntax

 **Tip:**

Using `ClearCache` without specifying a saved report alias in the `Request`, clears the primary default report. To clear a specific interactive grid report region on a page with more than one interactive grid reports, specify the region static ID along with saved report alias in the `Request`.

Use the following syntax in the `ClearCache` section of the URL to reset or clear pagination in an interactive grid report:

- `RR` - Resets an interactive grid report. This is equivalent to the end user choosing the Reset option from the interactive grid report Actions menu on the target page. The report is returned to the default report settings specified by the developer or saved by the user.
- `CR` - Clears interactive grid report. This clears all of the report filters.

8.6.9.4 Restrictions When Linking to Interactive Grid Reports

When linking to interactive grid reports, remember the following restrictions:

1. If a `Request` value is not defined in the URL, all of the primary default report settings will change.
2. If a `Request` value is not defined and `itemNames` section does not include a fully qualified filter column name with region static ID, an error occurs if there are more than one interactive grid report in the target page.
3. If a `Request` value is not defined and `itemNames` section do not include a fully qualified filter column name with region static ID, it will create a filter on the primary default report if there is only one interactive grid report region in the target page.

8.6.9.5 Valid Interactive Grid Linking Examples

This section contains valid linking examples.

Valid Linking Example 1

This example includes a link with no `Request` value, but includes a qualified filter column with region static ID in the `itemNames` section of the URL. This example creates a filter on the primary default report in the referenced region item name.

```
f?p=&APP_ID.:2:&SESSION.:::IG[EMP]_ENAME:KING
```

Valid Linking Example 2

In this example the link has no `Request` value. The clear cache section has `RR` or `CR` and will reset, or clear the primary default reports of all interactive grid report regions.

```
f?p=&APP_ID.:1:&SESSION.:::RR:
```

8.6.9.6 Invalid Interactive Grid Linking Examples

This section contains invalid linking examples.

Invalid Linking Example 1

This link has no `Request` value and does not include a fully qualified filter column with region static ID in the item name section of the URL. This example generates an error if there is more than one interactive grid report region in the target page.

```
f?p=&APP_ID.:2:&SESSION.::::ENAME:KING
```

Invalid Linking Example 2

This example has a link with two request values separated by commas and does not contain a fully qualified filter column with region static ID in the item name section of the URL. This example generates an error since it is not clear where the filter needs to be created.

```
f?p=&APP_ID.:2:&SESSION.:IG[test]_employee,IG[test2]_dept10::::ENAME:KING
```

8.6.9.7 Linking to Shared Interactive Grid Reports

You can link to saved primary default, alternative default, and public reports using `IG[region static ID]<report_alias>` in the `Request` value of the URL.

- [Editing the Interactive Grid Saved Report Alias](#)
- [Link Examples to a Primary Report](#)
- [Link Examples to Saved Reports](#)

See Also:

- ["About Using f?p Syntax to Link Pages"](#)
- ["Saving Interactive Grid Reports"](#)
- ["Deleting a Saved Interactive Grid Report"](#)

8.6.9.7.1 Editing the Interactive Grid Saved Report Alias

Edit the Alias for a saved reports to create a more meaningful URL link to the saved report.

To edit the Alias for saved reports:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. In the Rendering tab, find the region containing the report.
3. Under the region, expand **Saved Reports** and select the saved report.

The Property Editor displays the attributes for the Saved Report.

4. **Identification, Alias** - Enter a new alias for the report. Use this alias to define a more meaningful URL link to this saved report. This link can be used to link directly from elsewhere in the application.
5. **Link, Link Example** - View the URL link for this saved report. This attribute is view only and cannot be updated. Use this attribute to quickly copy the displayed URL. This URL can be used to link directly to this particular saved report from anywhere else in the application.
6. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.6.9.7.2 Link Examples to a Primary Report

The following examples demonstrate how to link to a primary report (`report_alias=PRIMARY`):

This example links to a primary report:

```
f?p=100:1:&APP_SESSION.:IG_PRIMARY
```

This example links, resets, and clears primary report settings:

```
f?p=100:1:&APP_SESSION.:IG_PRIMARY::RR,CR:
```

This example links, resets, and clears primary report settings. It additionally creates a `ENAME = 'KING'` filter on the primary report:

```
f?p=100:1:&APP_SESSION.:IG_PRIMARY::RR,CR:IG_ENAME:KING
```

8.6.9.7.3 Link Examples to Saved Reports

The following examples demonstrate how to link to a saved report (`report_alias=12345`):

This example links to a saved report:

```
f?p=100:1:&SESSION.:IG_12345
```

This example links, resets, and clears settings for saved report 12345:

```
f?p=100:1:&SESSION.:IG_12345::RR,CR:
```

This example links, resets, and clears saved report 12345 settings. It additionally creates a `ENAME = 'KING'` filter on saved report 12345.

```
f?p=100:1:&SESSION.:IG_12345::RR,CR:IG_ENAME:KING
```

8.7 Managing Interactive Reports

An interactive report is the formatted result of a SQL query. End users can customize the report layout and data displayed by selecting options on the Actions menu.

- [Example Interactive Report](#)
View an interactive report example.

- [Creating an Interactive Report Using the Create Application Wizard](#)
Run the Create Application Wizard to create a new application that contains one or multiple interactive report pages.
- [Managing Interactive Report Region Attributes](#)
Edit region attributes to alter the SQL source, change the region layout and appearance, define a region displays selector, and create region conditions.
- [Managing Interactive Report Attributes](#)
Edit report Attributes to control how an interactive report works.
- [Managing Interactive Report Column Attributes](#)
Edit column attributes to control the display, features, and behavior of interactive report columns.
- [Customizing Interactive Reports in a Running Application](#)
When running an application, users (that is, both end users and developers) can alter the layout of interactive reports data by choosing the columns they are interested in, applying filters, highlighting, and sorting. They can also define breaks, aggregations, charts, group bys, and add their own computations.
- [Linking to Interactive Reports](#)
Developers can use the syntax in the `Request` value and `ItemNames` section of the URL to link to interactive reports.



See Also:

"Using Interactive Reports" in *Oracle Application Express End User's Guide*

8.7.1 Example Interactive Report

View an interactive report example.

An interactive report is a formatted result of a SQL query. End users can customize the both report layout and control how the data that displays. Both the Create Application Wizard and Create Page Wizard support the creation of interactive reports. You choose a table on which to build a report, or provide a custom SQL SELECT statement. Interactive reports are only supported for Desktop applications.

End users can customize the report layout and data displayed by selecting options on the Actions menu. For example, end users can alter the report layout by hiding or exposing specific columns and applying filters, highlighting, and sorting. Advanced end users can also define breaks, aggregations, charts, group data, and add computations. Once customized, the report can be saved as either a private or public report.

The following is an example of an interactive report.

Status Id	Name	Description	Project Lead	Completed	Created	Updated
3	Configure Web Environment	Determine the hardware and software requirements for the application and develop with Web de	Lucille Beatie	10/17/2019	1/13/2020	1/13/2020
3	Train Developers	Ensure all developers are trained on the new tool get the app	Lucille Beatie	10/28/2019	1/13/2020	1/13/2020
2	Migrate Legacy Applications	Move the data and reports from legacy applications running on top of leg	Miyazaki Yokohama		1/13/2020	1/13/2020
2	Develop Partner Portal POC	Develop a proof of concept for a partner portal that work more collabora	Bernard Jackman		1/13/2020	1/13/2020
1	Develop Production Partner Portal	Develop the production partner portal that work more collabora	Lucille Beatie		1/13/2020	1/13/2020
3	Develop New Reporting Apps	Develop apps to meet the reporting requirements of the business	Lucille Beatie	11/11/2019	1/13/2020	1/13/2020
3	Develop IT Management Apps	Develop apps to allow IT management of the application	Bernard Jackman	11/22/2019	1/13/2020	1/13/2020
3	Develop Customer Tracker	Develop an application that allows sales representatives to track prospects through closed deals.	Lucille Beatie	12/12/2019	1/13/2020	1/13/2020

Developers can include multiple interactive reports per page and can restrict the capabilities available to end users (such as disabling download or support for hiding column). When the end user views the report, report functionality is the same across all reports in the application.

When viewing an interactive report, end users can customize how and what data displays. By default, interactive reports include a search bar, an Actions menu, column heading menus, and Edit icons in the first column of each row. Using options on the Actions menu, users can alter the report layout by hiding or exposing specific columns and applying filters, highlighting, and sorting. They can also define breaks, aggregations, charts, group bys, and add their own computations. Once customized, the report can be saved as either a private or public report.

Tip:

To view an example, install the sample app, *Sample Reporting*. To learn more, see [Sample Apps](#).

See Also:

"Using Interactive Reports" in *Oracle Application Express End User's Guide*

8.7.2 Creating an Interactive Report Using the Create Application Wizard

Run the Create Application Wizard to create a new application that contains one or multiple interactive report pages.

1. To create an application that contains one or multiple interactive report pages:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Click the **Create** button.
 3. Click **New Application**.
 4. For Name, enter the name used to identify the application to developers.
 5. For Appearance, accept the default Theme Style and menu layout (Vita, Side Menu), or change it by clicking the **Set Appearance** icon adjacent to the Appearance field.
 6. To add a report, click **Add Page** and select then select **Interactive Report**.
 7. On Add Report Page:
 - a. Page Name - Enter a name for this page.
 - b. Set Icon - Select an icon to display in the navigation menu for this page.
 - c. Page Source - Select the source for the report:
 - **Table or View**
 - **SQL Query**

What you select determines what displays next. Follow the on-screen instructions. To learn more about an attribute, click the Help icon in the lower left corner.
 - d. Select the report type **Interactive Report**.
 - e. Include Form - Select **Include Form** to include a form page for creating or updating records.
 - f. Lookup Columns - Expand to see attributes for defining a lookup to another table. Use Lookup Columns to replace identifiers with a display column, such as showing the department name instead of the department number. Specify the following:
 - Lookup Key - Select the column to change to output the display column.
 - Display Column - Select the column (from the lookup table) to be displayed.
-  **Tip:**

Lookup Columns only appear if the current page is based on a table and has foreign key constraints to another table.
- g. Advanced - Expand **Advanced** to configure these options:
 - Set as Home Page - Enable this to make this page the home page for the application.
 - Set as Administration Page - Enable this to have this page display under Administration.
 - Page Help - Enter text to be displayed when the user selects Page Help.
 - h. Click **Add Page**.

8. Features - Select features to include with the application. Features provide application-level functionality and can only be added once per application. To learn more, click the Help icon adjacent to **Features**.
9. Settings - Specify settings used to generate this application. To learn more about an attribute, click the Help icon adjacent to **Settings**.
10. Click **Create Application**.



See Also:

["Creating a Report Using the Create Page Wizard"](#)

8.7.3 Managing Interactive Report Region Attributes

Edit region attributes to alter the SQL source, change the region layout and appearance, define a region displays selector, and create region conditions.

- [Editing Interactive Report Region Attributes](#)
- [Displaying Interactive Reports Conditionally](#)



See Also:

["Editing Pages in Page Designer"](#)

8.7.3.1 Editing Interactive Report Region Attributes

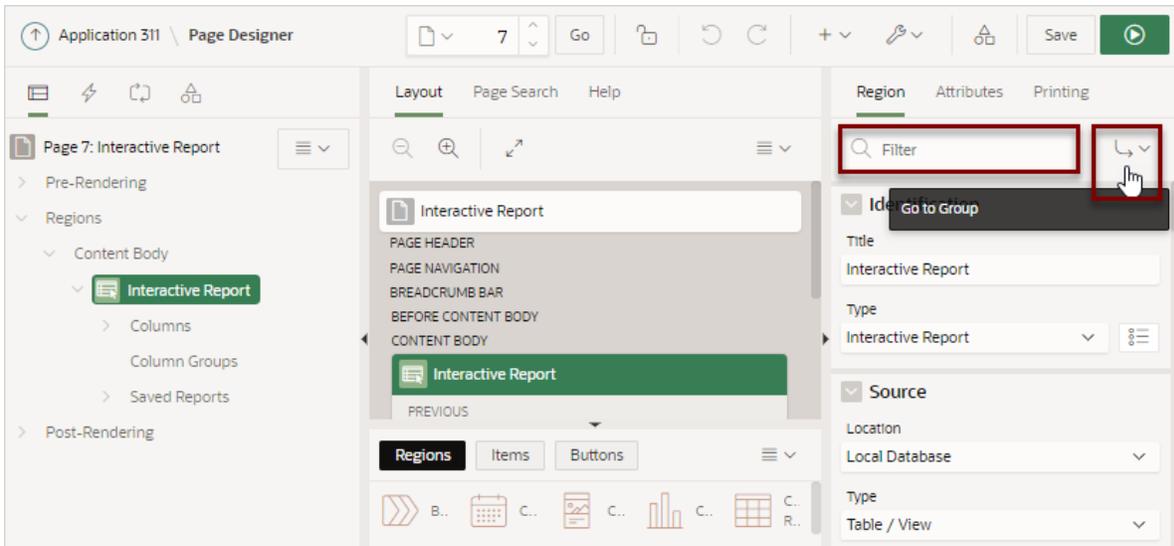
To edit region attributes in Page Designer:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. In the Rendering tab, select the region.

In the Property Editor, the **Region** tab displays the attributes. Attributes are organized in groups.



3. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
 - **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
4. Edit the appropriate attributes.

Tip:

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

See Also:

"Right Pane of Page Designer (Property Editor)"

8.7.3.2 Displaying Interactive Reports Conditionally

You can choose to have interactive reports display conditionally by editing region attributes.

1. To display an interactive report conditionally:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region.

The Property Editor displays the **Region** tab. Attributes are organized in groups.

3. Page Designer indicates what to do next. If there is an error, the Show Messages icon displays in the Page Developer toolbar.
 - a. Click the **Show Messages** icon on the Page Designer toolbar.
The Messages dialog displays errors that must be addressed.
 - b. Select an error to highlight the associated attribute in the Property Editor.
4. Configure **Server-side Condition**:
 - a. Find the **Server-side Condition** group.
 - b. **Type** - Select a condition type and follow the on-screen instructions
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

 **Tip:**

Asynchronous JavaScript and XML (Ajax) is used throughout interactive reports. Because Ajax is asynchronous, the value evaluated for conditional display must be in the session. To display an interactive report conditionally based on specified value, use a page item instead of using a `:REQUEST` value. Using `:REQUEST` in a conditional display causes the interactive report to function incorrectly.

8.7.4 Managing Interactive Report Attributes

Edit report Attributes to control how an interactive report works.

- [Editing Interactive Report Attributes](#)
- [Managing Link Columns](#)
- [Customizing the Interactive Report Search Bar](#)
- [Customizing the Interactive Report Actions Menu](#)
- [Configuring Interactive Report Actions Menu Download Options](#)
- [Controlling Interactive Report Pagination](#)
- [Enabling Icon View](#)
- [Enabling Detail View](#)
- [Configuring Advanced Attributes for Interactive Reports](#)

 **See Also:**

["Editing Pages in Page Designer"](#)

8.7.4.1 Editing Interactive Report Attributes

1. To edit interactive report Attributes in Page Designer:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In the Rendering tab, select the region containing the interactive report.
3. In the Property Editor, select the **Attributes** tab.

The Property Editor displays the attributes. Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

4. Edit the appropriate attributes.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

 **See Also:**

"Right Pane of Page Designer (Property Editor)"

8.7.4.2 Managing Link Columns

A Link Column displays on the left side of an interactive report. Developers can configure a Link Column to link to a single row view, a custom target, or be excluded from the report.

 **Tip:**

A Link Column cannot be sorted, hidden, or moved by an end user and does not interact with the standard column link defined on the Column Attributes page.

- [Linking to a Single Row View](#)
- [Linking to a Specific Page](#)
- [Linking to a URL](#)
- [Excluding a Link Column](#)

8.7.4.2.1 Linking to a Single Row View

1. To link to a single row view in an interactive report:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. Find the **Link** group and edit the following:
 - a. **Link Column** - Select **Link to Single Row View**.
 - b. **Uniquely Identify Rows by** - Select **ROWID** or **Unique Column**.
If you select, **Unique Column**, specify the column in the Unique Column field.
 - c. **Link Icon** - Accept the default or specify the path to another icon.
 - d. **Link Attributes** - Optionally specify additional column link attributes to be included in the `` tag (for example, a link target, classes, or styles).
 - e. **Authorization Scheme** - Select an authorization scheme to associate with the Link Column. This authorization scheme must evaluate to TRUE in order for the Link Column to be rendered in the report.
 - f. **Condition Type** - Select a condition type from the list that must be met in order for this link to be rendered.
 5. Find the **Single Row View** group and edit the following:
 - a. **Exclude Null Values** - Specify whether null columns are hidden on the Single Record View
 - b. **Only Displayed Columns** - Specify whether only those columns currently displayed are displayed in the Single Record View. If you select **Off**, then hidden report columns may also be shown on the Single Record View.
 6. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

Tip:

If an interactive report links to single row view and the link icon is missing ALT text or has empty ALT text, the `alt="Single Row View"` gets included automatically to improve accessibility. This can be further improved by making the ALT text something specific to the row, for example `alt="View Row: #COLUMN_NAME#" (where COLUMN_NAME should be a column that helps uniquely identify the current row).`

8.7.4.2.2 Linking to a Specific Page

1. To link to a specific page:
 1. View the page in Page Designer:
Page Designer appears.

2. In the Rendering tab, locate the region containing the report.
3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
4. Find the **Link** group and edit the following:
 - a. **Link Column** - Select **Link to Custom Target**.
 - b. **Target** - Click **No Link Defined**.
The Link Builder - Target dialog appears.
 - Target Type - Select **Page in this Application**.
 - Page - Select the target page number.
 - Set Items - Select a **Name** and **Value** to specify session state for an item.
 - Clear/Reset, Clear Cache - Specify the page numbers on which to clear cache. To specify multiple pages, enter a comma-delimited list of page numbers.
 - Clear/Reset, Action - Select one of the following:
 - **None** - No clear or reset action when page loads.
 - **Clear Regions** - Clears all region settings on the page.
 - **Reset Regions** - Resets all regions on the page back to the default state, including sort orders, hidden columns and so on.
 - **Reset Pagination** - This option enables backwards compatibility.
 - Advanced, Request - Specify the request to be used.
 - Click **OK**.
 - c. **Link Icon** - Enter the HTML to be used for the link. Use an image tag to display images, or pick from the list of default images. If not defined, #IMAGE_PREFIX#ws/small_page.gif is used.
 - d. **Link Attributes** (Optional) - Enter additional column link attributes to be included in the tag (for example, a link target, classes, or styles).
To view examples, select the attribute in the Property Editor and click the **Help** tab in the central pane.
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.7.4.2.3 Linking to a URL

1. To link to a URL:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. Find the **Link** group and edit the following:
 - a. **Link Column** - Select **Link to Custom Target**.

b. Target - Click the **No Link Defined**.

The Link Builder - Target dialog appears.

- Target Type - Select **URL**.
- Click **OK**.

c. Link Icon - Enter the HTML to be used for the link. Use an image tag to display images, or pick from the list of default images. If not defined, #IMAGE_PREFIX#ws/small_page.gif is used.**d. Link Attributes** (Optional) - Enter additional column link attributes to be included in the tag (for example, a link target, classes, or styles).

To view examples, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.7.4.2.4 Excluding a Link Column

1. To exclude a column link:

1. View the page in Page Designer:

Page Designer appears.

2. In the Rendering tab, select the region containing the report.

3. In the Property Editor, select the **Attributes** tab.

The Property Editor displays the attributes. Attributes are organized in groups

4. Configure Link attributes:

- a. Find the **Link** group.

- b. **Link Column** - Select **Exclude Link Column**.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

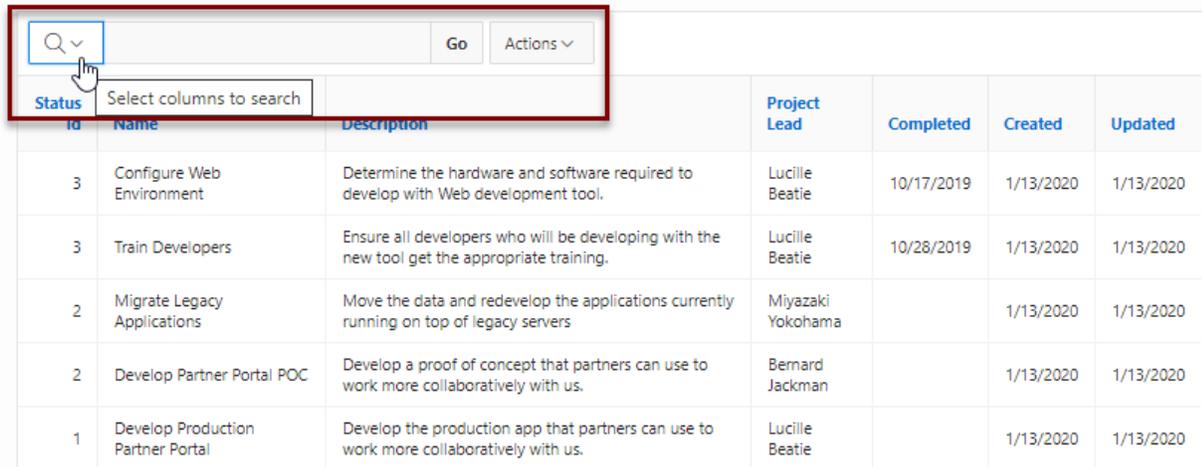
8.7.4.3 Customizing the Interactive Report Search Bar

All interactive reports include a search bar at the top of the page. Developers can customize what controls display or remove the search bar.

- [Interactive Report Search Bar](#)
- [Customizing the Search Bar](#)
- [Removing the Interactive Report Search Bar](#)

8.7.4.3.1 Interactive Report Search Bar

All interactive reports include a search bar at the top of the page which includes the following controls: a Select columns to search button, Text area, Go button, and Actions menu.



ID	Name	Description	Project Lead	Completed	Created	Updated
3	Configure Web Environment	Determine the hardware and software required to develop with Web development tool.	Lucille Beatie	10/17/2019	1/13/2020	1/13/2020
3	Train Developers	Ensure all developers who will be developing with the new tool get the appropriate training.	Lucille Beatie	10/28/2019	1/13/2020	1/13/2020
2	Migrate Legacy Applications	Move the data and redevelop the applications currently running on top of legacy servers	Miyazaki Yokohama		1/13/2020	1/13/2020
2	Develop Partner Portal POC	Develop a proof of concept that partners can use to work more collaboratively with us.	Bernard Jackman		1/13/2020	1/13/2020
1	Develop Production Partner Portal	Develop the production app that partners can use to work more collaboratively with us.	Lucille Beatie		1/13/2020	1/13/2020

If users have saved multiple reports, a saved report select list displays to the right of the **Go** button. Users can use this list to select a specific saved report. If multiple views are configured, a view selection button group also displays which enables the end user to switch views. You can remove or customize the search bar in Page Designer by configuring report attributes in the Property Editor.

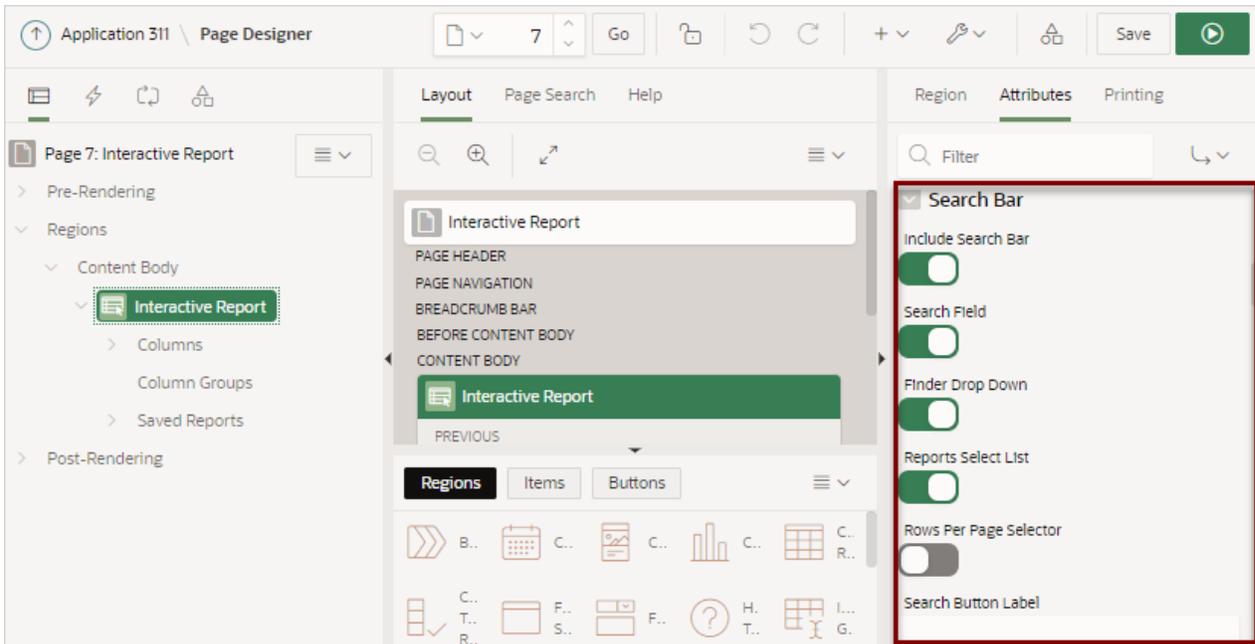


See Also:

["Customizing the Search Bar"](#) and ["Removing the Interactive Report Search Bar"](#)

8.7.4.3.2 Customizing the Search Bar

- To customize the search bar:
 - View the page in Page Designer:
Page Designer appears.
 - In the Rendering tab, select the region containing the report.
 - In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 - In the Property Editor, find the **Search Bar** group.



5. Under **Search Bar**, determine which options to include by selecting **On** or **Off**:
 - **Include Search Bar** - Select **On** to include a search bar above the report. If you include the search bar, you can also fully customize which functions to display. Select **Off** to not include the Search bar.
 - **Search Field** - Specify whether the search field is included within the search bar.
 - **Finder Drop Down** - Specify whether the Finder drop down is included at the beginning of the Search field within the search bar. The Finder drop down is a list of columns that enables users to limit their search to a specific column. If a column is selected then the search is only performed against the values in the selected column. Within a running interactive report, this option is identified as **Select columns to search**.
 - **Reports Select List** - Specify whether the Reports select list displays in the search bar. The Reports select list only displays if a report, other than the primary report, is accessible to the user.
 - **Rows Per Page Selector** - Specify whether a separate drop down row selector is included within the search bar. Do not select both this attribute and **Rows Per Page**.
 - **Search Button Label** - Enter the text for the search button label.
 - **Maximum Rows Per Page** - Enter the maximum number to display in the Rows Per Page selector.
6. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.



See Also:

"Saving Interactive Reports"

8.7.4.3 Removing the Interactive Report Search Bar

1. To remove the search bar from in interactive report:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. Turn the Search Bar off:
 - a. In the Property Editor, find the **Search Bar** group.
 - b. **Include Search Bar**- Select **Off**.
 5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.7.4.4 Customizing the Interactive Report Actions Menu

The Actions menu appears to the right of the Go button on the Search bar in an interactive report. Users use the Actions menu to customize how report information displays. Developers control what options display on the Actions menu in an interactive report.

**Tip:**

The structure of the interactive report Actions menu changed in release 5.1 to be consistent with interactive grids. To alter an interactive report Actions menu to use the previous (or legacy) structure, go to **Shared Components, Component Settings**, and configure the **Interactive Report** component. See "[Configuring Interactive Report Action Menu Structure](#)".

1. To customize the Actions menu:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. In the Property Editor, find the **Actions Menu** group.
 5. Under Actions Menu, enable and disable options by selecting **On** or **Of**
 - **Include Actions Menu** - Specify whether the Actions menu is included within the Search Bar.
 - **Filter** - Specify whether end users can define filters on this report.

- **Select Columns** - Specify whether end users can use Select Columns in the Actions menu to change the columns displayed in this report. User can select (or show), deselect (or hide) and reorder multiple columns using this option.
 - **Rows Per Page** - Specify whether end users can change the number of rows displayed for this report.
 - **Sort** - Specify whether end users can define sort columns for this report.
 - **Control Break** - Specify whether end users can define control breaks for this report.
 - **Highlight** - Specify whether end users can define highlights for this report.
 - **Compute** - Specify whether end users can define computational columns for this report.
 - **Aggregate** - Specify whether end users can define aggregates for this report.
 - **Chart** - Specify whether end users can define charts for this report.
 - **Group By** - Specify whether end users can define group by break-downs for this report.
 - **Pivot** - Specify whether end users can define pivot break-downs for this report.
 - **Flashback** - Specify whether end users can utilize flashback queries for this report.
 - **Save Report** - Specify whether end users can save their current report definition as a Private report. **Private reports** are displayed in a select list of available reports in the Search Bar, and are only displayed to the user who saved the report, providing they are authenticated. The option on the Actions menu is only available to authenticated users.
 - **Save Public Report** - Specify whether end users can save their current report definition as a Public report. **Public reports** are displayed in a select list of available reports in the Search Bar, and are displayed to everyone. The option on the Actions menu is only available to authenticated users and is further restricted if you also populate the Save Public Report Authorization.
 - **Save Public Report Authorization** - Select an authorization scheme to restrict who can save public report definitions. To enable an end user to save a public report, this authorization scheme must evaluate to TRUE. If no authorization scheme is provided then reports may be saved by any user.
 - **Reset** - Specify whether end users can reset their reports from the Actions menu. Resetting the report reverts all customizations made by the user, or specified by the calling URL, and displays the Primary Report.
 - **Help** - Specify whether end users can invoke the built-in help modal dialog for interactive reports. The help dialog only outlines those options available to the current user.
 - **Subscription** - Specify whether end users can define subscription settings for this report.
 - **Download** - Specify whether end users can download the report to one of the download formats specified.
6. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.7.4.5 Configuring Interactive Report Actions Menu Download Options

The Download option on the Actions menu enables users to download an interactive report as a comma-delimited file (CSV) format, HTML, Microsoft Excel (XLSX) format, Adobe

Portable Document Format (PDF), Microsoft Word Rich Text Format (RTF), or as one of the formats attached to an email. Microsoft Word Rich Text Format (RTF) requires the configuration of a print server. Microsoft Word format also requires BI Publisher.

 **WARNING:**

There is a 32K limit on downloads from the reports to Word. If the end user has too many columns displayed then they may encounter an error when attempting to download the data to these advanced formats. Downloads may also take considerable time to complete for large data sets.

 **Note:**

The Pivot view does not support download formats of PDF and RTF even if they are enabled and report server is configured..

- [Configuring Interactive Report Download Formats](#)
- [Enabling Interactive Report CSV Download](#)
- [Enabling Interactive Report Email Download](#)

8.7.4.5.1 Configuring Interactive Report Download Formats

Email is only available to authenticated users, and requires the SMTP Server to be configured within Application Express Administration Services application (Administration Services), by an Instance Administrator.

1. To configure download formats:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. Edit the following attributes:
 - a. **Search Bar, Include Search Bar** - Select **On**.
 - b. **Actions Menu, Download** - Select **On**.

 **Tip:**

Setting Download to **Off** prevents the Download menu from displaying on the Actions menu. To fully prevent users from downloading data, deselect all Download Formats described in the next step.

- c. **Download, Authorization** - Select an authorization scheme to restrict who can download. To enable an end user to download, this authorization scheme must evaluate to TRUE for that user.
- d. **Download, Download Formats** - Select download formats:
 - CSV
 - HTML
 - Excel
 - PDF
 - RTF
 - Email

 **Tip:**

The Download option only appears on the Actions menu if a file format is selected. If a report server has not been defined within Instance Administration then certain options do not display. To learn more, see "Configuring Report Printing" *Oracle Application Express Administration Guide*.

- e. **CSV Separator** - (CSV only) Define the column separator. If no value is entered, a comma or semicolon is used depending on your current NLS settings.
- f. **CSV Enclosed By** - (CSV only) Enter a delimiter character. This character delineates the starting and ending boundary of a data value. Default delimiter is double quotation marks (" ").
- g. **Filename** - Enter a name for the downloaded document. Do not specify a file extension, the extension is added automatically. If you leave this blank, the region name is used as the file name.
- h. **Supplemental Text** - Enter text that displays at the top of the download files. You can enter data classification, legal, or warning messages about the data in the file.

 **WARNING:**

Do not use the Supplemental Text attribute with CSV download. If you enable **CSV** download, the defined text will invalidate the CSV file format.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

 **See Also:**

["About Printing Reports to PDF"](#)

8.7.4.5.2 Enabling Interactive Report CSV Download

To enable support for CSV download, you must first enable **Automatic CSV Encoding** on the Edit Globalization Attributes page. See "[Accessing the Globalization Page](#)" and "[Automatic CSV Encoding](#)."

1. To enable the Enable CSV download in an interactive report:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. **Search Bar, Include Search Bar** - Select **On**.
 5. **Actions Menu, Download** - Select **On**.

 **Tip:**

Setting Download to **Off** prevents the Download menu from displaying on the Actions menu. To fully prevent users from downloading data, deselect all Download Formats described in the next step.

6. Under **Download**:
 - a. **Download Formats** - Select **CSV**.

 **Tip:**

The Download option only appears on the Actions menu if a file format is selected.

- b. **CSV Separator** - (CSV only) Define the column separator. If no value is entered, a comma or semicolon is used depending on your current NLS settings.
- c. **CSV Enclosed By** - (CSV only) Enter a delimiter character. This character delineates the starting and ending boundary of a data value. Default delimiter is double quotation marks (" ").
- d. **Filename** - Enter a name for the downloaded document. Do not specify a file extension, the extension is added automatically. If you leave this blank, the region name is used as the file name.

 **WARNING:**

Do not use the Supplemental Text attribute with CSV download. If you enable **CSV** download, the defined text will invalidate the CSV file format.

7. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.7.4.5.3 Enabling Interactive Report Email Download

Email is only available to authenticated users, and requires the SMTP to be configured within Application Express Administration Services application (Administration Services), by an Instance Administrator.

Interactive reports support email of all formats except Word (RTF). Note this only applies to Download dialog, not the Subscription dialog.

 **Tip:**

Email download is only supported on authenticated pages. If you enable Email download on a public page, the Email download option does not display in Download dialog.

To enable support for email download, an Oracle Application Express administrator must configure email at the Instance level. See "Configuring Mail" in *Oracle Application Express Administration Guide*.

1. To enable email download:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. **Search Bar, Include Search Bar** - Select **On**.
 5. **Actions Menu, Download** - Select **On**.

 **Tip:**

Setting Download to **Off** prevents the Download menu from displaying on the Actions menu. To fully prevent users from downloading data, deselect all Download Formats described in the next step.

6. Under **Download**:
 - a. **Download Formats** - Select **Email**.

 **Tip:**

The Download option only appears on the Actions menu if a file format is selected.

- b. **Filename** - Enter a name for the downloaded document. Do not specify a file extension, the extension is added automatically. If you leave this blank, the region name is used as the file name.

- c. **Supplemental Text** - Enter text that displays at the top of the download files. You can enter data classification, legal, or warning messages about the data in the file.

 **WARNING:**

Do not use the Supplemental Text attribute with CSV download. If you enable **CSV** download, the defined text will invalidate the CSV file format.

7. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

 **Note:**

Email sent from an Email Download contains a system generated email signature identifying who sent the email. This signature cannot be removed.

 **See Also:**

["About Emailing from an Interactive Report"](#)

8.7.4.6 Controlling Interactive Report Pagination

Pagination provides the end user with information about the number of rows and the current position within the result set. You control how pagination displays by making selections from Pagination attributes on the Attributes page in the Property Editor.

1. To edit interactive report pagination:
 1. View the page in Page Designer:

Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.

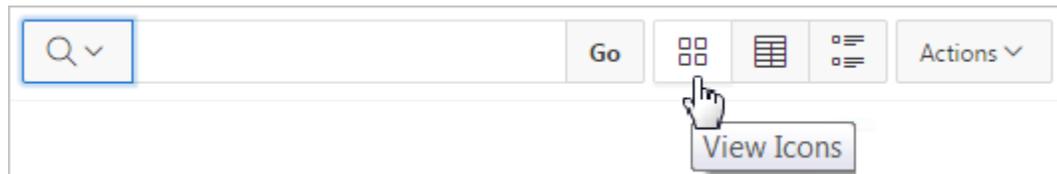
The Property Editor displays the attributes. Attributes are organized in groups
 4. Configure Pagination attributes:
 - a. Find **Pagination**.
 - b. **Type** - Select the pagination type for this report. Often only a certain number of rows of a report display on a page. In order to include additional rows, the application end user must to navigate to the next page of the report.
 - c. **Display Position** - Select where the report pagination displays.

Pagination can be shown above or below the report (or both) and can be positioned on the left or right.

- To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.7.4.7 Enabling Icon View

By default, most interactive reports display as a report. You can optionally display columns as icons. When configured to display columns as icons, a View Icons icon displays on the Search bar.



To use Icon view, you must identify the columns used to identify the icon, the label, and the target (that is, the link). As a best practice, set these columns to display as hidden since they are typically not useful for end users.

- [Adding a View Icon Button](#)
- [Adding a Custom Icon View Link](#)

8.7.4.7.1 Adding a View Icon Button

- To add Icon view to an interactive report:
 - View the page in Page Designer:

Page Designer appears.
 - In the Rendering tab, select the region containing the report.
 - In the Property Editor, select the **Attributes** tab.

The Property Editor displays the attributes. Attributes are organized in groups
 - Find **Icon View**. Configure the following attributes:
 - Show** - Select **On** to add a View Icons icon to the Search bar.
 - Custom** - Specify whether you wish to define a custom link for the Icon View. This option provides greater flexibility in defining the content of the Icon View, including the ability to utilize more than one column. Select **On** or **Off**.
 - Columns Per Row** - Select the number of icons to display per row in Icon View. A value of 5 displays 5 icons per row of the report.
 - Link Column** - Select the column that returns the link target of the icon.
 - Image Source Column** - Identify the column that returns the image source.
 - Label Column** - Select the column that returns the image label.
- To save your changes click **Save**. To save and run the page, click **Save and Run Page**.



See Also:

["Adding a Custom Icon View Link"](#)

8.7.4.7.2 Adding a Custom Icon View Link

A custom Icon View link provides greater flexibility in defining the content of the Icon View, including the ability to utilize more than one column.

1. To add a custom Icon View link:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
 4. Find **Icon View**. Configure the following attributes:
 - a. **Show** - Select **On**.
 - b. **Custom** - Select **On**.
 - c. **Columns Per Page** - Select the number of icons to display per row in Icon View. A value of 5 displays 5 icons per row of the report.
 - d. **Custom Link** - Enter the column link for the Icon view. Use substitution strings for column names, for example:

```
<a href="#EMP_LINK#"><br>#ENAME#</a>
```
 5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

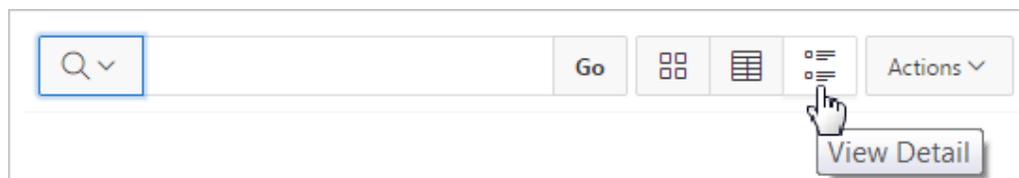


See Also:

["Adding a Custom Icon View Link"](#)

8.7.4.8 Enabling Detail View

By default, most interactive reports display as a report. You can optionally display details about each column. When configured, a View Details icon displays on the Search bar.



1. To add Details view to an interactive report:
 1. View the page in Page Designer:
Page Designer appears.

2. In the Rendering tab, select the region containing the report.
3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups
4. Find **Detail View**. Configure the following attributes:
 - a. **Show** - Select **On**.
 - b. **Before Rows** - Enter the HTML to be displayed before report rows. For example:

```
<table>
```

- c. **For Each Row** - Enter the body for report rows in the Detail View. Use #COLUMN_NAME# substitution strings for column names and column labels. For example:

```
<tr><td class="u-textRight">#ENAME_LABEL#:</td><td>#ENAME#</td></tr>
<tr><td class="u-textRight">#JOB_LABEL#:</td><td>#JOB#</td></tr>
```

- d. **After Rows** - Enter the HTML to be displayed after report rows. For example:

```
</table>
```

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.7.4.9 Configuring Advanced Attributes for Interactive Reports

By configuring advanced interactive report attributes, developers can define the region alias, specify an item whose value stores the saved report ID, and define a from address in an interactive report subscription or email download.

- [About Emailing from an Interactive Report](#)
- [Configuring Advanced Attributes](#)

8.7.4.9.1 About Emailing from an Interactive Report

You can define the from address for emails sent from an interactive report in two ways:

- Application-level — Edit the **Application Email From Address** attribute on the Edit Application Definition page.
- Report-level — Access the report Attributes. Under **Advanced**, edit the **Email from Address** attribute.

In either case, the value can be a literal string containing a valid email or an application substitution defined at the application-level using substitution syntax or &APP_EMAIL substitution which returns the Application Email From Address defined at the application-level. Examples:

```
john.doe@abc.com
&MY_APP_EMAIL_FROM.
&APP_EMAIL.
```

Note:

Oracle does not recommend using an item substitution at the application or page-level since it only works in email download, but not for subscriptions.

 **See Also:**

- ["Accessing the Definition Page"](#)
- ["Configuring Advanced Attributes for Interactive Reports"](#)
- ["Enabling Interactive Report Email Download"](#)

8.7.4.9.2 Configuring Advanced Attributes

1. To configure Advanced Attributes:
 1. View the page in Page Designer:

Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.

The Property Editor displays the attributes. Attributes are organized in groups
 4. Find **Advanced** and configure the appropriate options.
 - a. **Region Alias** - Enter an alphanumeric alias for this interactive report region.

The alias must be unique within the application. You can use an alias to reference an interactive report region in your custom API call. For example, you can write a function to return the `INTERACTIVE_REPORT_ID` by querying the `ALIAS` column in the `APEX_APPLICATION_PAGE_IR` view. Since the `INTERACTIVE_REPORT_ID` value can change when you export or import the application to different instance, referencing interactive report regions using an alias may be preferable.
 - b. **Report ID Item** - Select a page or application item whose value stores the saved report ID.

Interactive report uses this item value to link to a saved report. For example, you can define list of saved reports with links with defined item name and saved report ID as its value to link to a saved default reports, public or private reports. The saved report IDs can be retrieved from the `APEX_APPLICATION_PAGE_IR_RPT` view.
 - c. **Email From Address** - Enter a valid email address to use as the From address when sending email from this report.

Emails are sent from this report for Downloads of type Email and for Subscriptions. The value can be a literal string containing a valid email address or a static substitution reference defined in the application using substitution syntax.

Oracle does not recommend using an item substitution at the application or page-level since it only works in an email download, but not for subscriptions.

Examples:

```
john.doe@abc.com  
&MY_APP_EMAIL_FROM.  
&APP_EMAIL.
```

- d. **Oracle Text Index Column** - Select a column where the column is indexed by an Oracle Text index.

Row Search returns results based on the Oracle Text operator entered, providing the corresponding Oracle Text index has been created for the column. This option should only be enabled if the necessary index exist, and the end users have been trained in how to utilize the Oracle Text search operators. To simplify Oracle Text syntax for end users, you can specify a function for the Oracle Text PL/SQL Function Name Component Setting of Interactive Grids in Shared Components.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.7.5 Managing Interactive Report Column Attributes

Edit column attributes to control the display, features, and behavior of interactive report columns.

- [Editing Interactive Report Column Attributes](#)
- [Creating a Column Link in an Interactive Report](#)
- [Defining a Column as a List of Values in an Interactive Report](#)
- [Formatting Columns in an Interactive Report](#)
- [About Filtering on Conditional Links in Interactive Report Columns](#)



See Also:

["Editing Pages in Page Designer"](#)

8.7.5.1 Editing Interactive Report Column Attributes

Edit Column attributes to precisely control the report layout. For example, you can use these attributes to alter a column heading, change column positioning, hide a column, or control how users can manipulate a column.

To edit column attributes:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In the Rendering tab, locate the region and expand the Columns node.
The columns appear in the Rendering tab.
3. Select a column to edit.

The Property Editor displays the attributes for that column. Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

4. Edit the appropriate attributes.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. To edit the column heading, find the **Heading** group:
 - a. **Heading** - Enter the report column heading text.
 - b. **Alignment** - Select the heading alignment. Note that your alignment selection must be supported by the selected report template.
6. To control how users can manipulate a column::
 - a. Find the **Enable Users To** group.
 - b. For **Enable Users To** - For each attribute select **On** or **Off** to control how users can manipulate the report.
7. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

 **See Also:**

["About Filtering on Conditional Links in Interactive Report Columns"](#) and ["Right Pane of Page Designer \(Property Editor\)"](#)

8.7.5.2 Creating a Column Link in an Interactive Report

Use Column Attributes to create a link from a report to another page in your application or to a URL.

1. To create a column link to another page:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, locate the region and expand the Columns node.
The columns appear in the Rendering tab.
 3. Select a column to edit.
The Property Editor displays the attributes for that column. Attributes are organized in groups.
 4. Find **Identification**. From Type, select **Link**
 5. Find **Link** and click **No Link Defined**.
The Link Builder - Target dialog appears.

6. To create a link to another page, in the Link Builder - Target dialog:
 - a. Type - Select **Page in this Application**.
 - b. Page - Specify the target page number.
 - c. Set Items - Select a Name and Value to specify session state for an item.
 - d. Clear/Reset, Clear Cache - Specify the page numbers on which to clear cache. To specify multiple page, enter a comma-delimited list of page numbers.
 - e. Clear/Reset, Action - Select one of the following:
 - **None** - No clear or reset action when page loads.
 - **Clear Regions** - Clears all region settings on the page.
 - **Reset Regions** - Resets all regions on the page back to the default state, including sort orders, hidden columns and so on.
 - **Reset Pagination** - This option enables backwards compatibility.
 - f. Advanced, Request - Specify the request to be used.
 - g. Click **OK**.
7. To create a link to a URL, in the Link Builder - Target dialog:
 - a. Type - Select **URL**.
 - b. URL - Enter the URL address.
 - c. Click **OK**.
8. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.7.5.3 Defining a Column as a List of Values in an Interactive Report

Add a list of values in an interactive report to improve the speed of built-in filter tools.

1. To define a report column as a list of values:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, locate the region containing the report.
 3. In the Rendering tab, locate the region and expand the Columns node.
The columns appear in the Rendering tab.
 4. Select a column to edit.
 5. Configure Column Filter:
 - a. Find **Column Filter**.
 - b. For Type, select how to derive the filters provided in the report column drop down list. Options include:
 - **None** - No column filter is provided for this report.

- **Default Based on Column Type** - `STRING` and `NUMBER` columns derive the list of values from distinct column values. `DATE` columns derive the list of values from predefined date ranges.
 - **Use Defined List of Values to Filter Exact Match** - Derive the list of values from a defined list of values SQL query to create an equal filter.
 - **Use Defined List of Values to Filter Word Contains** - Derive the list of values from a defined list of values SQL query to create a contains filter.
 - **Use Named List of Values to Filter Exact Match** - Derive the list of values from the named list of values to create an equal filter.
 - **Use Named List of Values to Filter Word Contains** - Derive the list of values from the named list of values to create a contains filter.
6. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.7.5.4 Formatting Columns in an Interactive Report

You can use HTML expressions in interactive reports to further the customize column display.

1. To define column formatting:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.
 2. In the Rendering tab, locate the region and expand the Columns node.
The columns appear in the Rendering tab.
 3. Select a column to edit.
 4. Configure the column format:
 - a. Find **Column Formatting**.
 - b. In HTML Expression, enter HTML expressions to be shown in this column. Use `#COLUMN#` syntax to show column values in HTML.

- **Example 1: Change the background and text colors**

```
<span style="background-color: yellow; color: red;">#EMPLOYEE_STATUS#</span>
```

- **Example 2: Use Heading 2**

```
<h2>#EMPLOYEE_NAME#</h2>
```

- **Example 3: Use a dynamic class from the SQL query**

```
<span class="#COLUMN_CLASS#">#EMPLOYEE_STATUS#</span>
```

The `#COLUMN_CLASS#` and `#EMPLOYEE_STATUS#` substitutions in this example are columns selected in the report SQL query.

- **Example 4: Show an image, and a tooltip on hover**

```

```

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.7.5.5 About Filtering on Conditional Links in Interactive Report Columns

If an interactive report has a column value that is a link and the link markup is constructed in the report query, attempting to define a filter on this value from the column header menu fails. Oracle Application Express is not able to render the link correctly in the column header menu because the column values are themselves rendered as links, such that they can be selected to apply the filter. If the developer wanted to conditionally render the link based on query logic, the link may have been defined in the report query as opposed to using the declarative column link support.

For filtering to work on conditional links in columns, developers have two options:

- **Option 1: Use an HTML Expression column:**
 1. Add another column to your query that selects the equivalent of the link text from the link and define a column alias of `my_link_display`. This column alias will be the value used in the column header menu.
 2. Change the `my_link` column to be of type **Hidden Column**.
 3. In the `my_link_display` column, set the column heading to be the same as the `my_link` column and set **HTML Expression** to be `#MY_LINK#`. Keep the default **Escape Special Characters** as **Yes**.
 4. Run the page.

If needed, reorder the columns so that the new column is in the same position as the old one. Select the **Actions** menu and then **Select Columns**.
 5. Save a new default report. Select the **Actions** menu, **Save Report**, and then **Save as Default Report Settings**.

The link still renders fine in the report and the column header menu now renders just the `my_link_display` value which sets the filter correctly.

- **Option 2: Use a custom Column Filter for the link column, where you could query for the link text.**



See Also:

["Editing Interactive Report Column Attributes "](#)

8.7.6 Customizing Interactive Reports in a Running Application

When running an application, users (that is, both end users and developers) can alter the layout of interactive reports data by choosing the columns they are interested in, applying filters, highlighting, and sorting. They can also define breaks, aggregations, charts, group bys, and add their own computations.

- [About the Search Bar](#)
- [About the Actions Menu](#)

- [Using Interactive Report Filters](#)
- [Saving Interactive Reports](#)



See Also:

"Customizing an Interactive Report Using the Actions Menu" in *Oracle Application Express End User Guide*

8.7.6.1 About the Search Bar

Id	Name	Description	Project Lead	Completed	Created	Updated
3	Configure Web Environment	Determine the hardware and software required to develop with Web development tool.	Lucille Beatie	10/17/2019	1/13/2020	1/13/2020
3	Train Developers	Ensure all developers who will be developing with the new tool get the appropriate training.	Lucille Beatie	10/28/2019	1/13/2020	1/13/2020
2	Migrate Legacy Applications	Move the data and redevelop the applications currently running on top of legacy servers	Miyazaki Yokohama		1/13/2020	1/13/2020
2	Develop Partner Portal POC	Develop a proof of concept that partners can use to work more collaboratively with us.	Bernard Jackman		1/13/2020	1/13/2020
1	Develop Production Partner Portal	Develop the production app that partners can use to work more collaboratively with us.	Lucille Beatie		1/13/2020	1/13/2020

A search bar displays at the top of every interactive report and may include the following features:

- **Select Columns to Search** - This icon resembles a magnifying glass. Click this icon to narrow your search to specific columns. To search all columns, select **All Columns**.
- **Text Area** - Enter case insensitive search criteria (wildcard characters are implied) and click **Go**.
- **Go Button** - Executes a search.
- **Reports** - Displays alternate default and saved private, or public reports. See "[Saving Interactive Reports](#)."
- **View Icons** - Switches between an View Icon, View Report and View Detail of the default report (if enabled). May also include Chart and Group By View (if defined).
- **Actions menu** - Use the Actions menu to customize an interactive report. See "[About the Actions Menu](#)."



See Also:

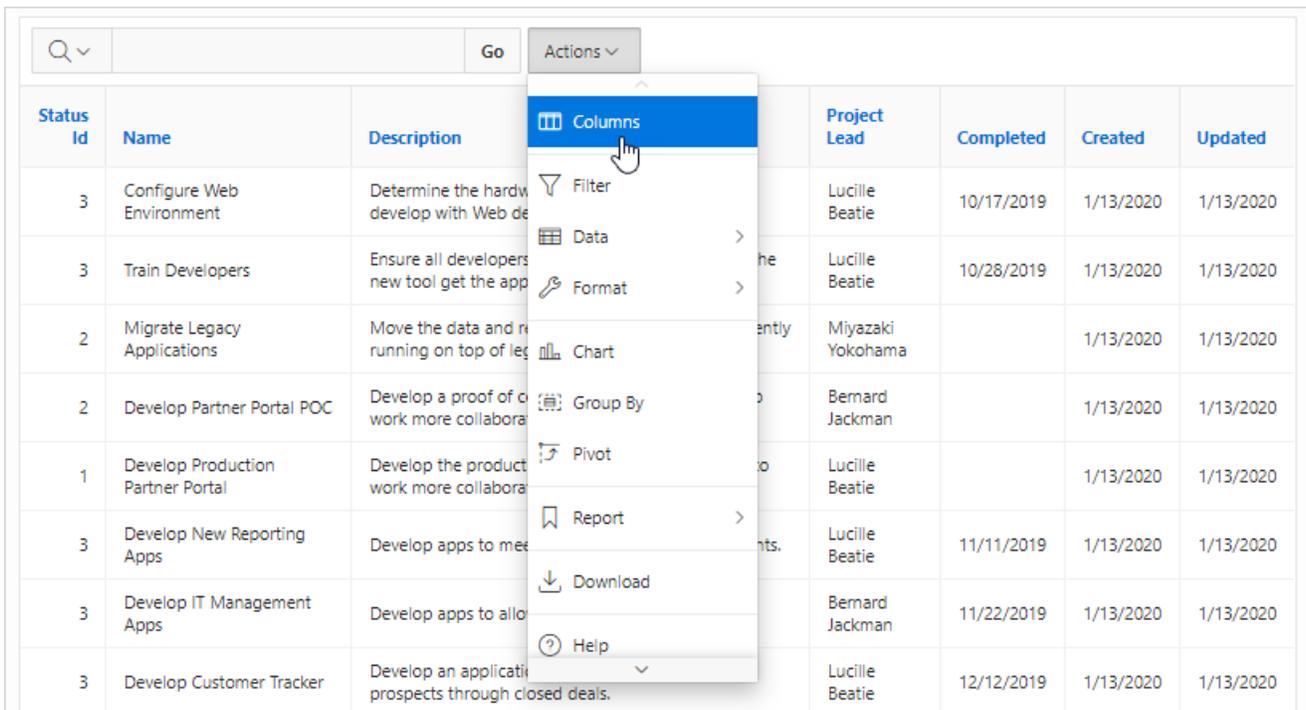
"Customizing the Interactive Report Search Bar"

8.7.6.2 About the Actions Menu

Note:

The structure of the interactive report Actions menu has changed to be consistent with interactive grids. To alter an interactive report Actions menu to use the previous (or legacy) structure, go to **Shared Components, Component Settings**, and configure the **Interactive Report** component. See "[Configuring Interactive Report Action Menu Structure](#)".

The Actions menu appears to the right of the Go button on the Search bar. End users use the Actions menu to customize an interactive report.



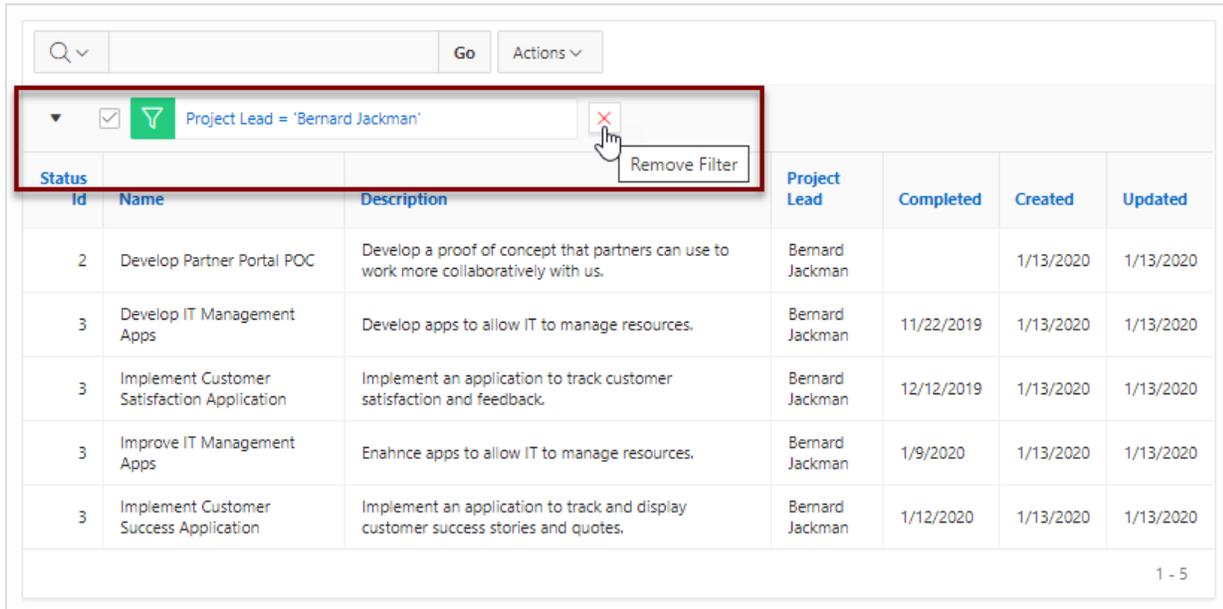
Status Id	Name	Description	Project Lead	Completed	Created	Updated
3	Configure Web Environment	Determine the hardware and software requirements for developing with Web de	Lucille Beatie	10/17/2019	1/13/2020	1/13/2020
3	Train Developers	Ensure all developers are trained on the new tool get the app	Lucille Beatie	10/28/2019	1/13/2020	1/13/2020
2	Migrate Legacy Applications	Move the data and reports from legacy systems running on top of leg	Miyazaki Yokohama		1/13/2020	1/13/2020
2	Develop Partner Portal POC	Develop a proof of concept for a partner portal that work more collabora	Bernard Jackman		1/13/2020	1/13/2020
1	Develop Production Partner Portal	Develop the production version of a partner portal that work more collabora	Lucille Beatie		1/13/2020	1/13/2020
3	Develop New Reporting Apps	Develop apps to meet the needs of various reporting requirements.	Lucille Beatie	11/11/2019	1/13/2020	1/13/2020
3	Develop IT Management Apps	Develop apps to allow IT staff to manage their own work.	Bernard Jackman	11/22/2019	1/13/2020	1/13/2020
3	Develop Customer Tracker	Develop an application that allows sales reps to track prospects through closed deals.	Lucille Beatie	12/12/2019	1/13/2020	1/13/2020

See Also:

"Customizing an Interactive Report Using the Actions Menu" in *Oracle Application Express End User Guide*

8.7.6.3 Using Interactive Report Filters

When you customize an interactive report, a filter displays between the search bar and the report. The following illustration shows an interactive report with one filter, `Project lead = 'Bernard Jackman'`.



Status				Project Lead	Completed	Created	Updated
Id	Name	Description					
2	Develop Partner Portal POC	Develop a proof of concept that partners can use to work more collaboratively with us.		Bernard Jackman		1/13/2020	1/13/2020
3	Develop IT Management Apps	Develop apps to allow IT to manage resources.		Bernard Jackman	11/22/2019	1/13/2020	1/13/2020
3	Implement Customer Satisfaction Application	Implement an application to track customer satisfaction and feedback.		Bernard Jackman	12/12/2019	1/13/2020	1/13/2020
3	Improve IT Management Apps	Enhance apps to allow IT to manage resources.		Bernard Jackman	1/9/2020	1/13/2020	1/13/2020
3	Implement Customer Success Application	Implement an application to track and display customer success stories and quotes.		Bernard Jackman	1/12/2020	1/13/2020	1/13/2020

1 - 5

Other key features of interactive report filters include:

- **Enable/Disable** - To enable and disable a filter, select and deselect the check box to the left of the filter name.
- **Filter Edit** - To edit a filter, click the filter name.
- **Remove Filter** - To remove a filter, select the **Remove Filter** icon to the right of the filter name.

By default, multiple filters display horizontally stacked on top of one another. To minimize the amount of information that displays and hide filter details, click the arrow to the left of the filter name. The following illustration shows the same report with the filter details hidden.

Status Id	Name	Description	Project Lead	Completed	Created	Updated
2	Develop Partner Portal POC	Develop a proof of concept that partners can use to work more collaboratively with us.	Bernard Jackman		1/13/2020	1/13/2020
3	Develop IT Management Apps	Develop apps to allow IT to manage resources.	Bernard Jackman	11/22/2019	1/13/2020	1/13/2020
3	Implement Customer Satisfaction Application	Implement an application to track customer satisfaction and feedback.	Bernard Jackman	12/12/2019	1/13/2020	1/13/2020
3	Improve IT Management Apps	Enhance apps to allow IT to manage resources.	Bernard Jackman	1/9/2020	1/13/2020	1/13/2020
3	Implement Customer Success Application	Implement an application to track and display customer success stories and quotes.	Bernard Jackman	1/12/2020	1/13/2020	1/13/2020

1 - 5

8.7.6.4 Saving Interactive Reports

All users can save a private or public interactive report. However, only the user who creates a private report can view, save, rename, or delete it. Developers have additional save capabilities in that they can save the report that initially displays, called the Primary Default, or create an Alternative Default report.

- [About the User Type and Available Save Options](#)
- [About Configuration Dependencies When Saving Interactive Reports](#)
- [Saving a Public or Private Interactive Report](#)
- [Saving a Default Interactive Report](#)
- [Renaming a Public or Private Interactive Report](#)
- [Deleting a Public or Private Interactive Report](#)
- [About Exporting Interactive Reports](#)

See Also:

"Managing Saved Interactive Reports" in *Oracle Application Express Administration Guide*

8.7.6.4.1 About the User Type and Available Save Options

An end user can save an interactive report in two ways:

- **Public Report** (End user and developer). This report is viewable by all users. However, only the user who creates a public report can save, rename, or delete it. Although all users can view a public report, they can only save it under a new report name.
- **Private Report** (End user and developer). Only the user who creates the private report can view, save, rename, or delete it.

A developer can additionally save an interactive report in the following ways:

- **Primary Default** (Developer only). The Primary Default is the report that initially displays. Primary Default reports cannot be renamed or deleted.
- **Alternative Report** (Developer only). Enables developers to create multiple report layouts. Only developers can save, rename, or delete an Alternative Report.

The following illustration shows the Reports list on the Search bar of an interactive report.

Status Id	Name	Description	Project Lead	Completed	Created	Updated
3	Configure Web Environment	Determine the hardware and software requirements for the application and develop with Web de	Lucille Beatie	10/17/2019	1/13/2020	1/13/2020
3	Train Developers	Ensure all developers who will be developing with the new tool get the appropriate training.	Lucille Beatie	10/28/2019	1/13/2020	1/13/2020
2	Migrate Legacy Applications	Move the data and redevelop the applications currently running on top of legacy servers	Miyazaki Yokohama		1/13/2020	1/13/2020
2	Develop Partner Portal POC	Develop a proof of concept that partners can use to work more collaboratively with us.	Bernard Jackman		1/13/2020	1/13/2020
1	Develop Production Partner Portal	Develop the production app that partners can use to work more collaboratively with us.	Lucille Beatie		1/13/2020	1/13/2020

This example shows two reports:

- **Default - Primary Report.** This is the initial report created by the application developer. Default, Primary reports cannot be renamed or deleted.
- **Private - 1. Bernard's Projects.** This is a Private report. Only the user who creates a private report can view, save, rename, or delete it.



Tip:

You can view saved report activity from the Workspace Administration page. On the Workspace home page, click the **Administration** menu and then select **Administration, Monitor Activity**, and then under **Page Views** select **By Interactive Report**.

8.7.6.4.2 About Configuration Dependencies When Saving Interactive Reports

Developers control how users can save an interactive report by editing report Attributes.

To fully enable users to save private reports, a developer must:

1. Define an authentication scheme for the current application.
2. Edit the following report Attributes:
 - **Search Bar, Reports Select List** — Set this attribute to **On** to include a Reports select list in the Search bar.
 - **Actions Menu, Save Report** — Set this attribute to **On** to enable end users to save their current report definition as a *Private* report.
 - **Actions Menu, Save Public Report** — Set this attribute to **On** to enable end users to save their current report definition as a *Public* report.
 - **Actions Menu, Save Public Report Authorization** — Select an authorization scheme to restrict who can save public report definitions. To enable an end user to save a public report, this authorization scheme must evaluate to TRUE. If no authorization scheme is provided then reports may be saved by any user.



See Also:

- ["Establishing User Identity Through Authentication"](#)
- ["Customizing the Interactive Report Actions Menu"](#)
- ["Customizing the Interactive Report Search Bar"](#)

8.7.6.4.3 Saving a Public or Private Interactive Report

End users can save an interactive report and classify it as being either public or private. Public reports can be viewed by all users. Private reports can only be viewed by the user who saves the report.

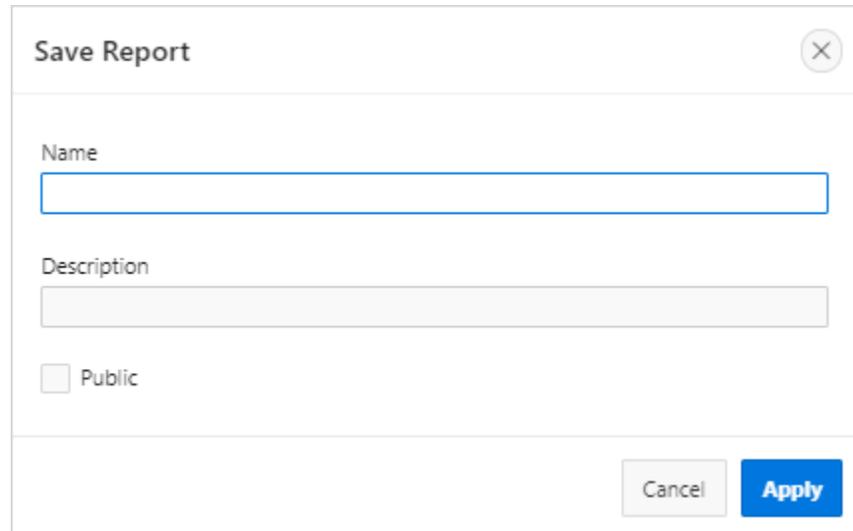


Tip:

To save a public report, the developer must edit the report Attributes. In the Property Editor, locate **Actions Menu** and set **Save Public Report** to **On**. Developers can also apply an authorization scheme to enable or disable **Save Public Report**. See "[About Configuration Dependencies When Saving Interactive Reports](#)."

To save a public or private interactive report:

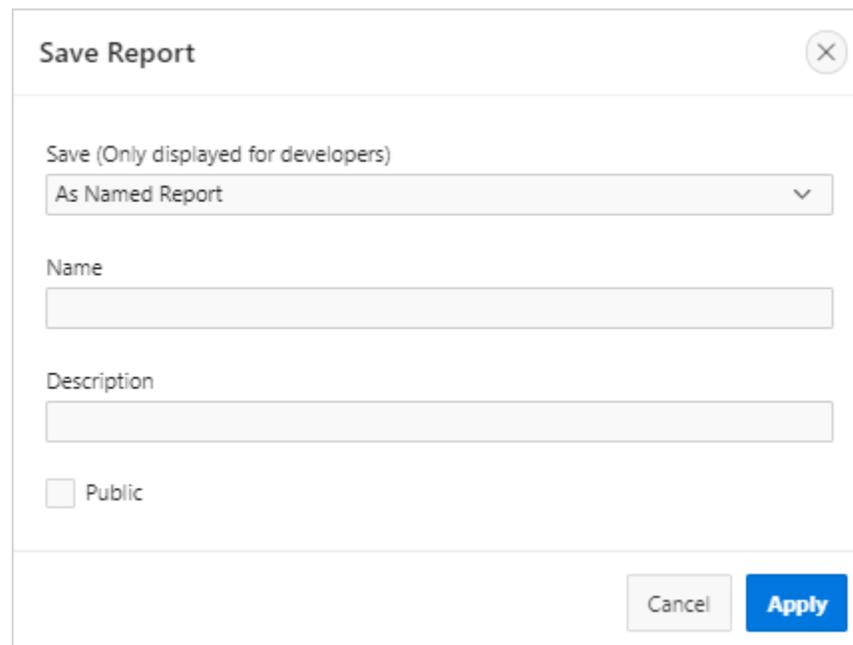
1. Go to the page containing the interactive report you want to save.
2. Customize the report (for example, hide columns, add filters, and so on).
3. Click the **Actions** menu and select **Report** and then **Save Report**.
The Save Report dialog appears.
4. For end users, the following Save Report dialog appears.



The 'Save Report' dialog box features a title bar with a close button (X) in the top right corner. Below the title bar, there are three input fields: a text box for 'Name', a larger text area for 'Description', and a checkbox labeled 'Public'. At the bottom right of the dialog, there are two buttons: a grey 'Cancel' button and a blue 'Apply' button.

In Save Report:

- a. **Name** - Enter a name for the report.
 - b. **Description** - Enter an optional description.
 - c. **Public** - Select this check box to make the report viewable to all users. Deselect this check box to make the report private.
 - d. Click **Apply**.
5. For developers, the following Save Report dialog appears.



This 'Save Report' dialog box for developers includes an additional dropdown menu at the top. The dropdown is titled 'Save (Only displayed for developers)' and currently shows 'As Named Report' with a downward arrow. Below this dropdown are the same 'Name', 'Description', and 'Public' fields as in the first dialog. The 'Cancel' and 'Apply' buttons are located at the bottom right.

In Save Report:

- a. **Save** - Select **As Named Report**.
- b. **Name** - Enter a name for the report.
- c. **Description** - Enter an optional description.
- d. **Public**- Select this check box to make the report viewable to all users. Deselect this check box to make the report private.

 **Tip:**

The Public check box only displays if you have enabled the **Save Public Report** report attribute.

- e. Click **Apply**.

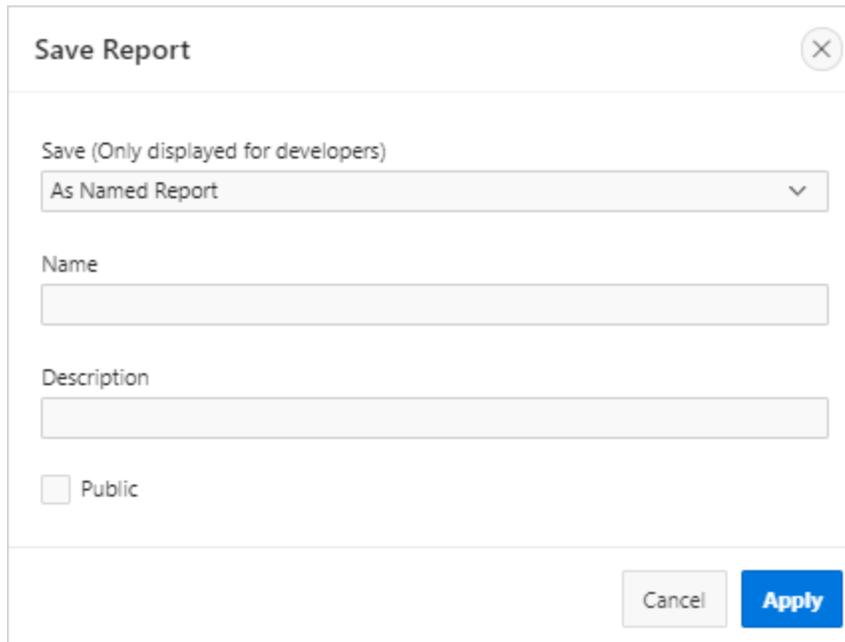
8.7.6.4.4 Saving a Default Interactive Report

Developers can save two types of default interactive report: **primary** and **alternative**. Both reports display on the Report list on the search bar. However, primary default reports cannot be renamed or deleted.

To save a default interactive report:

1. Run the report as a developer.
2. Customize the report (for example, hide columns, add filters, and so on).
3. Click the **Actions** menu and select **Report** and then **Save Report**.

The Save Report dialog appears.

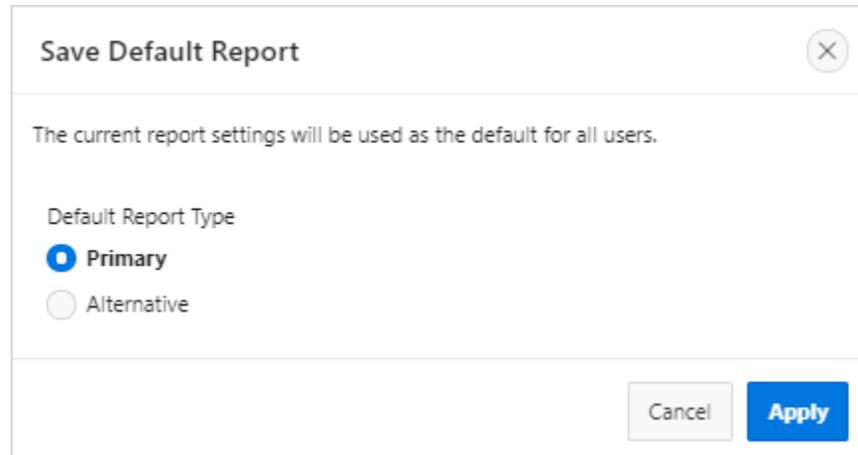


The image shows a 'Save Report' dialog box with a close button (X) in the top right corner. The dialog contains the following elements:

- A dropdown menu labeled 'Save (Only displayed for developers)' with 'As Named Report' selected.
- A text input field labeled 'Name'.
- A text input field labeled 'Description'.
- A checkbox labeled 'Public' which is currently unchecked.
- At the bottom right, there are two buttons: 'Cancel' and 'Apply'.

4. From Save, select **As Default Report Settings**.

The Save Default Report dialog appears.



The current report settings will be used as the default for all users.

Default Report Type

Primary

Alternative

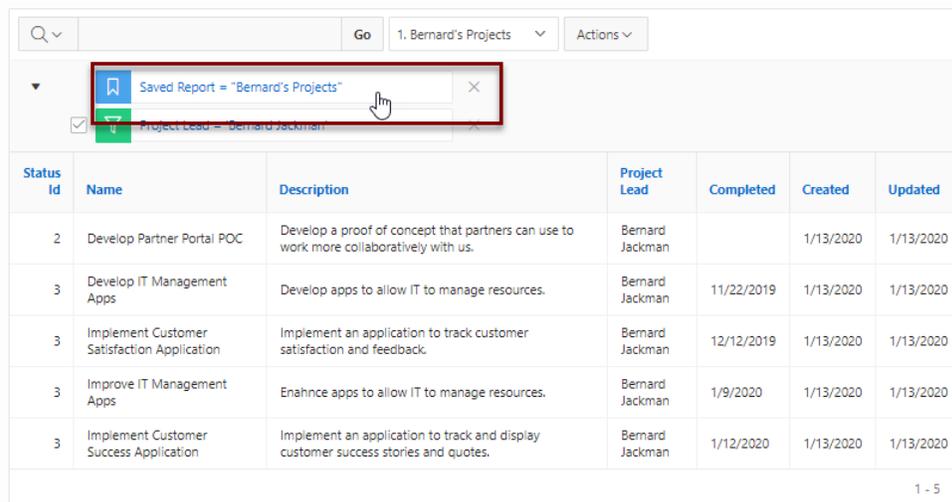
Cancel Apply

5. For Default Report Type, select either:
 - **Primary** - This report displays as the primary report when the page runs.
 - **Alternative** - This report displays as an alternative option on the Reports list on the Search bar. If you select **Alternative**, enter a name.
6. Click **Apply**.

8.7.6.4.5 Renaming a Public or Private Interactive Report

To rename a public or private interactive report:

1. Run the report as a developer.
2. Select the public or private interactive report to rename.
3. Click the saved report link.



Status Id	Name	Description	Project Lead	Completed	Created	Updated
2	Develop Partner Portal POC	Develop a proof of concept that partners can use to work more collaboratively with us.	Bernard Jackman		1/13/2020	1/13/2020
3	Develop IT Management Apps	Develop apps to allow IT to manage resources.	Bernard Jackman	11/22/2019	1/13/2020	1/13/2020
3	Implement Customer Satisfaction Application	Implement an application to track customer satisfaction and feedback.	Bernard Jackman	12/12/2019	1/13/2020	1/13/2020
3	Improve IT Management Apps	Enhance apps to allow IT to manage resources.	Bernard Jackman	1/9/2020	1/13/2020	1/13/2020
3	Implement Customer Success Application	Implement an application to track and display customer success stories and quotes.	Bernard Jackman	1/12/2020	1/13/2020	1/13/2020

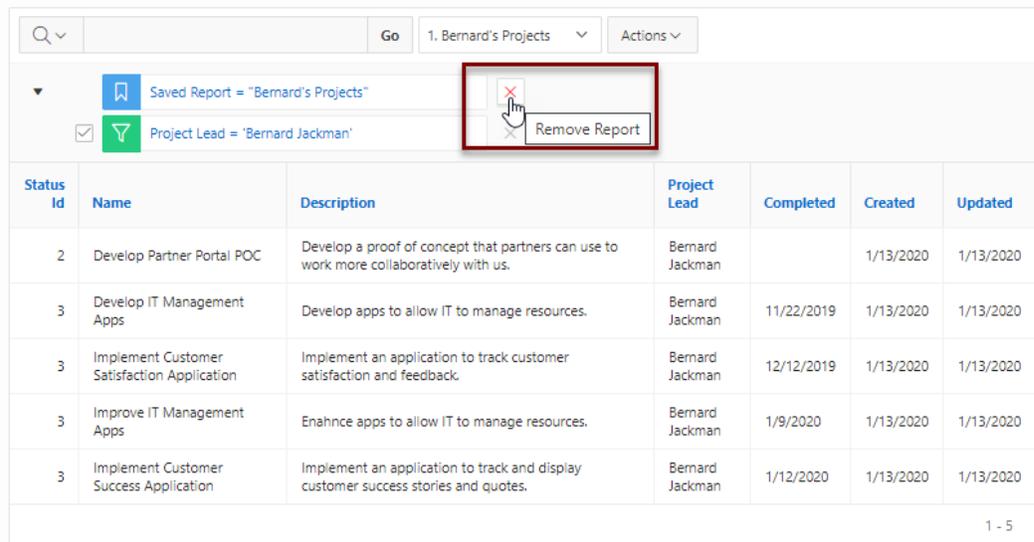
1 - 5

4. In the Rename Report dialog, edit the attributes (for example, enter a new name) and click **Apply**.

8.7.6.4.6 Deleting a Public or Private Interactive Report

To delete a public or private interactive report:

1. Run the report as a developer.
2. Click the **Remove Report** icon next to the report name link.



The screenshot shows a web interface for managing reports. At the top, there is a search bar, a 'Go' button, a dropdown menu set to '1. Bernard's Projects', and an 'Actions' dropdown. Below this, there are two filter buttons: 'Saved Report = "Bernard's Projects"' and 'Project Lead = "Bernard Jackman"'. A red box highlights a 'Remove Report' icon (a square with a red 'X') next to the report name link. Below the filters is a table with the following data:

Status Id	Name	Description	Project Lead	Completed	Created	Updated
2	Develop Partner Portal POC	Develop a proof of concept that partners can use to work more collaboratively with us.	Bernard Jackman		1/13/2020	1/13/2020
3	Develop IT Management Apps	Develop apps to allow IT to manage resources.	Bernard Jackman	11/22/2019	1/13/2020	1/13/2020
3	Implement Customer Satisfaction Application	Implement an application to track customer satisfaction and feedback.	Bernard Jackman	12/12/2019	1/13/2020	1/13/2020
3	Improve IT Management Apps	Enhance apps to allow IT to manage resources.	Bernard Jackman	1/9/2020	1/13/2020	1/13/2020
3	Implement Customer Success Application	Implement an application to track and display customer success stories and quotes.	Bernard Jackman	1/12/2020	1/13/2020	1/13/2020

At the bottom right of the table, it says '1 - 5'.

3. Click **Apply**.

8.7.6.4.7 About Exporting Interactive Reports

When you export an application, the Primary Default, Alternative Default, public reports are included by default. Configure the **Export Public Reports** and **Export Private Reports** attributes to control the type of reports to include in your export.



See Also:

["Exporting an Application"](#)

8.7.7 Linking to Interactive Reports

Developers can use the syntax in the `Request` value and `ItemNames` section of the URL to link to interactive reports.

Data in an interactive report is driven by declarative filters. Developer can set report parameters by modifying interactive report settings for an end user. However, these settings only affect the end user's working report and do not affect any saved report settings. Developers can use the syntax described in this section to link to interactive reports.

 **Note:**

When you add additional interactive report regions, be sure to change the old single interactive report link syntax. Otherwise, the link generates an error. A link to a page with more than one interactive report regions, the request or name syntax needs to fully qualify with region static ID. To open a link to an interactive report from outside of an application (for example, from an email), you may need to enable the Session Mangement, Deep Linking attribute in your application. See "[Session Management](#)."

- [Interactive Report Request Syntax](#)
- [Interactive Report Name and Value Syntax](#)
- [Interactive Report ClearCache Syntax](#)
- [Restrictions When Linking to Interactive Reports](#)
- [Valid Interactive Report Linking Examples](#)
- [Invalid Interactive Report Linking Examples](#)
- [Linking to Shared Interactive Reports](#)

 **See Also:**

- ["Understanding URL Syntax"](#)
- ["About Using f?p Syntax to Link Pages"](#)

8.7.7.1 Interactive Report Request Syntax

To link to a specific saved report, use the following `Request` syntax:

```
IR[region static ID]<report alias>
```

Consider the following example:

```
IR[EMP]_dept20
```

 **Note:**

The use of `Request` in the URL is optional. To link to multiple saved reports, separate each `Request` with comma.

8.7.7.2 Interactive Report Name and Value Syntax

To create a filter, use the following `itemNames` and `itemValues` syntax:

```
IR[region static ID]<operator>_<target column alias>
```

Consider the following example:

```
IR[EMP]C_ENAME:KING
```

**Note:**

If there is only one interactive report region on the page, the `itemName` does not need to be fully qualified with the region static ID. If an operator is not defined, a filter with equal operator is added.

To create a filter on an interactive report in a link, use the `itemNames` syntax described previously and add the filter value in the corresponding location in the item names section of the URL.

To create row text which contains a filter on an interactive report, use `ROWFILTER` as the target column alias in the item name syntax and add a filter value in the item `itemValues` of the URL. The link will add a Row Text Contains filter which searches all columns displayed in the report with type `STRING` or `NUMBER`.

Consider the following example:

```
IR[EMP]_ROWFILTER:SALES
```

Valid operators include:

- `C` = Contains
- `EQ` = Equals (this is the default)
- `GTE` = Greater than or equal to
- `GT` = Greater Than
- `LIKE` = SQL Like operator
- `LT` = Less than
- `LTE` = Less than or equal to
- `N` = Null
- `NC` = Not Contains
- `NEQ` = Not Equals
- `NLIKE` = Not Like
- `NN` = Not Null
- `NIN` = Not In (escape the comma separated values with a leading and trailing backslash, \)
- `IN` = In (escape the comma separated values with a leading and trailing backslash, \)
- `ROWFILTER` = Row Text Contains (this searches all columns displayed in the report with type `STRING` or `NUMBER`)

8.7.7.3 Interactive Report ClearCache Syntax

 **Tip:**

Using `ClearCache` without specifying a saved report alias in the `Request`, clears the primary default report. To clear a specific interactive report region on a page with more than one interactive reports, specify the region static ID along with saved report alias in the `Request`.

Use the following syntax in the `ClearCache` section of the URL to reset, clear, or reset pagination the interactive report:

- `RR` - Resets an interactive report and pagination. This is equivalent to the end user choosing the Reset option from the interactive report Actions menu on the target page. The report is returned to the default report settings specified by the developer or saved by the user.
- `CR` - Clears interactive report and resets pagination. This clears all of the session report settings such as control break, aggregate, flashback, chart, number of rows to display, filter, highlight, computation, group by, and pivot.
- `RP` - Resets interactive report pagination.

8.7.7.4 Restrictions When Linking to Interactive Reports

When linking to interactive reports, remember the following restrictions:

1. If a `Request` value is not defined in the URL, all of the primary default report settings will change.
2. If a `Request` value is not defined and `itemNames` section does not include a fully qualified filter column name with region static ID, an error occurs if there are more than one interactive report region in the target page.
3. If a `Request` value is not defined and `itemNames` section do not include a fully qualified filter column name with region static ID, it will create a filter on the primary default report if there is only one interactive report region in the target page.

8.7.7.5 Valid Interactive Report Linking Examples

This section contains valid linking examples.

Valid Linking Example 1

This example includes a link with no `Request` value, but includes a qualified filter column with region static ID in the `itemNames` section of the URL. This example creates a filter on the primary default report in the referenced region item name.

```
f?p=&APP_ID.:2:&SESSION.:::IR[EMP]_ENAME:KING
```

Valid Linking Example 2

To support backwards compatibility with previous releases, this example uses older syntax and works on a page with one interactive report region.

```
?p=&APP_ID.:1:&SESSION.:IR_REPORT_12345::RIR,CIR::RIR,CIR:IR_ENAME:KING
```

Valid Linking Example 3

In this example the link has no `Request` value. The clear cache section has `RIR` or `CIR` or `RP` and will reset, clear, or reset the pagination of the primary default reports of all interactive report regions.

```
f?p=&APP_ID.:1:&SESSION.:::RIR:
```

8.7.7.6 Invalid Interactive Report Linking Examples

This section contains invalid linking examples.

Invalid Linking Example 1

This link has no `Request` value and does not include a fully qualified filter column with region static ID in the item name section of the URL. This example generates an error if there is more than one interactive report region in the target page.

```
f?p=&APP_ID.:2:&SESSION.:::ENAME:KING
```

Invalid Linking Example 2

This example has a link with two request values separated by commas and does not contain a fully qualified filter column with region static ID in the item name section of the URL. This example generates an error since it is not clear where the filter needs to be created.

```
f?p=&APP_ID.:2:&SESSION.:IR[test]_employee,IR[test2]_dept10::ENAME:KING
```

Invalid Linking Example 3

This example uses old request value syntax used on a page with multiple interactive report regions. This example will generate an error. The old syntax only works if there is one interactive report region.

```
f?p=&APP_ID.:2:&SESSION.:IR_REPORT_myrrpt::ENAME:KING
```

8.7.7.7 Linking to Shared Interactive Reports

You can link to saved primary default, alternative default, and public reports using `IR[region static ID]<report_alias>` in the `Request` value of the URL.

- [Editing the Interactive Report Saved Report Alias](#)
- [Link Examples to a Primary Report](#)
- [Link Examples to Saved Reports](#)

 **See Also:**

- ["About Using f?p Syntax to Link Pages"](#)
- ["Saving a Default Interactive Report "](#)
- ["Deleting Saved Interactive Reports"](#)
- ["Managing Saved Interactive Reports" in *Oracle Application Express Administration Guide*](#)

8.7.7.7.1 Editing the Interactive Report Saved Report Alias

Edit the Alias for a saved reports to create a more meaningful URL link to the saved report.

To edit the Alias for saved reports:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In the Rendering tab, find the region containing the report.
3. Under the region, expand **Saved Reports** and select the saved report.
The Property Editor displays the attributes for the Saved Report.
4. **Identification, Alias** - Enter a new alias for the report. Use this alias to define a more meaningful URL link to this saved report. This link can be used to link directly from elsewhere in the application.
5. **Link, Link Example** - View the URL link for this saved report. This attribute is view only and cannot be updated. Use this attribute to quickly copy the displayed URL. This URL can be used to link directly to this particular saved report from anywhere else in the application.
6. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.7.7.7.2 Link Examples to a Primary Report

The following examples demonstrate how to link to a primary report (report_alias=PRIMARY):

This example links to a primary report:

```
f?p=100:1:&APP_SESSION.:IR_PRIMARY
```

This example links, resets, and clears primary report settings:

```
f?p=100:1:&APP_SESSION.:IR_PRIMARY::RIR,CIR:
```

This example links, resets, and clears primary report settings. It additionally creates a ENAME = 'KING' filter on the primary report:

```
f?p=100:1:&APP_SESSION.:IR_PRIMARY::RIR,CIR:IR_ENAME:KING
```

8.7.7.7.3 Link Examples to Saved Reports

The following examples demonstrate how to link to a saved report (`report_alias=REPORT1`):

This example links to a saved report:

```
f?p=100:1:&SESSION.:IR_REPORT1
```

This example links, resets, and clears settings for saved report `REPORT1`:

```
f?p=100:1:&SESSION.:IR_REPORT1::RIR,CIR:
```

This example links, resets, and clears saved report `REPORT1` settings. It additionally creates a `ENAME = 'KING'` filter on saved report `REPORT1`.

```
f?p=100:1:&SESSION.:IR_REPORT1::RIR,CIR:IR_ENAME:KING
```

8.8 Managing Classic Reports

A classic report is the formatted result of a SQL query.

Developers control how a classic report works by editing the following attributes in Page Designer: region attributes, report Attributes, and Column attributes.

- [Example Classic Report](#)
View a classic report example.
- [Creating a Classic Report Using the Create Application Wizard](#)
Run the Create Application Wizard to create a new application that contains one or multiple classic report pages.
- [Managing Classic Report Region Attributes](#)
Edit Region attributes to alter the SQL source, change the region layout and appearance, define a region displays selector, and create region conditions.
- [Managing Classic Report Attributes](#)
Edit report Attributes control how a classic report works.
- [Managing Classic Report Column Attributes](#)
Edit column attributes to control the display, features, and column behavior.

8.8.1 Example Classic Report

View a classic report example.

A classic report is a formatted result of a SQL query. You choose a table on which to build a report, or provide a custom SQL `SELECT` statement or a PL/SQL function returning a SQL `SELECT` statement. With the exception of sorting and simple filtering, end users cannot customize a classic report. Both the Create Application Wizard and Create Page Wizard support the creation of classic reports.

The following is an example of a classic report.

Status Id	Name	Description	Project Lead	Completed	Created	Updated
3	Configure Web Environment	Determine the hardware and software required to develop with Web development tool.	Lucille Beatie	10/17/2019	1/13/2020	1/13/2020
3	Train Developers	Ensure all developers who will be developing with the new tool get the appropriate training.	Lucille Beatie	10/28/2019	1/13/2020	1/13/2020
2	Migrate Legacy Applications	Move the data and redevelop the applications currently running on top of legacy servers	Miyazaki Yokohama		1/13/2020	1/13/2020
2	Develop Partner Portal POC	Develop a proof of concept that partners can use to work more collaboratively with us.	Bernard Jackman		1/13/2020	1/13/2020
1	Develop Production Partner Portal	Develop the production app that partners can use to work more collaboratively with us.	Lucille Beatie		1/13/2020	1/13/2020
3	Develop New Reporting Apps	Develop apps to meet C Level reporting requirements.	Lucille Beatie	11/11/2019	1/13/2020	1/13/2020

To create a classic report, developers either select a table or provide a SQL statement. Classic reports support general keyword search capability, the ability to specify the number of rows that display, and basic column sorting. You also have the option to include a form page for creating or updating records.



Tip:

To view an example, install the sample app, *Sample Reporting*. To learn more, see [Sample Apps](#).



Note:

Developers can create highly customized reports using report template (in particular, named column templates). See "[Report Templates](#)."

8.8.2 Creating a Classic Report Using the Create Application Wizard

Run the Create Application Wizard to create a new application that contains one or multiple classic report pages.

1. To create an application that contains one or multiple classic report pages:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Click the **Create** button.
 3. Click **New Application**.
 4. For Name, enter the name used to identify the application to developers.
 5. For Appearance, accept the default Theme Style and menu layout (Vita, Side Menu), or change it by clicking the **Set Appearance** icon adjacent to the Appearance field.
6. To add a classic report:
 - a. Click **Add Page**.
 - b. Expand the **Additional Pages** region and select **Classic Report**
7. On Add Report Page:

- a. Page Name - Enter a name for this page.
- b. Set Icon - Select an icon to display in the navigation menu for this page.
- c. Page Source - Select the source for the report:
 - **Table or View**
 - **SQL Query**

What you select determines what displays next. Follow the on-screen instructions. To learn more about an attribute, click the Help icon in the lower left corner.

- d. Select the report type **Classic Report**.
- e. Include Form - Select **Include Form** to include a form page for creating or updating records.
- f. Lookup Columns - Expand to see attributes for defining a lookup to another table. Use Lookup Columns to replace identifiers with a display column, such as showing the department name instead of the department number. Specify the following:
 - Lookup Key - Select the column to change to output the display column.
 - Display Column - Select the column (from the lookup table) to be displayed.

 **Tip:**

Lookup Columns only appear if the current page is based on a table and has foreign key constraints to another table.

- g. Advanced - Expand **Advanced** to configure these options:
 - Set as Home Page - Enable this to make this page the home page for the application.
 - Set as Administration Page - Enable this to have this page display under Administration.
 - Page Help - Enter text to be displayed when the user selects Page Help.
- h. Click **Add Page**.
8. Features - Select features to include with the application. Features provide application-level functionality and can only be added once per application. To learn more, click the Help icon adjacent to **Features**.
9. Settings - Specify settings used to generate this application. To learn more about an attribute, click the Help icon adjacent to **Settings**.
10. Click **Create Application**.

 **See Also:**

"Creating a Report Using the Create Page Wizard"

8.8.3 Managing Classic Report Region Attributes

Edit Region attributes to alter the SQL source, change the region layout and appearance, define a region displays selector, and create region conditions.

- [Editing Classic Report Region Attributes](#)



See Also:

"Editing Pages in Page Designer"

8.8.3.1 Editing Classic Report Region Attributes

1. To edit classic report Region attributes:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. In the Rendering tab, select the region.

In the Property Editor, the **Region** tab displays the attributes. Attributes are organized in groups.

Tip:

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

3. Edit the appropriate attributes.

Tip:

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

4. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.



See Also:

["Right Pane of Page Designer \(Property Editor\)"](#)

8.8.4 Managing Classic Report Attributes

Edit report Attributes control how a classic report works.

- [Editing Classic Report Attributes](#)
- [Editing Classic Report Pagination](#)
- [Adding Support for XML File or a CSV File Export](#)
- [Enabling Classic Report CSV Output Option](#)
- [Controlling Classic Report Column Breaks](#)



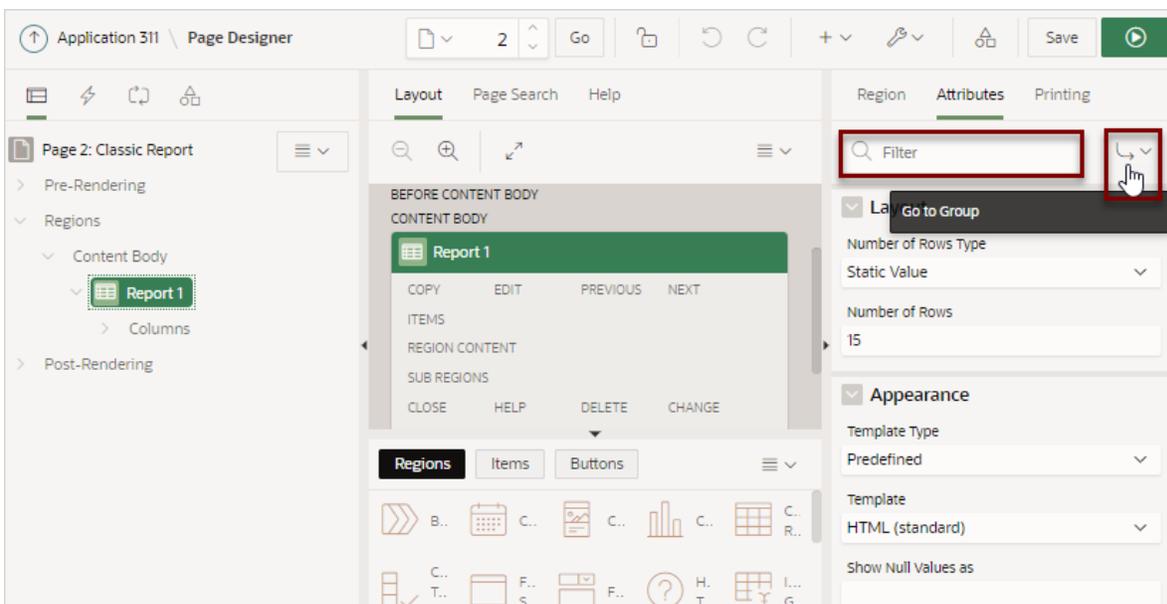
See Also:

["Editing Pages in Page Designer"](#)

8.8.4.1 Editing Classic Report Attributes

You can customize a classic report by editing report Attributes.

1. To edit report Attributes:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.



The Property Editor displays the report Attributes. Attributes are organized in groups.

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

4. Edit the appropriate attributes.
5. To view Help, select the attribute and click the Help tab. Once you activate the Help pane, the content that displays changes every time you select another attribute.
6. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.8.4.2 Editing Classic Report Pagination

1. To control classic report pagination:
 1. View the page in Page Designer:

Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.

The Property Editor displays the attributes. Attributes are organized in groups.
 4. Under **Pagination**, edit the following:
 - a. **Type** - Select the pagination type for this report. Generally only a subset of the results are currently displayed in the report. Pagination provides the user with information about the number of rows and the current position within the result set. Pagination also defines the style of links or buttons that are used to navigate to the next or previous page.
 - b. **Display Position** - Select where the report pagination displays.

- c. **Partial Page Refresh** - Specify whether to use Partial Page Refresh (PPR) to update the report display.

If the end user performs an action, such as a pagination request or selection of a new sort column, the current report rows must be refreshed. Setting this attribute to **On**, refreshes just the report region. Setting this attribute to **No**, refreshes the entire page.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.8.4.3 Adding Support for XML File or a CSV File Export

You can add support for exporting a report as an XML or CSV by selecting a report template.

1. To export a report as a file:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups.
 4. Under **Appearance**, edit the following:
 - a. **Template Type** - Select **Predefined**.
 - b. **Template** - Select **XML** or **CSV**.
Selecting **XML** prevents the Application Express engine from rendering the page and dumps the content to an XML file.
 5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.8.4.4 Enabling Classic Report CSV Output Option

1. To use the enable the CSV output option:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.
The Property Editor displays the attributes. Attributes are organized in groups.
 4. Under **Download**, edit the following:
 - a. **CSV Export Enabled** - Specify whether end users can download the report contents to a CSV file. To enable CSV Downloads, you must use a report template with a `#CSV_LINK#` substitution string and set this option to **On**.
 - b. **CSV Separator** - Enter a column separator. If no value is entered, a comma or semicolon is used depending on your current NLS settings.
 - c. **CSV Enclosed By** - Enter a delimiter character to delineate the starting and ending boundary of a data value. The default delimiter is double quotation marks.
 - d. **Link Text** - Specify the text for the link to invoke the CSV download.
 - e. **Filename** - Specify a name for the CSV download file. If no name is specified, the region name is used followed by the extension `*.csv`.

- f. **Supplemental Text** - Enter text that displays at the top of the download file. Use this attribute to for data classification, legal, or warning messages about the data in the file.

 **WARNING:**

Do not use the Supplemental Text attribute with CSV download. If you enable **CSV** download, the defined text will invalidate the CSV file format.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.8.4.5 Controlling Classic Report Column Breaks

You can control if a specific column repeats and how column breaks appear when printed using **Break Formatting** attributes. For example, suppose your report displays employee information by department number. If multiple employees are members of the same department, you can increase the readability by specifying that the department number only appears once.

1. To control column breaks:
 1. View the page in Page Designer:

Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. In the Property Editor, select the **Attributes** tab.

The Property Editor displays the attributes. Attributes are organized in groups.
 4. Under **Break Formatting** edit the following:
 - a. **Report Sum Label** - Enter the text that displays adjacent to report sum values.
 - b. **Break Columns** - Select how many report columns are incorporated into the break formatting. The columns must be consecutive columns, starting from the first column displayed in the report.
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.8.5 Managing Classic Report Column Attributes

Edit column attributes to control the display, features, and column behavior.

- [Altering Classic Report Column Layout](#)
- [Enabling Column Sorting in a Classic Report](#)
- [Creating a Column Link in a Classic Report](#)
- [Defining an Updatable Column in a Classic Report](#)
- [Defining a Column as a List of Values in a Classic Report](#)
- [Controlling When Classic Report Columns Display](#)

- [Adding a Download Link to a Classic Report](#)



See Also:

["Editing Pages in Page Designer"](#)

8.8.5.1 Altering Classic Report Column Layout

Edit Column attributes to precisely control the report layout. For example, you can use these attributes to alter column heading text, change column positioning, hide a column, create a sum of a column, or select a sort sequence.

To edit the Column attributes:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.
2. In the Rendering tab, locate the region and expand the Columns node.
The columns appear in the Rendering tab.
3. Select a column to edit.
4. Edit the appropriate attributes in the Property Editor. Attributes are organized in groups.

Tip:

To view Help, select the attribute and click the Help tab. Once you activate the Help pane, the content that displays changes every time you select another attribute.

The following table describes common ways to edit report columns.

Table 8-3 Common Report Column Edits for Classic Reports

Description	Developer Action
Hide a column.	Find Identification . For Type , select Hidden Column .
Edit the column heading text.	Find Heading . Edit the Heading and Alignment attributes.
Change the column heading text alignment.	Find Heading . Under Heading , make a new selection from Alignment .
Alter the column display sequence.	Find Layout . Edit the Sequence attribute.
Enable a unique sort sequence.	Find Sorting . For Sortable , select On and select a Default Sequence . Any number of columns can be sort enabled. However, at least one column must have a Sort Sequence defined.

Table 8-3 (Cont.) Common Report Column Edits for Classic Reports

Description	Developer Action
Enable the sum of a column.	Find Advanced . For Compute Sum , select On .

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.8.5.2 Enabling Column Sorting in a Classic Report

To enable column sorting:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.
2. In the Rendering tab, locate the region and expand the Columns node.
The columns appear in the Rendering tab.
3. Select a column to edit.
The Property Editor displays the attributes for that column. Attributes are organized in groups.
4. Find **Sorting**.
5. Under Sorting, edit the following:
 - a. Default Sequence - Select the sort sequence for this column. Each column should have a unique sequence to correctly order the report output.
 - b. Sortable -To enable sorting, select **On**. Selecting **On** enables the end user to sort this column in the report.
6. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

 **Tip:**

Column sorting must be enabled if you want columns with null values to display at the top or end of the report. To learn more about the Sort Nulls attribute, see "[Editing Classic Report Pagination](#)."

8.8.5.3 Creating a Column Link in a Classic Report

Use the Column Link attributes to create a link from a report to another page in your application or to a URL.

To create a column link to another page:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In the Rendering tab, locate the region and expand the Columns node.
The columns appear in the Rendering tab.
3. Select a column to edit.
The Property Editor displays the attributes for that column. Attributes are organized in groups.
4. In the Property Editor, find **Identification** and edit the Type attribute.
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.8.5.5 Defining a Column as a List of Values in a Classic Report

A column can be rendered as Radio Group or a static, named, or query-based LOV. For example, a column can be rendered using a select list or a popup list of values. Or, a column can be rendered as read-only text based on a list of values.

This last approach is an effective strategy when creating display lookup values and is particularly useful in regular, nonupdatable reports. This approach enables you to display the value of a column without having to write a SQL JOIN statement.

1. To render a report column as a list of values:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, locate the region and expand the Columns node.
The columns appear in the Rendering tab.
 3. Select a column to edit.
The Property Editor displays the attributes for that column. Attributes are organized in groups.
 4. Find **Identification**. From **Type**, select **Plain Text (based on List of Values)**.
 5. Find **List of Values**. Select a **Type**:
 - **Shared Component** - Creates a list of values based on a predefined list of values defined in Shared Components.
 - **SQL Query** - Creates a dynamic list of values based on the SQL Query you provide.
 - **Static Values** - Creates a static list of values is based on the text value you provide.

- **PL/SQL Function Body returning SQL Query** - Creates a dynamic list of values is based on the SQL Query returned by the entered PL/SQL Function Body you provide.
6. The UI changes based on the **List of Values, Type** you select. Fill in all required attributes (identified in red).
 7. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.8.5.6 Controlling When Classic Report Columns Display

You can use the Authorization Scheme and Server-side Condition attributes to control when a column displays.

Use Authorization Scheme to control access to resources (such as a report column) based on predefined user privileges. For example, you could create an authorization scheme in which only managers can view a specific report column. Before you can select an authorization scheme, you must first create it. Use Server-side Condition

A condition is a small unit of logic that enables you to control the display of a column based on a predefined condition type. The condition evaluates to true or false based on the values you enter in the Expressions fields.

To specify Authorization Scheme and Server-side Condition attributes:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In the Rendering tab, locate the region and expand the Columns node.
3. Select a column to edit.

The Property Editor displays the attributes for that column. Attributes are organized in groups.
4. If controlling a column with an authorization scheme, select an authorization scheme:
 - a. Find **Security**.
 - b. Authorization Scheme - Make a selection.
5. If controlling the column with a condition define a condition, define a condition:
 - a. Find **Server-side Condition**.
 - b. Type - Make a selection.
 - c. Depending upon your selection, enter an expression or value in the fields provided.If the authorization is successful and the condition type display evaluates to true, the column displays.
6. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

 **See Also:**

- ["Providing Security Through Authorization"](#)
- ["Understanding Conditional Rendering and Processing"](#)
- ["Available Conditions"](#)

8.8.5.7 Adding a Download Link to a Classic Report

Developers can create a link within a report that enables users to export the report as a comma-delimited file (.csv) file. To add a CSV link to a report, you must enable **Automatic CSV Encoding**. When using Automatic CSV Encoding, the report template is not important. You can include a CSV link with any report template that has the CSV export substitution string defined.

 **See Also:**

["Accessing the Globalization Page"](#) and ["Automatic CSV Encoding"](#)

8.9 Printing Report Regions

Configure a report region to print by exporting it to several different formats.

 **Tip:**

If you run Oracle Application Express with Oracle Database 11g Release 1 (11.1) or later, you must enable network services to use report printing if you configured an external print server. See ["Enabling Network Services in Oracle Database 11g or Later."](#)

- [About Report Printing](#)
- [About Printing Reports to PDF](#)
- [Configuring Report Printing at the Application-Level](#)
- [About Classic Report Printing Methods](#)
- [Configuring Classic Report Print Attributes](#)
- [Configuring Interactive Report Regions for Printing](#)
- [About Report Queries](#)
- [About Report Layouts](#)

8.9.1 About Report Printing

By taking advantage of region report printing, your application users can view and print reports that have a predefined orientation, page size, column headings, and page header and footer. Classic reports, interactive reports and interactive grids also have the ability to export to PDF, Microsoft Excel, HTML, and Comma Separated Values (CSV). Additional export formats require the use of an external print server.

Oracle Application Express provides three report printing configuration options:

- **None (Native)** - Select this option if you do not use an external print server. This option enables you to use the basic printing functionality, which includes CSV, HTML, PDF and XLSX.
- **Oracle BI Publisher** - This option requires a valid license of Oracle BI Publisher (also known as Oracle XML Publisher). This option enables you to take report query results and convert them from XML to RTF format using Oracle BI Publisher. Select this option to upload your own customized RTF or XSL-FO templates for printing reports within Application Express.

Oracle BI Publisher supports Adobe Portable Document Format (PDF), Microsoft Word Rich Text Format (RTF), or Microsoft Excel format (XLS), or Extensible Markup Language (XML). If you choose to use other third-party rendering engines, other output formats can also be configured.

 **Tip:**

To learn more about installing and configuring Oracle BI Publisher, see "[About Report Printing Configuration Options](#)".

- **External (Apache FOP)** - Select this option if you are using Apache FOP on an external J2EE server. This option enables you to use the basic printing functionality, which includes creating report queries and printing report regions using the default templates provided in Application Express and using your own customized XSL-FO templates.
- **Oracle REST Data Services** - Select this option if you are using the Oracle REST Data Services (formerly called Application Express Listener) release 2.0 or later. This option enables you to use the basic printing functionality, which includes creating report queries and printing report regions using the default templates provided in Application Express and using your own customized XSL-FO templates.

 **Note:**

The Oracle REST Data Services option does not require an external print server, instead the report data and style sheet are downloaded to the listener, rendered into PDF format by the listener and then sent to the client. The PDF documents in this setup are not returned back into the database, thus the print APIs are not supported when using the Oracle REST Data Services-based configuration.

 **Note:**

The functionality to produce PDF Reports has been removed in Oracle REST Data Services (ORDS) release 19.4.

 **Note:**

Your Oracle Application Express instance administrator can change the report printing configuration for your instance. See "Configuring Report Printing for an Instance" in *Oracle Application Express Administration Guide*

8.9.2 About Printing Reports to PDF

Oracle Application Express has native support to print basic reports to PDF. Use a report server if you want full control and advanced layouts for your reports.

8.9.3 Configuring Report Printing at the Application-Level

Configure the print server type for an application by editing the **Print Server Type** attribute on the Application Definition page. The application-level **Print Server Type** overrides similar settings in Instance Administration.

1. To configure report printing at the application-level:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.

The Application home page appears.
 3. From Application home page, you can access the Definition page in two ways:
 - Click the **Edit Application Properties** button.
 - From Shared Components:
 - Click **Shared Components**.
 - Under Application Logic, click **Application Definition Attributes**.

The Definition page appears.
4. Report Printing:
 - a. Print Server Type - Print Server Type controls the print server of the application. This setting overrides similar settings in Administration Services. Options include
 - **Native Printing** - Use native printing. No external print server required.
 - **Remote Print Server** - Choose a remote server of the type "Print Server" that is configured in the Workspace Utilities.
 - **Use Instance Settings** - Use the Report Printing settings defined at Instance Administration.
 - b. Click **Apply Changes**.

5. To add a Remote Print Server:
 - a. Click the **Add Remote Print Server** button.
The Add Remote Print Server wizard appears.
 - b. Print Server Type - Select the Print Server type. Options include:
 - **Oracle Analytics Publisher** - Select this option if you are using a licensed version of Oracle Analytics Publisher. This option enables you to take report query results and convert them from XML to RTF format using Oracle Analytics Publisher. Select this option if you want to upload your own customized RTF or XSL-FO templates for printing reports within Application Express.
 - **APEX Office Print** - Select this option if you are using APEX Office Print.What appears next depends upon the Print Server Type you select.
6. If the Print Server Type is **Oracle Analytics Publisher**, configure the following:
 - a. Add Remote Printer Server:
 - Print Server Type - Select **Oracle Analytics Publisher**.
 - Name - Enter a name for the remote server object here. Remote Server names must be unique within the workspace.
 - Static Identifier - Use the Static ID to reference the Remote Server in API calls.
 - Endpoint URL - Enter the Endpoint URL of the external print server.
 - Click **Next**.
 - b. Add Remote Print Server Credentials:
 - Authentication Required - Determines whether to use authentication for the remote print server. See field-level help for more details.
 - Name - Enter a descriptive name for the Web Credential. This name must be unique within the workspace.
 - Static Identifier - Use the Static ID to reference the Web Credential in API calls.
 - Username - Enter the Username for Basic Authentication. Application Express does not store this information encrypted.
 - Password - Enter the Password for Basic Authentication. Application Express stores this information encrypted, so it cannot be retrieved back in clear text.
 - Click **Apply Changes**.
7. If the Print Server Type is **APEX Office Print**, configure the following:
 - a. Add Remote Print Server:
 - Print Server Type - Select **APEX Office Print**.
 - Name - Enter a name for the remote server object here. Remote Server names must be unique within the workspace.
 - Static Identifier - Use the Static ID to reference the Remote Server in API calls.
 - Endpoint URL - Enter the Endpoint URL of the external print server.
 - HTTPS Host Name - The host name to be matched against the common name (CN) of the remote server's certificate for an HTTPS request. It can also be a domain name like *.example.com. If NULL, the host name in the given URL will be used.

- Click **Next**.
- b. Add Remote Print Server Credentials:
 - Authentication Required - Determines whether to use authentication for the remote print server. See field-level help for more details.
 - Name - Enter a descriptive name for the Web Credential. This name must be unique within the workspace.
 - Static Identifier - Use the Static ID to reference the Web Credential in API calls.
 - API Key - Enter the API key for Authentication. Application Express stores this information encrypted, so it cannot be retrieved back in clear text.
 - Click **Apply Changes**.

**Note:**

- [Creating a Remote Server](#)
- "Configuring Report Printing in a Full Development Environment" in *Oracle Application Express Administration Guide*

8.9.4 About Classic Report Printing Methods

There are two ways to print classic report regions:

- **Configure Printing Attributes for a Report Region.** You can print a report region by configuring the Printing Attributes for the region. See "[Configuring Classic Report Print Attributes](#)."
- **Create a Report Query.** You can print a report by defining a report query as a Shared Component. See "[Printing a Report Region by Defining a Report Query](#)."

Both report regions and report queries can be downloaded in the following formats:

- PDF - Adobe Portable Document Format.
- RTF - Microsoft Word Rich Text Format.
- Excel - Microsoft Excel format. Note that when BI Publisher is configured as print server and a custom report layout is specified, the export is not a true `.xls` file because the content is HTML-based.
- HTML
- XML - Extensible Markup Language.

To format either a report region or report query, you associate it with a report layout.

 **Tip:**

You can also have the output format specified by an item that determines the output format at runtime. Select the item that holds the format value. Valid values are PDF, RTF (to open the document in Microsoft Word), XLS (to open the document in Microsoft Excel) and HTML (to download the document as an HTML file).

 **See Also:**

["Formatting a Report Region or Report Query Using Report Layouts"](#)

8.9.5 Configuring Classic Report Print Attributes

One approach to printing a report region is to configure Print Attributes. Once configured, these attributes apply only to the current region and cannot be used outside the context of the region.

1. To configure a classic report region for printing:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. Enable the Attribute, **Printing**:
 - a. In the Property Editor, select the **Attributes** tab.
 - b. Under **Printing**, set **Enabled** to **On**.
 4. Configure **Printing** attributes:
 - a. In the Property Editor, select the **Printing** tab.
 - b. Edit the appropriate Printing attributes.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

**See Also:**

"[About Classic Report Printing Methods](#)" and "Configuring Report Printing" in *Oracle Application Express Administration Guide*

8.9.6 Configuring Interactive Report Regions for Printing

You can configure a report region to print in various formats.

Unlike classic reports, the interactive report Print Attributes can only use the default XSL-FO layout and is initiated from the report Attributes, Download.. Once configured, these attributes only apply only to the current region and cannot be used outside the context of the region.

1. To configure an interactive report region for printing:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, select the region containing the report.
 3. Enable the Attribute, **Printing**:
 - a. In the Property Editor, select the **Attributes** tab.
 - b. Find **Printing**.
 - c. Set **Enabled** to **On**.
 4. Configure **Printing** attributes:
 - a. In the Property Editor, select the **Printing** tab.
 - b. Edit the appropriate Printing attributes.

**Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

8.9.7 About Report Queries

You can print a report region by defining a report query as a Shared Component. A report query identifies the data to be extracted. Unlike SQL statements contained in regions, report queries contain SQL statements that are validated when you save the query. Note that report queries must be SQL statements, not functions returning SQL statements.

**See Also:**

["Printing a Report Region by Defining a Report Query"](#)

8.9.8 About Report Layouts

To format either a classic report region or report query, you associate it with a report layout. Using report layouts renders the data in a printer-friendly format. If you do not select a report layout, a default XSL-FO layout is used. The default XSL-FO layout is always used for rendering Interactive Report regions.

**See Also:**

["Formatting a Report Region or Report Query Using Report Layouts"](#)

8.10 Understanding BLOB Support in Forms and Reports

Oracle Application Express includes declarative BLOB support to enable developers to declaratively upload files in forms, and download or display files in reports.

BLOB display and download can also be authored procedurally using PL/SQL. This section describes how to upload, download and display files, and how to manage additional file attributes such as MIME type and file name that are important for proper management of files stored in BLOB columns. Using this functionality you can easily extend your Oracle Application Express applications to manage files including images, documents, videos, and so on.

- [About BLOB Support in Reports](#)
- [About Providing a Download Link](#)
- [About Displaying the BLOB](#)
- [About Working With BLOBs Procedurally](#)

8.10.1 About BLOB Support in Reports

Oracle Application Express includes BLOB support for both classic and interactive reports. If you use a wizard to create a report and include a column of type BLOB, basic support is included. Additional information should be added after generation to make the download capability more user friendly.

8.10.2 About Providing a Download Link

To facilitate the inclusion of a download link in a report, the report includes the selection of the length of the BLOB (for example, `dbms_lob.getlength(RESUME)`). If the length is 0, the BLOB is NULL and no download link is displayed. In the same way you specify a format mask for a date or number you can format a download link. The DOWNLOAD format is more complex however than other format masks in that you are required to specify at least three parameters, for example:

DOWNLOAD:EMP:RESUME:EMPNO

The following table describes the parameters of the DOWNLOAD format:

Position	Attribute	Required	Description
1	DOWNLOAD	Yes	Identifies the DOWNLOAD report format mask.
2	Table Name	Yes	Case sensitive name of table containing target column of type BLOB.
3	Column containing BLOB	Yes	Case sensitive name of column of type BLOB.
4	Primary Key Column 1	Yes	Case sensitive name of primary key column 1.
5	Primary Key Column 2	No	Case sensitive name of primary key column 2.
6	MIME type Column	No	Case sensitive column name used to store the MIME type.
7	Filename Column	No	Case sensitive column name used to store the filename of the BLOB. If NULL, the column name is used as the default when a user downloads the file.
8	Last Update Column	No	Case sensitive column name used to store the last update date of the BLOB. If used, the HTTP header of the file download indicates the date of last modification and web browsers will be able to cache the BLOB. If not specified, the browser may not be able to cache files.
9	Character Set Column	No	Case sensitive column name used to store the character set of the BLOB. Most relevant for Asian languages which may need to maintain the character set encoding.
10	Content Disposition	No	Specify <code>inline</code> or <code>attachment</code> . All other values are ignored. If a MIME type is provided and the file is a type that can be displayed, the file is displayed. If MIME type is not provided, or the file cannot be displayed inline, the user is prompted to download.
11	Download Text	No	String used for the download link. If nothing is provided, <code>Download</code> is used. Note that this supports substitutions (useful for translated applications).
12	Table Owner	Yes	Identifies name of table owner containing target column of type BLOB.

Consider the following example:

```
DOWNLOAD:EMP:RESUME:EMPNO::RESUME_MIMETYPE:RESUME_FILENAME:RESUME_LAST_UPDATE::attachment:Resume
```

To be able to enter these parameters and create the format as described above. You have to select **Blob Format** for Number/Date format item. Once selected, the Blob Column attributes region displays and you can fill in all parameters as described above.

8.10.3 About Displaying the BLOB

If the BLOB you are working with is an image, you can display it in the report using the new report format mask of 'IMAGE'. Regardless of the MIME type, the report always attempts to display the BLOB. If the BLOB cannot be rendered, a broken image is displayed.

The following table describes the parameters of the IMAGE format mask:

Position	Attribute	Required	Description
1	IMAGE	Yes	Identifies the IMAGE report format mask.
2	Table Name	Yes	Case sensitive name of table containing target column of type BLOB.
3	Column containing BLOB	Yes	Case sensitive name of column of type BLOB.
4	Primary Key Column 1	Yes	Case sensitive name of primary key column 1.
5	Primary Key Column 2	No	Case sensitive name of primary key column 2.
6	MIME type Column	No	Case sensitive column name used to store the MIME type.
7	Filename Column	No	Not used for IMAGE format but left in so that the format can easily be changed between IMAGE and DOWNLOAD.
8	Last Update Column	No	Case sensitive column name used to store the last update date of the BLOB. If used, the HTTP header of the file download indicates the date of last modification and web browsers will be able to cache the BLOB. If not specified, the browser may not be able to cache files.
9	Character Set Column	No	Not used for IMAGE format but left in so that the format can easily be changed between IMAGE and DOWNLOAD.
10	Content Disposition	No	Not used for IMAGE format but left in so that the format can easily be changed between IMAGE and DOWNLOAD.
11	Alt Text	No	String used for the alt tag associated with the image.
12	Table Owner	Yes	Identifies name of table owner containing target column of type BLOB.

Consider the following example:

```
IMAGE:EMP:RESUME:EMPNO::RESUME_MIMETYPE:RESUME_FILENAME:RESUME_LAST_UPDATE::attachment:
Resume
```

To be able to enter these parameters and create the format as described above. You have to select Blob Format for Number/Date format item. Once selected, a new region, Blob Column attributes, displays and you can fill in all parameters as described above.

8.10.4 About Working With BLOBs Procedurally

As an alternative to using the built-in methods of providing a download link, you can use the `APEX_UTIL.GET_BLOB_FILE_SRC` function. One advantage of this approach, is the ability to more specifically format the display of the image (with height and width tags). Note that this approach is only valid if called from a valid Oracle Application Express session. Also, this method requires that the parameters that describe the BLOB to be listed as the format of a valid item within the application. That item is then referenced by the function.



See Also:

`GET_BLOB_FILE_SRC` Function in *Oracle Application Express API Reference*

9

Developing Forms

Developers can create a variety of different application forms either manually or by using wizards. Some forms enable users to update a single row in a table, while other forms enable users to update multiple rows in a table.

Tip:

Run the **Upgrade Application** utility to automatically upgrade legacy forms to the new form region. See "[#unique_715](#)."

- [Understanding Form Types](#)
When creating a database application, developers can create four basic form types: editable interactive grid, form, report with form, or master detail.
- [Creating a Form](#)
Developers can create forms using the Create Application Wizard and Create Page Wizard.
- [Configuring Lost Update Detection](#)
Prevent form users from overwriting one another by configuring the Lost Update Detection.
- [About Making an Interactive Grid Editable](#)
Developers determine whether the underlying data is read-only or editable by users. An interactive grid presents users a set of data in a searchable, customizable report. In an editable interactive grid, users can also add to, modify, and refresh the data set directly on the page.
- [Creating Master Detail Forms](#)
Developers can create a master detail form with either the Create Application Wizard or the Create Page Wizard.
- [Validating User Input in Forms](#)
Developers can create validation and an associated error message to check the data a user enters before processing.
- [Understanding BLOB Support in Forms](#)
Oracle Application Express includes BLOB support to enable developers to declaratively upload and download files in forms.

See Also:

- "[Creating a Legacy Master Detail Form](#)"
- "[Managing Legacy Tabular Forms](#)"
- "[Developing Reports](#)"

9.1 Understanding Form Types

When creating a database application, developers can create four basic form types: editable interactive grid, form, report with form, or master detail.

- [Editable Interactive Grid](#)
View an example of an editable interactive grid.
- [Form](#)
View an example form.
- [Report with Form](#)
View an example report with form.
- [Master Detail Forms](#)
View an example master detail form.



See Also:

["Creating a Legacy Master Detail Form"](#)

9.1.1 Editable Interactive Grid

View an example of an editable interactive grid.

An interactive grid presents users with a set of data in a searchable, customizable report. In an editable interactive grid, users can also add to, modify, and refresh the data set directly on the page. Functionally, an interactive grid includes most customization capabilities available in interactive reports plus the ability to rearrange the report interactively using the mouse. The following is an example of an editable interactive grid.

<input type="checkbox"/>	<input type="checkbox"/>	Project Lead	Name	Description	Created	Completed ↑=
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Lucille Beatie	Configure Web Environment	Determine the hardware and software required to...	1/13/2020	10/17/2019
<input type="checkbox"/>	<input type="checkbox"/>	Lucille Beatie	Train Developers	Ensure all developers who will be developing with...	1/13/2020	10/28/2019
<input type="checkbox"/>	<input type="checkbox"/>	Lucille Beatie	Develop New Reporting Apps	Develop apps to meet C Level reporting requirem...	1/13/2020	11/11/2019
<input type="checkbox"/>	<input type="checkbox"/>	Bernard Jackman	Develop IT Management Apps	Develop apps to allow IT to manage resources.	1/13/2020	11/22/2019
<input type="checkbox"/>	<input type="checkbox"/>	Lucille Beatie	Develop Customer Tracker	Develop an application to track customers from p...	1/13/2020	12/12/2019
<input type="checkbox"/>	<input type="checkbox"/>	Bernard Jackman	Implement Customer Satisfact...	Implement an application to track customer satisf...	1/13/2020	12/12/2019



See Also:

["Using an Editable Interactive Grid"](#) in *Oracle Application Express End User's Guide*

9.1.2 Form

View an example form.

From creates a form that enables users to update a single row in a database table. The following is an example of a form on table.

The screenshot shows a web form titled "Form on a Table". It contains the following fields:

- Name**: A text input field with a red asterisk indicating it is required.
- Description**: A larger text input field.
- Project Lead**: A text input field.
- Completed**: A date input field with a red asterisk and a calendar icon.
- Created**: A date input field with a red asterisk and a calendar icon.
- Updated**: A date input field with a red asterisk and a calendar icon.

At the bottom left is a "Cancel" button, and at the bottom right is a blue "Create" button.

Both the Create Application Wizard and Create Page Wizard support the creation of a simple form. The main difference between these two wizards is that the Create Page Wizard offers more customization and data source options. Using the Create Page Wizard, the developer has the option to select a data source (that is, Local Database, REST Enabled SQL Service, or REST Data Source). Additionally, the developer can also specify whether to include and configure breadcrumbs or a navigation menu and select the columns and the order in which they display.



See Also:

[Creating a Form Using the Create Page Wizard](#)

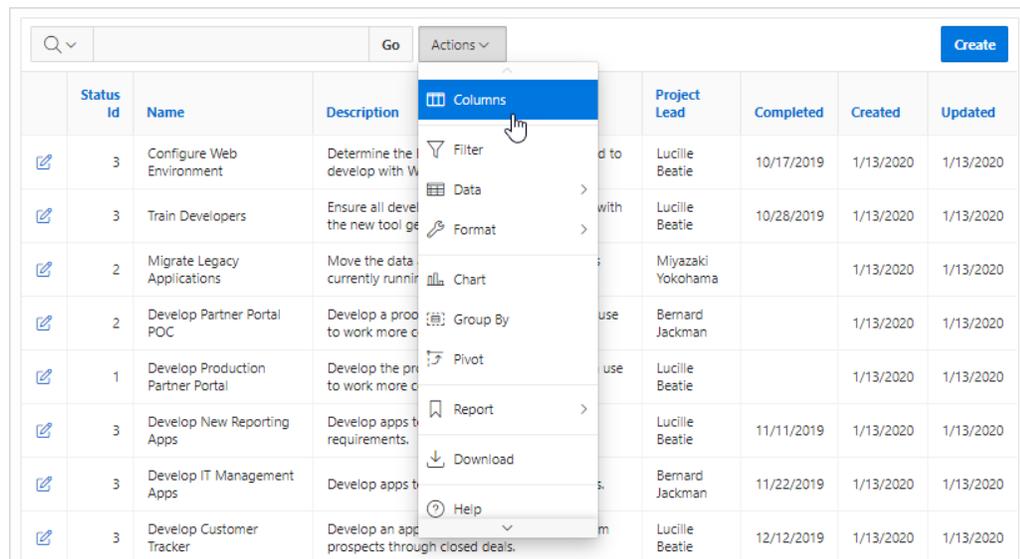
9.1.3 Report with Form

View an example report with form.

Report with Form creates a report (that is, an interactive grid, an interactive report, or a classic report) and form on a table. Developers select a Report Type to determine if the report is an interactive grid, interactive report, or a classic report. Users click an Edit icon to access the form.

Both the Create Application Wizard and Create Page Wizard support the creation of a report and form combination. The main difference between these two wizards is that the Create Page Wizard offers more customization and data source options. Using the Create Page Wizard, the developer selects the report type (that is, interactive grid, interactive report, or classic report) and then a data source (that is, Local Database, REST Enabled SQL Service, or REST Data Source). Additionally, the developer can also specify whether to include and configure breadcrumbs or a navigation menu and select the columns and the order in which they display.

The following is an example of an interactive grid report with form.



The screenshot shows a table with columns: Status Id, Name, Description, Project Lead, Completed, Created, and Updated. A context menu is open over the 'Columns' option, showing options like Filter, Data, Format, Chart, Group By, Pivot, Report, Download, and Help.

Status Id	Name	Description	Project Lead	Completed	Created	Updated
3	Configure Web Environment	Determine the develop with W	Lucille Beatie	10/17/2019	1/13/2020	1/13/2020
3	Train Developers	Ensure all devel the new tool ge	Lucille Beatie	10/28/2019	1/13/2020	1/13/2020
2	Migrate Legacy Applications	Move the data currently runnin	Miyazaki Yokohama		1/13/2020	1/13/2020
2	Develop Partner Portal POC	Develop a prod to work more c	Bernard Jackman		1/13/2020	1/13/2020
1	Develop Production Partner Portal	Develop the pro to work more c	Lucille Beatie		1/13/2020	1/13/2020
3	Develop New Reporting Apps	Develop apps to requirements.	Lucille Beatie	11/11/2019	1/13/2020	1/13/2020
3	Develop IT Management Apps	Develop apps to	Bernard Jackman	11/22/2019	1/13/2020	1/13/2020
3	Develop Customer Tracker	Develop an app prospects through closed deals.	Lucille Beatie	12/12/2019	1/13/2020	1/13/2020

9.1.4 Master Detail Forms

View an example master detail form.

A master detail form reflects a one-to-many relationship between two tables in a database. Master detail forms enable users to insert, update, and delete values from two tables or views. Typically, a master detail form displays a master row and multiple detail rows within a single HTML form. Developers can create a single page or two page master detail. You choose the tables on which to build the master and detail regions. Master Detail form options include:

- **Stacked** - Creates a single page master detail with editable interactive grids.
- **Side by Side** - Creates a single page (or Side by Side) master detail with a master table and detail table. The left side contains a master list to navigate to the master record. The right side contains the selected master record and the associated detail report.

- **Drill Down** - Creates a two page (or Drill Down) master detail. The first page contains an interactive report for the master table. The second page features a standard form for the master and interactive grid for the detail.

 **See Also:**

- ["Creating Master Detail Forms"](#)
- ["About Master Detail Forms"](#)

9.2 Creating a Form

Developers can create forms using the Create Application Wizard and Create Page Wizard.

- [Form Options When Running the Create Page Wizard](#)
Learn about form options when running the Create Page Wizard.
- [Creating a Form Using the Create Application Wizard](#)
Use the Create Application Wizard to create a form.
- [Creating a Form Using the Create Page Wizard](#)
Use the Create Page Wizard to create forms on a local database or on an external data source.
- [Creating a Report and Form Using the Create Page Wizard](#)
Run the Create Page Wizard to add a new page with a report and form that uses local database or on an external data source.

 **See Also:**

- ["Developing Reports"](#)
- ["Managing Legacy Tabular Forms"](#)
- ["Creating a Legacy Master Detail Form"](#)

9.2.1 Form Options When Running the Create Page Wizard

Learn about form options when running the Create Page Wizard.

 **Tip:**

Universal Theme - 42 is optimized to work equally well in either a mobile or desktop environment. In previous releases and in earlier themes, the Mobile user interface is based on jQuery Mobile. Because jQuery Mobile is desupported, you must migrate existing mobile applications to the Universal Theme.

Available Forms in the Create Page Wizard

The Create Page Wizard supports the following forms.

Table 9-1 Create Page Wizard — Available Forms

Form Type	Description	To Learn More
Form	Creates a form that enables users to update a single row on the specified data source (Local Database, REST Enabled SQL Service, or REST Data Source).	"Creating a Form Using the Create Page Wizard"
Editable Interactive Grid	Creates an editable interactive grid based on the data source (internal or external) you specify. An interactive grid presents users a set of data in a searchable, customizable report. In an editable interactive grid, users can also add to, modify, and refresh the data set directly on the page. Functionally, an interactive grid includes most customization capabilities available in interactive reports plus the ability to rearrange the report interactively using the mouse.	See "Managing Interactive Grids" and "Making an Existing Interactive Grid Editable"
Report with Form	Creates a report and form based on the data source you specify. You choose the report type (Interactive Report , Interactive Grid , or Class Report) Note: This wizard does not support tables having more than 127 columns. Selecting more than 127 columns generates an error.	Not applicable.
List View with Form	Optimized for mobile applications. Creates a form and list view that enables users to update a single row in a database table. You choose the table on which to build the form and select the column to be used for displaying text in the List View.	Not applicable
Form on Local Procedure	Builds a form based on stored procedure arguments. Use this approach when you have implemented logic or Data Manipulation Language (DML) in a stored procedure or package.	Not applicable.

Available Master Detail Options in the Create Page Wizard

The Create Page Wizard supports the following master detail options.

Table 9-2 Create Page Wizard — Available Master Detail Options

Form Type	Description	To Learn More
Stacked	Creates a single page (or Stacked) master detail with editable interactive grids. Users can query, insert, update, and delete values from two tables or views which are related. You choose the data source (internal or external on which to build the Stacked master detail.	See "Creating a Stacked Master Detail Using the Create Page Wizard"

Table 9-2 (Cont.) Create Page Wizard — Available Master Detail Options

Form Type	Description	To Learn More
Side by Side	Creates a single page (or Side by Side) master detail with a master table and detail table. The left side contains a master list to navigate to the master record. The right side contains the selected master record and the associated detail report. You choose the data source (internal or external on which to build the Side by Side master detail.	See " Creating a Side by Side Master Detail Using the Create Page Wizard "
Drill Down	Creates a two page (or Drill Down) master detail form. The first page contains an interactive report for the master table. The second page features a standard form for the master and interactive grid for the detail. You choose the data source (internal or external on which to build the Drill Down master detail.	See " Creating a Drill Down Master Detail Using the Create Page Wizard "

**See Also:**

"[Creating a Form Using the Create Page Wizard](#)"

9.2.2 Creating a Form Using the Create Application Wizard

Use the Create Application Wizard to create a form.

1. To create a form using the Create Application Wizard:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Click the **Create** button.
 3. Click **New Application**.
 4. For Name, enter the name used to identify the application to developers.
 5. For Appearance, accept the default Theme Style and menu layout (Vita, Side Menu), or change it by clicking the **Set Appearance** icon adjacent to the Appearance field.
 6. To add a form, click **Add Page** and select then select **Form**.
 7. On Create Form Page:
 - a. Page Name - Enter a name for this page.
 - b. Set Icon - Select an icon to display in the navigation menu for this page.
 - c. Table - Select the table for the form.
 - d. Include Report - Select **Include Report** to create a report and form. The first page is an interactive report. Each row provides a link to a form where users can update a record.
 - e. Advanced - Expand **Advanced**:
 - Page Help - Enter text to be displayed when the user selects Page Help.

 **Tip:**

This setting requires you select the **About Page** feature. If you select the **About Page** feature, a help icon is generated in the navigation bar with an entry for page help.

- f. Click **Add Page**.
8. Under Features, select features to include with the application. Features provide application-level functionality and can only be added once per application. To learn more, click the Help icon adjacent to **Features**.

 **Tip:**

Click the **Check All** button to select all features.

9. Under Settings, specify settings used to generate this application. To learn more about an attribute, click the Help icon adjacent to **Settings**.
10. Click **Create Application**.

 **See Also:**

["Creating Database Applications"](#)

9.2.3 Creating a Form Using the Create Page Wizard

Use the Create Page Wizard to create forms on a local database or on an external data source.

The component(s) described in this topic include built-in support for REST Enabled SQL and REST Data Sources which enables read and write access to remote data sources. In order to build a component on a remote data source, you must first create the application and configure the external data source.

 **Note:**

Using the Create Page Wizard creates a complex form region which includes multiple form items and processes. Although you can create a region directly in the Rendering tree or drag a region from the Gallery, these approaches will not create these additional components.

1. To create a form using the Create Page Wizard:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. Click **Create Page**.

4. For Create a Page:
 - a. Page Type - Select **Component** and then select either **Form** or **Master Detail**.

 **Tip:**

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- b. If you select **Form**, select a form type:
 - **Form**
 - **Editable Interactive Grid**
 - **Report with Form**
 - **List View with Form** (Optimized for mobile apps)
 - **Form on Local Procedure**

 **Tip:**

To learn more about each form type, see "[Form Options When Running the Create Page Wizard](#)."

- c. If you select **Master Detail**, select a type:
 - **Stacked** - Creates single page master detail with editable interactive grids. With this page, users can query, insert, update, and delete values from two tables or views which are related. You choose the tables on which to build the master and detail regions.
 - **Side by Side** - Create a single page master detail with a master table and detail table. In addition, the page includes a searchable region on the left that displays a primary and secondary column from the master table. Use this region to select a record to display.
 - **Drill Down** - Creates a two page (or Drill Down) master detail form. The first page contains an interactive report for the master table. The second page features a standard form for the master and interactive grid for the detail.
 - d. Click **Next**.
5. What appears next depends upon the form you select. Follow the on-screen instructions. To learn more about an attribute, see field-level Help.

 **Tip:**

When prompted to select a Data Source, select **Local Database**, **REST Enabled SQL Service**, or **REST Data Source**.

 **See Also:**

- ["Creating Master Detail Forms"](#)
- ["Managing REST Enabled SQL References"](#)
- ["Managing REST Data Sources"](#)

9.2.4 Creating a Report and Form Using the Create Page Wizard

Run the Create Page Wizard to add a new page with a report and form that uses local database or on an external data source.

The component(s) described in this topic include built-in support for REST Enabled SQL and REST Data Sources which enables read and write access to remote data sources. In order to build a component on a remote data source, you must first create the application and configure the external data source.

 **Tip:**

Using the Create Page Wizard creates a complex form region which includes multiple form items and processes. Although you can create a region directly in the Rendering tree or drag a region from the Gallery, these approaches will not create these additional components.

1. To create a report and form using the Create Page Wizard:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select the application.
 3. Click **Create Page**.
 4. On Create a Page, for Page Type, **Form**.
 5. Create Page - Select **Report with Form**.
 6. For Page Attributes:
 - a. Report Type - Select a report type. Options include.
 - **Interactive Grid** - Creates a read-only interactive grid.
 - **Interactive Report** - Creates an interactive report.
 - **Classic Report** - Creates a template-based classic report.
 - b. Report Page Number - Enter a page number. If you identify a new page number, the wizard creates a new page. If you identify an existing page number, the wizard adds the component to that page.
 - c. Report Page Name - Enter the title of the page that to contain the report.
 - d. Form Page Number - Enter the page number of the form to be generated. If the page does not exist it will be created.
 - e. Form Page Name - Enter the form name. This text becomes the page title, name, and subtitle.

- f. Form Page Mode - Identify the page mode. To learn more, see field-level Help.
 - g. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page, and which breadcrumb navigation control you want to use.
 - h. Click **Next**.
7. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
8. On Data Source, select a data source. Options include:
 - **Local Database** - Data is sourced from a local database.
 - **REST Enabled SQL Service** - Data is sourced from a remote database, where the connection is defined using REST Enabled SQL. To create or maintain REST Enabled SQL references, navigate to Shared Components, REST Enabled SQL.
 - **REST Data Source** - Data is sourced from a RESTful web service defined using REST Data Sources. REST Data Source are created and maintained within Shared Components.
9. What displays next changes based on your selection. Follow the on-screen instruction. To learn more about an attribute, see field-level Help.

 **See Also:**

- ["Managing REST Enabled SQL References"](#)
- ["Managing REST Data Sources"](#)

9.3 Configuring Lost Update Detection

Prevent form users from overwriting one another by configuring the Lost Update Detection.

Lost updates occur when two or more users try to update the same data, and the last update overwrites updates made by the previous user. To prevent this, updates can check the existing column value(s) in the database with the value(s) retrieved when the record was originally queried.

Configuring Lost Update Detection, you configure the Form region Attribute, **Lost Update Type**, and enable the **Prevent Lost Updates** attribute for the corresponding Form - Automatic Row Processing (DML) process.

1. To enable Lost Update Detection:
 1. Create a form region using the Create Page Wizard.
 2. View the page containing the form region in Page Designer.
 3. In the Rendering tab, select the form region.
 4. In the Property Editor, select the **Attributes** tab.

The Property Editor displays the attributes. Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. In the Property Editor, find the **Edit** group and configure the **Lost Update Type** attribute. Options include:
 - **Row Values** - A checksum value is calculated for each row, when initially querying the data. The checksum is calculated by concatenating all of the updateable columns into a string and then generating a unique value. When committing the updated record, this checksum is compared to the checksum value.
 - **Row Version Column** - If your database table includes a column which is incremented every time a record is updated, preferably by a database trigger, then this column can be used instead of calculating checksums. Oracle does not recommend this option if your form updates data in multiple tables.

Next, update the corresponding Form - Automatic Row Processing (DML) process.

6. In the left pane, click the Processing tab.
7. Find and select the corresponding Form - Automatic Row Processing (DML) process.
8. In the Property Editor, find the **Settings**.
9. For **Prevent Lost Updates**, select **On**.
10. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

 **See Also:**

["Editing Pages in Page Designer"](#)

9.4 About Making an Interactive Grid Editable

Developers determine whether the underlying data is read-only or editable by users. An interactive grid presents users a set of data in a searchable, customizable report. In an editable interactive grid, users can also add to, modify, and refresh the data set directly on the page.

As described in "Using Interactive Grids" in *Oracle Application Express End User's Guide*, users can lock, hide, filter, freeze, highlight, and sort individual columns. Advanced users can also define breaks, aggregations, and computations against columns. Users can also directly customize the appearance of an interactive grid. Users can use the mouse to resize the width of a column and drag and drop columns into different places in the grid.

In an editable interactive grid, users can also add to, modify, and refresh the data set directly on the page. Editable interactive grids expand the functionality of regular interactive grids to enable users to more directly update a grid's structure and contents. Users can add and delete rows, edit cell contents, and refresh the grid with the latest updates.

**See Also:**

["Making an Existing Interactive Grid Editable"](#) and ["Managing Interactive Grids"](#)

9.5 Creating Master Detail Forms

Developers can create a master detail form with either the Create Application Wizard or the Create Page Wizard.

- [About Master Detail Forms](#)
A master detail form enables users to query, insert, update, and delete values from two related tables or views. You choose the tables on which to build the master and detail regions.
- [Creating a Master Detail Form Using the Create Application Wizard](#)
Run the Create Application Wizard to create a new application containing one or more pages. Supported master detail forms include Stacked and Side by Side.
- [Creating a Stacked Master Detail Using the Create Page Wizard](#)
Run the Create Page Wizard to add a single page (or Stacked) master detail form that uses an local or external data source.
- [Creating a Side by Side Master Detail Using the Create Page Wizard](#)
Run the Create Page Wizard to add a new page with a Side by Side master detail that uses a local or external data source.
- [Creating a Drill Down Master Detail Using the Create Page Wizard](#)
Run the Create Page Wizard to add a two page Drill Down master detail that uses a local or external data source.

**See Also:**

["Creating Master Detail from an Existing Interactive Grid"](#) and ["Creating a Legacy Master Detail Form"](#)

9.5.1 About Master Detail Forms

A master detail form enables users to query, insert, update, and delete values from two related tables or views. You choose the tables on which to build the master and detail regions.

A master detail form reflects a one-to-many relationship between tables in a database. Typically, a master detail form displays a master row and multiple detail rows. When you create a master detail form using the Create Page or Create Application Wizards, you choose the tables on which to build the master form and the detail form. **App Builder** supports three

types of master detail form options: **Stacked**; **Drill Down**; and **Side by Side**. While the Create Page Wizard supports all master detail form options, the Create Application Wizard supports only Stacked and Side by Side.

Stacked Master Detail

A **Stacked** master detail form contains a single page with editable interactive grids based on two related tables or views. Users select a row in the master grid to update the detail grids. Developers can create a stacked master detail with either the Create Application Wizard or the Create Page Wizard.

The following example displays master detail interactive grids on the same page. The user has option of interacting with either the master or the detail without leaving the page.

		Project Details	Project Details	Progress	Associated Records			
<input type="checkbox"/>	≡	Name	Description	Project Lead	Status	Milestones	Tasks	Comments
<input type="checkbox"/>	≡	Configure Web Development Too...	Determine the hardware and softwa...	Tyson King	Completed	0	6	3
<input type="checkbox"/>	≡	Train Developers on Web develop...	Ensure all developers who will be d...	Lucille Beatie	Completed	2	6	2
<input type="checkbox"/>	≡	Migrate Legacy Applications	Move the data and redevelop the a...	Miyazaki Yo...	In-Progress	3	9	6
<input checked="" type="checkbox"/>	≡	Develop Production Partner Portal	Develop the production app that pa...	Lucille Beatie	Assigned	5	17	0
<input type="checkbox"/>	≡	Develop Partner Portal POC	Develop a proof of concept that par...	Tyson King	In-Progress	2	7	0

1 rows selected 1 - 5

The previous illustration shows the master interactive grid with the project, *Develop Production Partner Portal* selected. The next illustration shows detail interactive grids for *Milestones* and *Tasks*.

Show All		Milestones	Tasks	Comments				
Milestones								
		Search: All Text Columns <input type="text"/> <input type="button" value="Go"/> <input type="button" value="Actions"/> <input type="button" value="Edit"/> <input type="button" value="Add Milestone"/> <input type="button" value="Reset"/>						
<input type="checkbox"/>	≡	Name	Description	Due Date ↑±	Tasks			
<input checked="" type="checkbox"/>	≡	Define Production App Sc...	Based on the results of the POC, define the requirements for the production ...	27-SEP-18	3			
<input type="checkbox"/>	≡	Build Phase 1 of Productio...	Develop the modules defined in the first phase of the application.	04-OCT-18	3			
<input type="checkbox"/>	≡	Perform Beta testing with ...	Work with a few key partners to trial Phase 1 of the Partner Portal app.	12-OCT-18	3			
<input type="checkbox"/>	≡	Complete Phase 1 Develo...	Based on the results of the Beta program, enhance the application to make p...	08-NOV-18	4			
<input type="checkbox"/>	≡	Roll out Phase 1 of Partne...	Go-Live for the Partner Portal application to all partners.	12-NOV-18	4			
		1 rows selected Total 5						
Tasks								
		Search: All Text Columns <input type="text"/> <input type="button" value="Go"/> <input type="button" value="Actions"/> <input type="button" value="Edit"/> <input type="button" value="Add Task"/> <input type="button" value="Reset"/>						
<input type="checkbox"/>	≡	Name	A...	Start Date ↑±	End Date	Is Complete?	Milestone	Description
<input checked="" type="checkbox"/>	≡	Define production scope of Partner ...	Ty...	26-SEP-18	27-SEP-18	No	Define Production App S...	Define the scope anc
<input type="checkbox"/>	≡	Finalize Partner App Data Model	D...	26-SEP-18	27-SEP-18	No	Define Production App S...	Refine the data mod
<input type="checkbox"/>	≡	Finalize User Experience	M...	26-SEP-18	27-SEP-18	No	Define Production App S...	Write developer stan

Drill Down Master Detail

A **Drill Down** master detail contains two pages based on two related tables or views. The first page contains an interactive report for the master table. The second page features a standard form for the master and interactive grids for the detail. Developers can create a Drill Down master detail with the Create Page Wizard.

<input type="text" value="Q"/> <input type="button" value="Go"/> <input type="button" value="Actions"/> <input type="button" value="Create Project"/>					
	Name	Project Lead	Status	Completed Date	Description
	Configure Web Development Tool Environment	Tyson King	Completed	18-AUG-18	Determine the hardware and software required to develop with Web development tool.
	Train Developers on Web development tool	Lucille Beatie	Completed	02-SEP-18	Ensure all developers who will be developing with the new tool get the appropriate training.
	Migrate Legacy Applications	Miyazaki Yokohama	In-Progress	-	Move the data and redevelop the applications currently running on top of legacy servers
	Develop Partner Portal POC	Tyson King	In-Progress	-	Develop a proof of concept that partners can use to work more collaboratively with us.
	Develop Production Partner Portal	Lucille Beatie	Assigned	-	Develop the production app that partners can use to work more collaboratively with us.
					1 - 5

In this example, users click the Edit icon to view project details. The second page includes both a standard form (for the master) and editable interactive grids.

Drill Down \ Develop Partner Portal POC

< > 4 of 5 Delete Cancel Save

Show All Project Details Milestones Tasks Comments

Project Details

Name *

Project Lead

Status *

Description

▶ Audit Details

Milestones

Search: All Text Columns Go Actions Edit Add Milestone Reset

<input type="checkbox"/>		Name	Due Date ↑	Description	Tasks
<input checked="" type="checkbox"/>		Define Requirements	19-SEP-18	Work with key stakeholders to define the scope of the project, and design ...	3
<input type="checkbox"/>		Build Proof-of-Concept	26-SEP-18	Create the initial screens and populate with data so key stakeholders can r...	4

For numeric and date fields, you can also pre-define date and number format masks, or apply those format masks after generating the initial form. Wizard generated master detail forms also automatically create validations for some columns. Validations are created for columns that are set to NOT NULL in the underlying table and columns of type NUMBER, DATE or TIMESTAMP. Note that validations are not created for columns if the column is set to read-only, either based on the user's selection, or defined user interface defaults.



Tip:

You can control the appearance of a specific column by editing column attributes.

Side by Side Master Detail

A **Side by Side** master detail form contains a single page master detail utilizing a side by side layout and report regions with modal edit windows. The left side contains a master list to navigate to the master record. The right side contains the selected master record and the associated detail report(s). Developers can create Side by Side master detail with either Create Application Wizard or Create Page Wizard.

Side by Side

Reset + Add Project

Configure Web Development Tool Environment
COMPLETED

Develop Partner Portal POC
IN-PROGRESS

Develop Production Partner Portal
ASSIGNED

Migrate Legacy Applications
IN-PROGRESS

Train Developers on Web development tool
COMPLETED

▼ **Overview: Side by Side**

This example displays master-detail regions on the same page. The user selects a record from the master on the left to render the detail on the right without leaving the page.

Project Details Edit Project

Project Lead	Lucille Beatie
Name	Develop Production Partner Portal
Description	Develop the production app that partners can use to work more collaboratively with us.
Status	Assigned
Created	9/14/2018
Created By	ADMIN
Updated	9/14/2018
Updated By	ADMIN

The illustration that follows shows the Milestones detail interactive report. Users can Milestones by clicking an Edit icon.

Side by Side
Created 9/14/2018 Reset Add Project

Configure Web Development Tool Environment
COMPLETED

Develop Partner Portal POC
IN-PROGRESS

Develop Production Partner Portal
ASSIGNED

Migrate Legacy Applications
IN-PROGRESS

Train Developers on Web development tool
COMPLETED

Created By ADMIN

Updated 9/14/2018

Updated By ADMIN

Show All Milestones Tasks Comments

Milestones +

	Name	Description	Due Date	Created	Created By	Updated	Updated By
	Define Production App Scope	Based on the results of the POC, define the requirements for the production app.	27-SEP-18	9/14/2018	ADMIN	9/14/2018	ADMIN
	Build Phase 1 of Production Partner Portal App	Develop the modules defined in the first phase of the application.	04-OCT-18	9/14/2018	ADMIN	9/14/2018	ADMIN
	Perform Beta testing with select Partners	Work with a few key partners to trial Phase 1 of the Partner Portal app.	12-OCT-18	9/14/2018	ADMIN	9/14/2018	ADMIN

9.5.2 Creating a Master Detail Form Using the Create Application Wizard

Run the Create Application Wizard to create a new application containing one or more pages. Supported master detail forms include Stacked and Side by Side.

Tip:

The Create Application Wizard uses general best practices to generate the application and does not include several advanced options included in the Create Page Wizard.

1. To create a master detail form using the Create Application Wizard:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Click the **Create** button.
 3. Click **New Application**.
 4. For Name, enter the name used to identify the application to developers.
 5. For Appearance, accept the default Theme Style and menu layout (Vita, Side Menu), or change it by clicking the **Set Appearance** icon adjacent to the Appearance field.
 6. To add a report, click **Add Page** and select then select **Master Detail**.

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7. On Add Master Detail Page:
 - a. Page Name - Enter a name for this page.
 - b. Set Icon - Select an icon to display in the navigation menu for this page.
 - c. Page Type - Select one of the following:
 - **Side by Side** - Creates a single page (or Side by Side) master detail with a master table and detail table. The left side contains a master list to navigate to the master record. The right side contains the selected master record and the associated detail report.
 - **Stacked** - Creates single page master detail with editable interactive grids.

If Page Type is **Side by Side**:

- Table - Select the master table for the page.
- Primary Display Column - Select the column to display in the list of master records.
- Secondary Display Column - Select the descriptive column to display in the list of master records, under the Primary Display Column.
- Detail Table - Select the detail table.

If Page Type is **Stacked**:

- Table - Select the master table for the editable interactive grid.
- Detail Table - Select the detail table for the page.

- d. Advanced - Expand **Advanced**:
 - Page Help - Enter text to be displayed when the user selects Page Help.

 **Tip:**

This setting requires you select the **Help Pages** feature. If the **Help Pages** feature is not selected, the Help icon is not be generated and end users cannot access page help.

- e. Click **Add Page**.
8. Under Features, select features to include with the application. Features provide application-level functionality and are typically added once per application. To learn more, click the Help icon adjacent to **Features**.

 **Tip:**

Click the **Check All** button to select all features.

9. Under Settings, specify settings used to generate this application. To learn more about an attribute, click the Help icon adjacent to **Settings**.
10. Click **Create Application**.
11. To view the new master detail page, click **Run Page**.
The rendered page appears.

**See Also:**

["Creating Database Applications"](#)

9.5.3 Creating a Stacked Master Detail Using the Create Page Wizard

Run the Create Page Wizard to add a single page (or Stacked) master detail form that uses an local or external data source.

A **Stacked** master detail form contains a single page with editable interactive grids based on two related tables or views. Users select a row in the master grid to update the detail grids.

- [Creating a Stacked Master Detail Using a Local Database](#)
- [Creating a Stacked Master Detail Using External Data Sources](#)

9.5.3.1 Creating a Stacked Master Detail Using a Local Database

1. To create a Stacked master detail on a new page using a local database:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. Click **Create Page**.
 4. For Create a Page:
 - a. Page Type - Select **Component** and then **Master Detail**.

**Tip:**

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- b. Select **Stacked**.
5. On Page Attributes:
 - a. Page Number - Enter the page number of the master page. If you identify a new page number, the wizard creates a new page. If you identify an existing page number, the wizard adds the component to that page.
 - b. Page Name - Enter the name of the page.
 - c. Page Mode - Identify the page mode. Options include:
 - **Normal** - The page is presented as a normal Application Express application page.
 - **Modal Dialog** - The page is presented as a modal dialog. A modal dialog is an overlay window positioned within the viewport, which remains active and focused until the end user dismisses (closes) it. The underlying page is grayed out and the end user is prevented from interacting with the rest of the page until the dialog is closed.

- d. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page. If you elect to include breadcrumb navigation, additional attributes appear.
 - e. Click **Next**.
6. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
7. For Master Source:
 - a. Master Region Title - Enter a region title for the master region.
 - b. Location - Select **Local Database**.
 - c. Location - **Local Database**.
 - d. Table / View Name - Select the table or view on which the grid will be based.
 - e. Primary Key Column - Select the name of the column that uniquely identifies a row in the table.
 - f. Select Columns - Select one or more columns to be included in the region. Select all columns to be displayed.
 - g. Click **Next**.
8. For Detail Source:
 - a. Detail Region Title - Enter a region title for the detail region.
 - b. Location - **Local Database**.
 - c. Table/View Name - Select the table or view on which the grid is based.
 - d. Primary Key Column - Select the name of the column that uniquely identifies a row in the table.
 - e. Master Detail Foreign Key - Select the foreign key that relates between the master and detail tables.
 - f. Select Columns - Select one or more columns to be included in the region. Select all columns to be displayed.
 - g. Click **Create**.

The Page Designer appears.
9. To view the new master detail, click **Save and Run Page**.

The rendered page appears.

9.5.3.2 Creating a Stacked Master Detail Using External Data Sources

The component(s) described in this topic include built-in support for REST Enabled SQL and REST Data Sources which enables read and write access to remote data sources. In order to build a component on a remote data source, you must first create the application and configure the external data source.

1. To create a single page master detail master detail on a new page using an external data source:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.

3. Click **Create Page**.
4. For Create a Page:
 - a. Page Type - Select **Component** and then **Master Detail**.

 **Tip:**

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- b. Select **Stacked**.
5. On Page Attributes:
 - a. Page Number - Enter the page number of the master page. If you identify a new page number, the wizard creates a new page. If you identify an existing page number, the wizard adds the component to that page.
 - b. Page Name - Enter the name of the page.
 - c. Page Mode - Identify the page mode. Options include:
 - **Normal** - The page is presented as a normal Application Express application page.
 - **Modal Dialog** - The page is presented as a modal dialog. A modal dialog is an overlay window positioned within the viewport, which remains active and focused until the end user dismisses (closes) it. The underlying page is grayed out and the end user is prevented from interacting with the rest of the page until the dialog is closed.
 - d. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page. If you elect to include breadcrumb navigation, additional attributes appear.
 - e. Click **Next**.
6. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
7. For Master Source:
 - a. Master Region Title - Enter a region title for the master region.
 - b. Location - Select a data source. Options include:
 - **Local Database** - Data is sourced from a local database.
 - **REST Enabled SQL Service** - Data is sourced from a remote database, where the connection is defined using REST Enabled SQL. To create or maintain REST Enabled SQL references, navigate to Shared Components, REST Enabled SQL.
 - **REST Data Source** - Data is sourced from a RESTful web service defined using REST Data Sources. REST Data Source are created and maintained within Shared Components.

- c. For Location, select either **REST Enabled SQL Service** or **REST Data Source**.
8. What displays next changes based on your selection. Follow the on-screen instruction. To learn more about an attribute, see field-level Help.
9. To view the new master detail, click **Save and Run Page**.

The rendered page appears.

9.5.4 Creating a Side by Side Master Detail Using the Create Page Wizard

Run the Create Page Wizard to add a new page with a Side by Side master detail that uses a local or external data source.

A **Side by Side** master detail form contains a single page master detail utilizing a side by side layout and report regions with modal edit windows. The left side contains a master list to navigate to the master record. The right side contains the selected master record and the associated detail report(s).

- [Creating a Side by Side Master Detail Using a Local Database](#)
- [Creating a Side by Side Master Detail Using External Data Sources](#)

9.5.4.1 Creating a Side by Side Master Detail Using a Local Database

1. To create a Side by Side master detail on a new page using a local database:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. Click **Create Page**.
 4. For Create a Page:
 - Page Type - Select **Component** and then **Master Detail**.

 **Tip:**

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- On Create Page, select **Side by Side**.
5. On Page Attributes:
 - a. Starting Page Number - Enter an unused starting page number. This wizard will create multiple pages starting with the number specified. The default is the first available page number within this application.
 - b. Master Detail Page Name - Enter the name of the master detail page which contains side by side master detail regions. The left side contains a master list to navigate to navigate to the master record. The right side contains the selected master record and the associated detail report.
 - c. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page. If you elect to include breadcrumb navigation, additional attributes appear.

- d. Click **Next**.
6. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
7. On the Master Detail Source, specify the following:
 - a. Table/View Owner - Select the owner of the table on which you are building master detail page.
 - b. Master Table - Select the master table or view.
 - c. Primary Display Column - Select the column to display as primary column in the report to navigate to a different master record.
 - d. Secondary Display Column - Select the column to display as secondary column in the report to navigate to a different master record.
 - e. Detail Table - Select the detail table or view.
 - f. Detail Table 2 - Select the detail table or view (optional).
 - g. Detail Table 3 - Select the detail table or view (optional).
 - h. Detail Table 4 - Select the detail table or view (optional).
 - i. Click **Create**.
8. To view the new master detail, click **Save and Run Page**.

The rendered pages appear.

9.5.4.2 Creating a Side by Side Master Detail Using External Data Sources

The component(s) described in this topic include built-in support for REST Enabled SQL and REST Data Sources which enables read and write access to remote data sources. In order to build a component on a remote data source, you must first create the application and configure the external data source.

1. To create a Side by Side master detail on a new page using an external data source:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. Click **Create Page**.
 4. For Create a Page:
 - a. Page Type - Select **Component** and then **Master Detail**.

 **Tip:**

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- b. On Create Master Detail, select **Side by Side**.

5. On Page Attributes:
 - a. Starting Page Number - Enter an unused starting page number. This wizard will create multiple pages starting with the number specified. The default is the first available page number within this application.
 - b. Master Detail Page Name - Enter the name of the master detail page which contains side by side master detail regions. The left side contains a master list to navigate to navigate to the master record. The right side contains the selected master record and the associated detail report.
 - c. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page. If you elect to include breadcrumb navigation, additional attributes appear.
 - d. Click **Next**.
6. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
7. On the Master Detail Source, click the **Advanced** button. Edit the following:
 - a. Master Region Title - Enter a region title for the master region.
 - b. Location - Select a data source. Options include:
 - **Local Database** - Data is sourced from a local database.
 - **REST Enabled SQL Service** - Data is sourced from a remote database, where the connection is defined using REST Enabled SQL. To create or maintain REST Enabled SQL references, navigate to Shared Components, REST Enabled SQL.
 - **REST Data Source** - Data is sourced from a RESTful web service defined using REST Data Sources. REST Data Source are created and maintained within Shared Components.
 - c. For Location, select either **REST Enabled SQL Service** or **REST Data Source**.
8. What displays next changes based on your selection. Follow the on-screen instruction. To learn more about an attribute, see field-level Help.
9. To view the new master detail, click **Save and Run Page**.

The rendered page appears.

9.5.5 Creating a Drill Down Master Detail Using the Create Page Wizard

Run the Create Page Wizard to add a two page Drill Down master detail that uses a local or external data source.

A **Drill Down** master detail contains two pages based on two related tables or views. The first page contains an interactive report for the master table. The second page features a standard form for the master and interactive grids for the detail.

- [Creating a Drill Down Master Detail Using a Local Database](#)
- [Creating a Drill Down Master Using External Data Sources](#)

9.5.5.1 Creating a Drill Down Master Detail Using a Local Database

1. To create a two page Drill Down master detail using a local dataase:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click **Create Page**.
4. For Create a Page:
 - a. Page Type - Select **Component** and then **Master Detail**.

 **Tip:**

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- b. Select **Drill Down**.
5. On Page Attributes:
 - a. Master Page Number - Enter the page number of the master page. The master page will contain a read-only master interactive grid. Enter a new page number or an existing page number.
 - b. Master Page Name - Enter the name of the master page.
 - c. Detail Page Number - Enter the page number of the detail page. The detail page will contain a form and editable interactive grid..
 - d. Detail Page Name - Enter the name of the detail page.
 - e. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page. If you elect to include breadcrumb navigation, additional attributes appear.
 - f. Click **Next**.
6. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
7. For Master Source:
 - a. Table/View Owner - Select the owner of the table on which you are building the interactive grid.
 - b. Table/View Name - Select the table or view on which the grid is based.
 - c. Primary Key Column - Select the name of the column that uniquely identifies a row in the table.
 - d. Form Navigation Order - Select the navigation order column used by the previous and next buttons on the Detail Page which navigates to a different master record.
 - e. Select Columns - Select one or more columns to be included in the region. Select all columns to be displayed.
 - f. Click **Next**.
8. For Detail Source:

- a. Table/View Owner - Select the owner of the table on which you are building the interactive grid.
- b. Table/View Name - Select the table or view on which the grid is based.
- c. Primary Key Column - Select the name of the column that uniquely identifies a row in the table.
- d. Master Detail Foreign Key - Select the foreign key that relates between the master and detail tables.
- e. Select Columns - Select one or more columns to be included in the region. Select all columns to be displayed.
- f. Click **Create**.

Page Designer appears.

9. To view the new master detail, click **Save and Run Page**.

The rendered pages appear.

9.5.5.2 Creating a Drill Down Master Using External Data Sources

The component(s) described in this topic include built-in support for REST Enabled SQL and REST Data Sources which enables read and write access to remote data sources. In order to build a component on a remote data source, you must first create the application and configure the external data source.

1. To create a two page drill down master detail using an external data sources:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. Click **Create Page**.
 4. For Create a Page:
 - a. Page Type - Select **Component** and then **Master Detail**.

 **Tip:**

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- b. On Create Page, select **Drill Down**.
5. On Page Attributes:
 - a. Master Page Number - Enter the page number of the master page. The master page will contain a read-only master interactive grid. Enter a new page number or an existing page number.
 - b. Master Page Name - Enter the name of the master page.
 - c. Detail Page Number - Enter the page number of the detail page. The detail page will contain a form and editable interactive grid..
 - d. Detail Page Name - Enter the name of the detail page.

- e. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page. If you elect to include breadcrumb navigation, additional attributes appear.
 - f. Click **Next**.
6. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
7. On the Master Source, edit the following:
 - a. Location - Select a data source. Options include:
 - **Local Database** - Data is sourced from a local database.
 - **REST Enabled SQL Service** - Data is sourced from a remote database, where the connection is defined using REST Enabled SQL. To create or maintain REST Enabled SQL references, navigate to Shared Components, REST Enabled SQL.
 - **REST Data Source** - Data is sourced from a RESTful web service defined using REST Data Sources. REST Data Source are created and maintained within Shared Components.
 - b. For Location, select either **REST Enabled SQL Service** or **REST Data Source**.
8. What displays next changes based on your selection. Follow the on-screen instruction. To learn more about an attribute, see field-level Help.
9. To view the new master detail, click **Save and Run Page**.

The rendered page appears.

9.6 Validating User Input in Forms

Developers can create validation and an associated error message to check the data a user enters before processing.

- [About Creating Validations and Error Messages](#)
- [Associating a Validation with a Specific Item](#)
- [About the Error Message Display Location](#)

9.6.1 About Creating Validations and Error Messages

You can use validations to check data a user enters before processing. Once you create a validation and the associated error message, you can associate it with a specific item. You can choose to have validation error messages display inline (that is, on the page where the validation is performed) or on a separate error page.

Creating an inline error message involves these steps:

- Step 1 - Create a validation and specify error message text. To learn more, see "[Understanding Validations](#)."
- Step 2 - Associate the validation with a specific item.

9.6.2 Associating a Validation with a Specific Item

To associate an item with a validation and specify error message text:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In Page Designer, select the Processing tab in the left pane.
3. Under Validating, select the validation you want to associate.
The Property Editor displays Validation attributes.
4. Under Validation, edit the following attributes:
 - Error, Error Message - Enter the text to be displayed in the event that the validation does not pass.
 - Error, Display Location - Select where the error message displays for this validation. Validation error messages display on a separate error page, or inline with the existing page. Inline error messages display underneath the associated item label or in a notification area defined as part of the page template.
 - Error, Associated Item - Select the item where this validation error message displays. .

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. Click **Save**.

9.6.3 About the Error Message Display Location

The error message display location identifies where a validation error message displays. Validation error messages can display on an error page or inline within the existing page. Inline error messages can display in a notification area (defined as part of the page template) or within the field label.

To create a hard error that stops processes, including any remaining validations, you must display the error on an error page.

9.7 Understanding BLOB Support in Forms

Oracle Application Express includes BLOB support to enable developers to declaratively upload and download files in forms.

- [About BLOB Support in Forms](#)
- [About Uploading and Downloading Files into a BLOB](#)

- [About Displaying the BLOB](#)
- [About Removing the Image Reference](#)

9.7.1 About BLOB Support in Forms

If you create a form using the Create Application Wizard, create a page of type of **Form** or **Report and Form**, create a region of type **Form**, or add an item to an existing form, any item whose source is a database column of type BLOB results in an item of type **File Browse**. When the form is called for INSERT, the file selected by the user is loaded into the BLOB column. When the form is called for update, a download link is displayed to the right of the Browse button. Users can use this link to download the file.

9.7.2 About Uploading and Downloading Files into a BLOB

The defaulted BLOB support does not give you all the information a typical application needs to effectively manage a BLOB. In addition to knowing that the column is a BLOB, more information about the file provides a better experience for the end-user. The File Browse page item has additional settings to facilitate managing this additional information completely declaratively.



Tip:

For more information on File Browse settings, see **File Browse** in "[About Item Types](#)."

There are two different types of storage types available within the File Browse item type:

- BLOB column specific in Item Source Attribute - Completely declarative approach that supports configuration of the additional settings discussed here. This references a BLOB in your own database table.
- Table WWV_FLOW_FILES - Available for backwards compatibility. Oracle does not recommend using this in new applications.
- Table APEX_APPLICATION_TEMP_FILES - Store the uploaded file in a temporary location that you can access with the view APEX_APPLICATION_TEMP_FILES. Oracle Application Express automatically deletes the file at the end of the session or at the end of the upload request, depending on what you choose for Purge File At.

To provide this additional information, it is recommended that you add additional columns to your base table to store and track the MIME type, file name, last updated date and character set settings. You can accomplish this by extending your table. For example:

```
ALTER TABLE emp ADD
  (ATTACH_MIMETYPE    VARCHAR2(255),
   ATTACH_FILENAME    VARCHAR2(255),
   ATTACH_LAST_UPDATE DATE,
   ATTACH_CHARSET     VARCHAR2(128));
```

 **Note:**

The character set of the BLOB is not automatically set on upload. To store the character set value for your BLOB, you must provide an additional page item on your page which is bound to the column you use to store the character set, and where the user will be able to specify the character set for the document they are uploading.

If you manually create a form on a custom table, you can still take advantage of this feature. To do so, use the File Browse item type with a Storage Type setting of BLOB column specified in Item Source Attribute, on a page with a DML Process type of DML_PROCESS_ROW. This process determines the table name and primary key columns.

9.7.3 About Displaying the BLOB

If the BLOB you are working with is an image, you can display it in a form. To handle it declaratively, use the Display Image item type as described in "[About Item Types](#)." To handle it procedurally, see "[Understanding BLOB Support in Forms and Reports](#)."

9.7.4 About Removing the Image Reference

Because there is no set to NULL when using File Browse, if you need to provide a mechanism to remove an image reference, you must include a special Remove Image button to nullify the necessary columns. Consider the following example:

```
UPDATE demo_product_info
  SET product_image = NULL,
      MIMETYPE = NULL,
      FILENAME = NULL,
      IMAGE_LAST_UPDATE = NULL,
      CHARSET = NULL
 WHERE product_id = :P6_PRODUCT_ID;
```

10

Managing Database Application Components

Oracle Application Express supports the creation the following database application components: calendars, maps, charts, and application Help.

- [Understanding Oracle JET Integration with Oracle Application Express](#)
Oracle Application Express includes the Oracle JET (JavaScript Extension Toolkit) library. This section provides information about JET and how it is integrated with Oracle Application Express.
- [Creating Calendars](#)
App Builder includes support for creating a calendar with monthly, weekly, daily, and list views. Once you specify the table on which the calendar is based, you can create drill-down links to information stored in specific columns and enable drag and drop capability.
- [Creating Charts](#)
Create charts in App Builder by running a built-in wizard or creating it manually in Page Designer.
- [Creating Maps](#)
Create maps that visualize location data (real coordinates) based on data in a table.
- [Creating Help for Your Application](#)
Help created in App Builder displays on a dedicated Help page. To access Help, users click a link that takes them to a dedicated Help page. This Help page displays page and field-level Help topics specific to the page they are viewing.



See Also:

["Controlling Page Layout"](#) and ["Adding Navigation"](#)

10.1 Understanding Oracle JET Integration with Oracle Application Express

Oracle Application Express includes the Oracle JET (JavaScript Extension Toolkit) library. This section provides information about JET and how it is integrated with Oracle Application Express.

- [About Oracle JET](#)
- [How Oracle JET is integrated with Oracle Application Express](#)

10.1.1 About Oracle JET

Oracle JET (JavaScript Extension Toolkit) is a collection of open source JavaScript libraries with a set of Oracle contributed JavaScript libraries. Oracle JET is targeted at intermediate and advanced JavaScript developers and provides a rich set of UI components that can be

easily integrated into Oracle Application Express. Oracle JET is a modular toolkit which enables developers to use as much or as little of the features that they desire.



See Also:

"[Oracle JET Homepage](#)" to learn more about Oracle JET.

10.1.2 How Oracle JET is integrated with Oracle Application Express

Currently Oracle Application Express integrates some parts of Oracle JET , primarily with `Chart` region types, and `Text field` with `Autocomplete` item types.



Note:

Although Oracle JET provides two-way data binding (using `knockout.js`), currently Oracle Application Express does not natively utilize this aspect of the toolkit.

Oracle JET uses a module loader (`RequireJS`) to only load modules that are required for specific functionality to work. This means that you do not have to load the entire Oracle JET library for certain functionality and also enables each module to define its own dependencies. At runtime, when a module is requested, the module loader looks at the module being requested for any dependencies to other modules. If there are any dependencies, these will also be loaded.

Module loader can however result in a large number of additional resources being individually loaded at runtime, which can have a negative performance impact. For this reason, Oracle Application Express makes use of the `RequireJS Optimization Tool`, which:

- provides a way to determine all the dependencies for modules either at design time or as part of a standard build process
- bundles them up into one combined, minified file

`RequireJS Optimization Tool` is loaded at runtime to avoid the need for all the additional requests.

Find the list of the bundles used for `Chart` and `Text field` with `Autocomplete` native types.

- `jetCommonBundle.min.js`
- `inputSearchBundle.min.js`
- `chartBundle.min.js`

 **Note:**

You can utilize the Common bundle `jetCommonBundle.min.js` in your plug-ins. This Common Bundle gets included on any Oracle Application Express page as soon as a file is included with your plug-in, which defines the `[require jet]` prefix. This means that any module your plug-in uses that is already included in the common bundle does not need to be refetched by `requireJS`.

jetCommonBundle.min.js

- **Directory:** `/images/libraries/apex/minified/`
- **Included when:** When a JavaScript file is requested that defines itself as requiring JET, by using the `[require jet]` prefix in Oracle Application Express, and the page is not in Debug mode

When debugging, the bundle is not loaded and `requireJS` loads all the individual resources separately.

inputSearchBundle.min.js

- **Directory:** `/images/libraries/apex/minified/`
- **Included when:** A Text Field with Autocomplete item is included on a page, and the page is not in debug mode.

When debugging, the bundle is not loaded and `requireJS` loads all the individual resources separately.

chartBundle.min.js

- **Directory:** `/images/libraries/apex/minified/`
- **Included when:** A JET chart is included on a page (for example, when a Chart region, or Interactive Grid region is added to a page), and the page is not in debug mode.

When debugging, the bundle is not loaded and `requireJS` loads all the individual resources separately.

 **See Also:**

- "[requireJS homepage](#)" to learn more about RequireJS
- "[RequireJS Optimization Tool](#)" to learn more about RequireJS Optimization Tool

10.2 Creating Calendars

App Builder includes support for creating a calendar with monthly, weekly, daily, and list views. Once you specify the table on which the calendar is based, you can create drill-down links to information stored in specific columns and enable drag and drop capability.

- [About Supported Calendars](#)
App Builder supports two types of calendars: Calendar and Legacy Calendar.
- [Sample Calendar](#)
View a sample calendar in the *Sample Calendar* sample app.
- [Adding a Calendar to a New Page Using a Local Database](#)
Run the Create Page Wizard to create a new page with a calendar using a local database.
- [Adding a Calendar on a New Page Using External Data Sources](#)
Use the Create Page Wizard to add a new page with a calendar that uses an external data source.
- [Creating a Calendar in Page Designer](#)
Manually create a calendar in Page Designer by providing the SQL query.
- [Managing Calendar Attributes](#)
Once you create a calendar, you can alter the display by editing attributes in the Property Editor.
- [About Dynamic Action Support for Calendar](#)
Use the Dynamic Action Create Wizard to specify an action that is performed when a defined set of conditions occur. You can specify which elements are affected by the action and when and how they are affected.



See Also:

"[Managing Legacy Calendars](#)" and "[Integrating with Google Calendar](#)"

10.2.1 About Supported Calendars

App Builder supports two types of calendars: Calendar and Legacy Calendar.

Calendar is based on the FullCalendar jQuery library and can only be customized through CSS. **Legacy Calendar** is template-based and may be deprecated in the future release. Although Oracle still supports legacy components, the creation of new calendars is based on the FullCalendar jQuery library.



Tip:

In previous releases **Legacy Calendar** was referred to as **Calendar (Template)**, **Classic calendar**, **Easy calendar**, and **SQL calendar**.

You to create a calendar based on a table or SQL query you provide. During the creation process, you are prompted to select a date column and display column. Because it offers a better user interface and numerous additional features, Oracle recommends converting all legacy calendars to the latest calendar.

Calendar

The Calendar option supports:

- Rendering calendar events on multiple views (Month, Week, Day, or List).

- Rendering of duration and non-duration based events.
- Ability to modify the start and end dates by dragging and dropping events on different dates. Drag and drop is only supported for local data sources, that is, database objects in the referenced database schema and not on external data sources such as a Google calendar.
- Ability to change the duration by resizing the length of the events, by changing the end date.
- Ability to Edit or Adding new events on calendar using forms by clicking either on events or empty calendar cell.
- Rendering events from external sources using web service calls or Google Calendar feeds.
- Ability to render events titles on single or multiple lines.
- Using different CSS classes, developer can choose different styles for different type of events.
- Ability to download events in PDF printable format
- Support of multiple formats for sharing events (iCal, CSV, XML).
- Ability to add tooltip on Month/Week/Day views to make it easier for users to have a quick look at details of each event.

Legacy Calendar

Legacy Calendars option supports:

- Rendering of start date only.
- Look and feel defined by templates.
- Modification of start date by dragging and dropping events.
- Calendars that include daily, weekly, and monthly views.
- The date column determines the days on the calendar which contains entries.
- The display column defines a specific row which displays the calendar.



See Also:

["Managing Legacy Calendars"](#)

10.2.2 Sample Calendar

View a sample calendar in the *Sample Calendar* sample app.

Sample apps are designed to highlight specific functionality and are intended to serve as a developer guide on how to make use of a particular feature. The following is **Monthly Calendar: Projects** from the *Sample Calendar* sample app.

- a. User Interface - Select a user interface for the page (optional).
This attribute only displays for applications using older themes and for which Desktop and Mobile User Interfaces have been defined.
 - b. Select a page type - Select **Calendar**.
3. For Page Attributes:

 **Tip:**

To learn more about an attribute, see field-level Help. See "[Viewing Help](#)".

- a. Page Number - If you identify a new page number, the wizard creates a new page. If you identify an existing page number, the wizard adds the component to that page.
 - b. Page Name - Enter a title for the page to be created.
 - c. Page Mode - Select a page mode.
 - d. Page Group - Identify the name of the page group you would like to associate with this page.
 - e. Breadcrumb - Select whether to use a breadcrumb navigation control on your page, and which breadcrumb navigation control you want to use.
 - f. Click **Next**.
4. For Navigation Menu, specify the type of navigation to include on this page and click **Next**. The navigation options that display depend upon the current application theme.
5. For Data Source, select **Local Database**.
6. For Source Type, do one of the following:
- If the source is a table:
 - a. Source Type - Select **Table**.
 - b. Table/View Owner - Select the owner of the table on which you are building a calendar.
 - c. Table/View Name - Select the table or view on which the calendar is based.
 - d. Select Columns - Select one or more columns to be included in the calendar.
 - e. Click **Next**.
 - If the Calendar source is a SQL Query:
 - a. Source Type - Select **SQL Query**.
 - b. Enter Region Source - Enter the SQL SELECT statement to be used for the calendar. The SQL SELECT statement must include at least two columns, of which one must be a DATE column.
 - c. Click **Next**.
7. For Settings:
- a. Display Column - Select the column which holds the text displayed for events on this calendar.
 - b. Start Date Column - Select the column which holds the start date for events displayed on this calendar.

- c. End Date Column - Select the column which holds the end date for events displayed on this calendar. If this attribute is specified, then the calendar displays duration-based events.
- d. Show Time - Select whether the time portion of the date display.
- e. Click **Create**.

10.2.4 Adding a Calendar on a New Page Using External Data Sources

Use the Create Page Wizard to add a new page with a calendar that uses an external data source.

The component(s) described in this topic include built-in support for REST Enabled SQL and REST Data Sources which enables read and write access to remote data sources. In order to build a component on a remote data source, you must first create the application and configure the external data source.

1. To create a calendar on a new page using an external data source:

1. Run the Create Page Wizard:

- a. Navigate to the Workspace home page.
- b. Click the **App Builder** icon.
- c. Select an application.
- d. On the Application home page, click **Create Page**.

The Create Page Wizard appears.

2. On Create a Page:

- a. Page Type - Select **Component**.
- b. Click **Calendar**.

3. For Page Attributes:

 **Tip:**

To learn more about an attribute, see field-level Help. See "[Viewing Help](#)".

- a. Page Number - If you identify a new page number, the wizard creates a new page. If you identify an existing page number, the wizard adds the component to that page.
- b. Page Name - Enter a title for the page to be created.
- c. Page Mode - Select a page mode. **Normal** presents the page as a normal Application Express application page. **Modal Dialog** presents the page as an overlay window positioned which remains active and focused until the end user dismisses (closes) it. The underlying page is grayed out and the end user is prevented from interacting with the rest of the page until the dialog is closed.
- d. Page Group - Identify the name of the page group you would like to associate with this page.

- e. Breadcrumb - Select whether to use a breadcrumb navigation control on your page, and which breadcrumb navigation control you want to use.
 - f. Click **Next**.
4. For Navigation Menu, specify the type of navigation to include on this page and click **Next**. The navigation options that display depend upon the current application theme.
5. Select a data source. Options include:
 - **Local Database** - Data is sourced from a local database.
 - **REST Enabled SQL Service** - Data is sourced from a remote database, where the connection is defined using REST Enabled SQL. To create or maintain REST Enabled SQL references, navigate to Shared Components, REST Enabled SQL.
 - **REST Data Source** - Data is sourced from a RESTful web service defined using REST Data Sources. REST Data Source are created and maintained within Shared Components.

For Data Source, select either **REST Enabled SQL Service** or **REST Data Source**.

6. What displays next changes based on your selection. Follow the on-screen instructions. To learn more about an attribute, see field-level Help.
7. To view page, click **Save and Run Page**.

The rendered page appears.

10.2.5 Creating a Calendar in Page Designer

Manually create a calendar in Page Designer by providing the SQL query.

Tip:

To create a calendar in Page Designer, you must provide a SQL Query. To create a calendar by selecting a table, use the Create Page Wizard. See "[Adding a Calendar to a New Page Using a Local Database](#)".

To create a calendar in Page Designer:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. If necessary, click the Layout tab in the central pane.
3. In the Gallery, click the **Regions** tab.
4. Right-click **Calendar**, click **Add To**, and select the appropriate location.

 **Tip:**

You also select **Calendar** with the mouse and drag it to the appropriate location in the Layout tab.

5. Page Designer indicates what to do next. If there is an error, the Show Messages icon displays in the Page Developer toolbar.
 - a. Click the **Show Messages** icon on the Page Designer toolbar.

The Messages dialog displays errors that must be addressed.
 - b. Select an error to highlight the associated attribute in the Property Editor.
6. In the Property Editor, edit the appropriate Region attributes:
 - Identification, Title - Enter a region title.
 - Source, Location - Select the location of the database which contains column which holds the CSS Class to style the events displayed on this calendar. Options include:
 - **Local Database** - Data is sourced from a local database.
 - **REST Enabled SQL** - Data is sourced from a remote database where the connection is defined using a REST Enabled SQL service.
 - **REST Data Source** - Data is sourced from a RESTful web service defined using REST Data Sources. REST Data Source are created and maintained within Shared Components.

What displays next depends upon Source, Location you select.

 **Tip:**

To learn more, select the attribute in the Property Editor and click the **Help** tab in the central pane.

7. Edit the calendar Attributes.
 - In the Rendering tab, locate the Calendar region and click **Attributes**.

The Property Editor displays the calendar Attributes.
 - Edit the calendar Attributes:
 - Settings, Display Column - Select the column which holds the text displayed for events on this calendar.
 - Settings, Start Date - Select the column which holds the start date for events displayed on this calendar.
8. Click **Save**.

10.2.6 Managing Calendar Attributes

Once you create a calendar, you can alter the display by editing attributes in the Property Editor.

Each calendar has two sets of editable attributes: **Region attributes** and **calendar Attributes**.

- [Editing Calendar Attributes in the Property Editor](#)
Access calendar attributes in the Property Editor.
- [Editing an Existing Calendar to Include Add and Edit Functionality](#)
Edit an existing calendar to include add and edit functionality.
- [Adding Calendar Initialization JavaScript Code](#)
Add a JavaScript function to override the standard jQuery FullCalendar initialization attributes by editing the Initialization JavaScript Code attribute.
- [Enabling the Dragging and Dropping of Data in an Existing Calendar](#)
The Calendar Region supports moving or changing calendar events with drag and drop.

10.2.6.1 Editing Calendar Attributes in the Property Editor

Access calendar attributes in the Property Editor.

Region attributes define the area of the page which functions as a container for the calendar. **Calendar Attributes** specify the template, date columns, and general calendar formatting.

1. To edit calendar Attributes:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, locate and select the calendar.
The Property Editor displays two tabs: **Region** and **Attributes**.
 3. In the Property Editor, select the appropriate tab:
 - **Region - Region attributes** define the area of the page which functions as a container for the calendar.
 - **Attributes - Calendar Attributes** specify the template, date columns, and general calendar formatting.
 4. Edit the calendar attributes.
To view help for an attribute, select the attribute in the Property Editor and click the Help tab in the central pane.
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

10.2.6.2 Editing an Existing Calendar to Include Add and Edit Functionality

Edit an existing calendar to include add and edit functionality.

 **Tip:**

When defining calendar create and edit links for Desktop applications, Oracle recommends defining two separate pages. To create an **Edit Link**, select one of the table or SQL query columns as the Primary Key Column in the Calendar attributes.

1. To edit an existing calendar to include add and edit functionality:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, locate and select the calendar.
 3. In the Property Editor, click the **Attributes** tab.
The Property Editor displays the calendar Attributes.
 4. Edit **Settings, Create Link** to specify a target page to call when the user clicks an empty cell or an existing calendar entry.
 - a. **Settings, Create Link** - Click **No Link Defined**.
The Link Builder - Create Link dialog appears.
 - b. **Type** - Select the type of link target.
 - c. **Application** - If you select **Page in a different application**, enter the application ID.
 - d. **Page** - Specify the target page number.
 - e. **Set Items** - Configure the values to be passed from the calendar to the target page. The **Create Link** is called after a date or date range has been selected in the calendar. Therefore, the selected start and end dates must be passed to the Create Page.
 - To pass the selected date or the start date of a selected date range:
 - **Name** - Specify the name of the target page item containing the start date of the event. If a form, this should be a date picker element.
 - **Value** - `&APEX$NEW_START_DATE`.
 - When a date range has been selected, pass the end date as follows:
 - **Name** - Specify the name of the target page item containing the end date of the event. For a form, this should be a date picker element.
 - **Value** - `&APEX$NEW_END_DATE`.

You can pass additional values in the same way as any other link to an application page.

- Click **OK**.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.

5. Edit **Settings**, **Edit Link** to define a target page to be called when the user clicks an existing entry.

 **Tip:**

To create an Edit Link, you must pass a primary key value to the target page in order for the form to look up the table row.

- a. Settings, Edit Link - Click **No Link Defined**.
The Link Builder - Create Link dialog appears.
 - b. Type - Select the type of link target.
 - c. Application - If you select **Page in a different application**, enter the application ID.
 - d. Page - Specify the target page number.
 - e. Set Items - Configure the values to be passed from the calendar to the target page. The Create Link is called after a date or date range has been selected in the calendar. Therefore, the selected start and end dates must be passed to the Create Page.
 - Name - Specify the name of the target page item containing the primary key value; typically a hidden item, for example:
`PX_ID`.
 - Value - Specify the table or SQL query column containing the primary key value, for example:
`&ID`.
 - Click **OK**.
6. Click **Save**.

10.2.6.3 Adding Calendar Initialization JavaScript Code

Add a JavaScript function to override the standard jQuery FullCalendar initialization attributes by editing the Initialization JavaScript Code attribute.

Note that the function must return a JavaScript Object containing the calendar initialization attributes as parameters.

1. To add initialization JavaScript code:
1. View the page in Page Designer:

- a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
- Page Designer appears.
2. In the Rendering tab, locate and select the calendar.
The Property Editor displays Region attributes.
 3. In the Property Editor, click the **Attributes** tab.
The Property Editor displays the calendar Attributes.
 4. Find **Advanced**.

 **Tip:**

To search for a group or an attribute, enter a keyword in the Filter Properties field. The groups and attributes containing the term appear.

5. In **Advanced, Initialization JavaScript Code**, enter a JavaScript function to override the standard jQuery FullCalendar initialization attributes.

Example: Calendar based FullCalendar v5:

```
function ( pOptions) {
    pOptions.slotMinTime           =
    "07:00:00";                    // hide
    slots before minTime
    pOptions.slotMaxTime           =
    "21:00:00";                    // hide
    slots after maxTime
    pOptions.dayHeaderFormat       = { weekday: 'short', month:
    'numeric', day: 'numeric' };   // week view column headings
    pOptions.slotDuration          =
    "00:15:00";                    // custom
    slot duration
    pOptions.weekNumbers           =
    true;                            // show
    week numbers
    pOptions.weekText              =
    "CW";                             //
    heading for week numbers
    pOptions.weekNumberCalculation =
    "ISO";                             // use
    "ISO" week numbers
    pOptions.displayEventTime      =
    true;                              // show
    event time ...
    pOptions.displayEventEnd       =
    false;                             // ...
    but not the end time
    pOptions.disableKeyboardSupport =
    true;                               //
    disable builtin keyboard navigation
}
```

```

        pOptions.windowResize          =
null;                                // suppress
automatic switch to list view on small screens
        return pOptions;
    }

```

Example: Calendar based FullCalendar v3 (Deprecated):

```

function ( pOptions) {
    pOptions.titleFormat      = "[Conference
Schedule]";                  // custom title
    pOptions.minTime          =
"07:00:00";                  // hide slots before minTime
    pOptions.maxTime          =
"18:00:00";                  // hide slots after maxTime
    pOptions.columnFormat     = {month: '', week: 'dddd', day:
'dddd'};                    // week view column headings
    pOptions.slotDuration     =
"00:15:00";                  // custom slot duration
    pOptions.weekNumbers      =
true;                        // show week numbers
    pOptions.weekNumberTitle  = "CW";
    return pOptions;
}

```

 **Tip:**

Calendars based on FullCalendar v3 have been deprecated and will be desupported in a future release.

6. Click **Save**.

10.2.6.4 Enabling the Dragging and Dropping of Data in an Existing Calendar

The Calendar Region supports moving or changing calendar events with drag and drop.

1. To enable support for drag and drop for a calendar region:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
Page Designer appears.
 2. In the Property Editor, click the **Attributes** tab.
The Property Editor displays the calendar Attributes.
 3. Find **Settings** and edit the following attributes:
 - a. **Settings, Primary Key Column** - Select a table or SQL Query column.
The Drag and Drop field appears in the Property Editor, below Additional Calendar Views.

b. Settings, Drag and Drop - Select On.

Drag and Drop PL/SQL Code appears.

c. Settings, Drag and Drop PL/SQL Code - Enter the PL/SQL code to execute when the end user finishes a drag and drop for an event.

Within the PL/SQL code, you can reference the ID of the dragged event, the new start, and end end dates as:

```
:APEX$PK_VALUE, :APEX$NEW_START_DATE amd :APEX$_NEW_END_DATE
```

For example, the following code changes the event row in the `PROJECTS` table after the end user has dragged the event to a new date.

```
begin
  update projects
    set start_date = to_date(:APEX$NEW_START_DATE,
  'YYYYMMDDHH24MISS'),
      end_date = to_date(:APEX$NEW_END_DATE,
  'YYYYMMDDHH24MISS')
    where id = :APEX$PK_VALUE;
end;
```

To learn more, click the **Help** tab in the central pane.

4. Click Save.

10.2.7 About Dynamic Action Support for Calendar

Use the Dynamic Action Create Wizard to specify an action that is performed when a defined set of conditions occur. You can specify which elements are affected by the action and when and how they are affected.

Dynamic actions provide a way to define complex client-side behavior declaratively without the need for JavaScript. When working with dynamic actions, you should be mindful of the fact that the more dynamic actions you add to a page, the greater your overall page size. This is because the dynamic action framework emits additional code to the client for each dynamic action defined, which then also must be downloaded and executed by the framework in the client.

Dynamic actions contain a condition that can be specified to control the action. Oracle Application Express components such as reports or charts can react to specific calendar events. For example, if you view a calendar and click a button to view a subsequent month, you can create a dynamic action to automatically refresh an associated report.

To use this feature the developer creates a new dynamic action on the Calendar page in Page Designer. Select the new dynamic action in the Dynamic Action tab in the left pane of Page Designer. Once created, the new dynamic action displays in red with the label **New**. Then, the developer edits the dynamic action attributes in the Property Editor. In Property Editor, locate and expand **When** attribute. Under the **When** attribute, for **Event**, select one of the following events:

- **Date Selected [Calendar]**

This event fires when the user selects an empty date or date range either with the mouse or with the keyboard. If the developer provides a "create link" in the calendar attributes, no event fires.

Information about the current view is being passed as the "data" object:

```
{ "newStartDate"::: "newEndDate"::: }  
  
{ "newStartDate":{first day of selection} (YYYYMMDDHH24MISS),  
  "newEndDate": {last day of selection} YYYYMMDDHH24MISS }
```

- **Event Selected [Calendar]**

This event fires when the user clicks an existing event with the mouse or selects it with the keyboard. When the developer provided an "edit link" in the Calendar attributes, no event is being fired. The "data" object contains the jQuery FullCalendar JSON representation of the event.

 **See Also:**

Full Calendar documentation Event Data, "[Event Object](#)"

- **View Changed [Calendar]**

This event fires when either the view type changes (day, week, month, list) or when the view changes to its previous or next view page. The "data" object contains the following information:

```
{ "viewType": {view type, day, week, month or list},  
  "startDate": {first day of view} (YYYYMMDDHH24MISS),  
  "endDate": {last day of view} (YYYYMMDDHH24MISS) }
```

 **See Also:**

"[Managing Dynamic Actions](#)" and "[Debugging Dynamic Actions](#)" for information on how to debug problems

10.3 Creating Charts

Create charts in App Builder by running a built-in wizard or creating it manually in Page Designer.

- [About Supported Charts](#)
App Builder supports charts based on the Oracle JavaScript Extension Toolkit (Oracle JET) Data Visualizations.
- [Sample Charts](#)
View chart examples in the *Sample Charts* sample app.
- [Creating a Chart Using the Create Application Wizard](#)
Create a new application that contains a chart page.
- [Creating a Dashboard Page Using the Create Application Wizard](#)
Create a new application that contains a Dashboard page which contain up to four charts.
- [Adding a Chart on a New Page Using a Local Database](#)
Run the Create Page Wizard to add a new chart page using a local database.

- [Adding a Chart on a New Page Using External Data Sources](#)
Run the Create Page Wizard to add a new chart page using an external data source.
- [Adding a Chart in Page Designer](#)
Add a chart to a page by creating it manually in Page Designer.
- [Editing Charts](#)
You can alter how a chart displays by editing chart attributes in Page Designer.

10.3.1 About Supported Charts

App Builder supports charts based on the Oracle JavaScript Extension Toolkit (Oracle JET) Data Visualizations.

Oracle JET empowers developers by providing a modular open source toolkit based on modern JavaScript, CSS3, and HTML5 design and development principles. The Oracle JET data visualization components include customizable charts, gauges, and other components that you can use to present flat or hierarchical data in a graphical display for data analysis. Each Oracle JET visualization supports animation, accessibility, responsive layout, internationalization, test automation, and a range of inter activity features. Charts provide dozens of different ways to visualize a data set.



See Also:

"Work with Data Visualizations" in *JavaScript Extension Toolkit (JET) Developing Applications with Oracle JET*.

Chart Creation Methods

You can create charts by running the Create Application Wizard, Create Page Wizard, or by adding a new chart manually to a page in Page Designer. The Create Page Wizard offers the most supported chart types. The following table summarizes various methods for creating charts.

Method	Description	To Learn More
Create Application Wizard, Chart	Creates a page containing a chart. Supported chart types include: <ul style="list-style-type: none"> • Area • Bar • Line • Pie 	Creating a Chart Using the Create Application Wizard
Create Application Wizard, Dashboard	Creates a dashboard page with up to four charts. Supported chart types include: <ul style="list-style-type: none"> • Area • Bar • Line • Pie 	Creating a Dashboard Page Using the Create Application Wizard

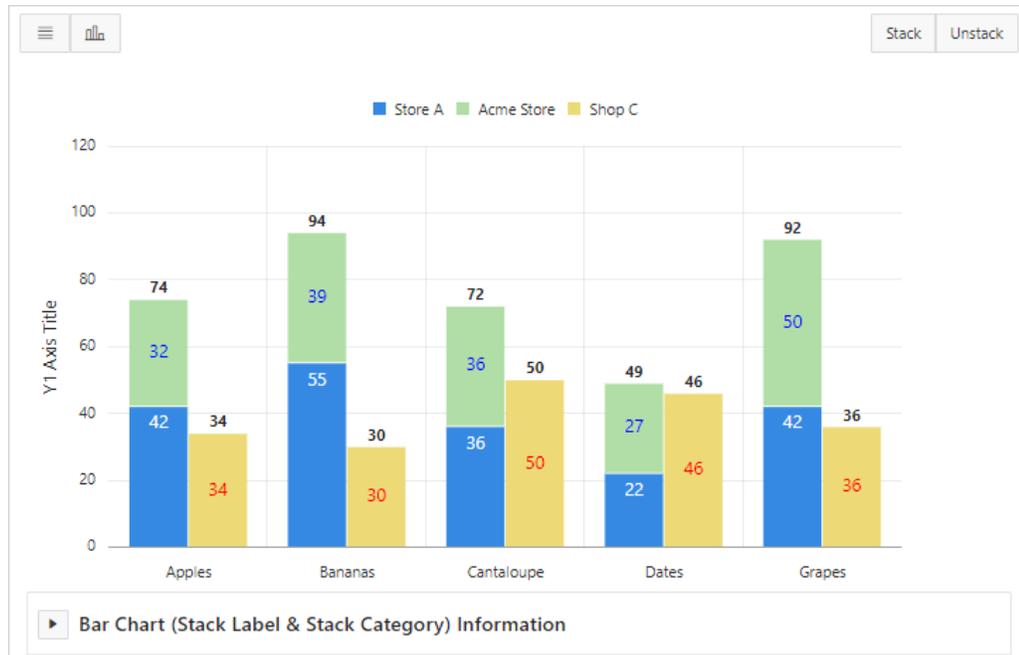
Method	Description	To Learn More
Create Page Wizard, Chart	Creates a new page containing a chart. Supported chart types include: <ul style="list-style-type: none">• Area• Bar• Box Plot• Bubble• Combination• Status Meter Gauge• Donut• Funnel• Gantt• Line• Line with Area• Pie• Polar• Pyramid• Radar• Scatter• Stock	See Adding a Chart on a New Page Using a Local Database and Adding a Chart on a New Page Using External Data Sources
Create Page Wizard, Dashboard	Creates dashboard page. Choose from four different chart layouts which you can easily customize in Page Designer. Available chart layouts include: <ul style="list-style-type: none">• Primary and 2 secondary charts• Grid of 4 charts• Primary and 3 secondary charts• Grid of 6 charts	Adding a New Page to an Application . See online Help when creating this page type.
Page Designer	Add a new chart to an existing page in Page Designer.	Adding a Chart in Page Designer

**See Also:**[Editing Charts](#)

10.3.2 Sample Charts

View chart examples in the *Sample Charts* sample app.

Sample apps are designed to highlight specific functionality and are intended to serve as a developer guide on how to make use of a particular feature. The following is a sample bar chart from *Sample Charts* sample app.



Click the **Horizontal** and **Vertical** to toggle between a horizontal or vertical display. Click **Stack** and **Unstack** to view two series of data or three series of data.

This chart displays two series of data, *Store A* and *Acme Store*, stacked and associated with the Y axis, and the third series of data, *Shop C*, associated with an extra Y axis and rendered as a separate chart below the other two series of data.

Expand the **Bar Chart (Stack Label & Stack Category) Information** region at the bottom of the page to view information on the chart.

Tip:

To view chart examples, install the sample app, *Sample Charts*. To learn more, see [Sample Apps](#).

10.3.3 Creating a Chart Using the Create Application Wizard

Create a new application that contains a chart page.

Run the Create Application Wizard and create a new page containing one of the following chart types: Area, Bar, Line, or Pie.

Note:

Create up to four charts at once by adding a Dashboard page.

1. To add a chart page when running the Create Application Wizard:
1. On the Workspace home page, click the **App Builder** icon.
2. Click the **Create** button.

3. Click **New Application**.
4. For Appearance, accept the default Theme Style and menu layout (Vita, Side Menu), or change it by clicking the **Set Appearance** icon adjacent to the Appearance field.
5. Under Pages:
 - a. Click **Add Page**.
 - b. On Add Page, select **Chart**.
6. On Add Chart Page:
 - a. Page Name - Enter a name for this page.
 - b. Set Icon - Select an icon to display in the navigation menu for this page.
 - c. Select a chart type: **Area**, **Bar**, **Line**, or **Pie**.
 - d. Table or View - Click the LOV icon (bullet points and lines) and select a table or view on which to build the chart.
 - e. Label Column - Select the column name used to define the label(s) of the x-axis on the chart.
 - f. Value Aggregation - Select how to aggregate the chart Value Column. For example, selecting **Count** bases the aggregation on the selected **Label Column**. For all other aggregation types, if no **Value Column** is selected, the aggregation is based on the select Label Column.
 - g. Value Column - Select the column name to be used for defining the value on this chart.
 - h. Click **Add Page**.
7. Features - Select features to include with the application. Features provide application-level functionality and can only be added once per application. To learn more, click the Help icon adjacent to Features.
8. Settings - Specify settings used to generate this application. To learn more about an attribute, click the Help icon adjacent to Settings.
9. Click **Create Application**.

10.3.4 Creating a Dashboard Page Using the Create Application Wizard

Create a new application that contains a Dashboard page which contain up to four charts.

A Dashboard page can contain up to four charts. To create a chart, select the chart (Chart 1, Chart 2, Chart 3, or Chart 4), the Chart Type, and then define the remaining attributes.

1. To add a Dashboard page when running the Create Application Wizard:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Click the **Create** button.
 3. Click **New Application**.
 4. For Appearance, accept the default Theme Style and menu layout (Vita, Side Menu), or change it by clicking the **Set Appearance** icon adjacent to the Appearance field.
 5. Under Pages:
 - a. Click **Add Page**.
 - b. On Add Page, select **Dashboard**.

The Add Dashboard Page appears.

6. On Add Dashboard Page:
 - a. Page Name - Enter a name for this page.
 - b. Set Icon - Select an icon to display in the navigation menu for this page.
7. Create Chart 1:
 - a. Chart Type - Select **Area**, **Bar**, **Line**, or **Pie**.
 - b. Table or View - Click the LOV icon (bullet points and lines) and select a table or view on which to build the chart.
 - c. Label Column - Select the column name used to define the label(s) of the x-axis on the chart.
 - d. Value Aggregation - Select how to aggregate the chart Value Column. For example, selecting **Count** bases the aggregation on the selected **Label Column**. For all other aggregation types, if no **Value Column** is selected, the aggregation is based on the select Label Column.
 - e. Value Column - Select the column name to be used for defining the value on this chart.

The screenshot shows the 'Add Dashboard Page' dialog box. The 'Page Name' field is set to 'Dashboard'. The 'Chart 1' tab is active. Under 'Chart Type', the 'Bar' option is selected. The 'Table or View' is set to 'EBA_PROJECTS_V'. The 'Label Column' is 'NAME'. The 'Value Column' is 'COST'. The 'Column Value' is set to 'Count'. The 'Add Page' button is visible at the bottom right.

8. Create Chart 2:
 - a. Click **Chart 2**.
 - b. Chart Type - Select **Area**, **Bar**, **Line**, or **Pie**.
 - c. Table or View - Click the LOV icon (bullet points and lines) and select a table or view on which to build the chart.
 - d. Label Column - Select the column name used to define the label(s) of the x-axis on the chart.

- e. Value Aggregation - Select how to aggregate the chart Value Column. For example, selecting **Count** bases the aggregation on the selected **Label Column**. For all other aggregation types, if no **Value Column** is selected, the aggregation is based on the select Label Column.
 - f. Value Column - Select the column name to be used for defining the value on this chart.
9. Repeat the previous step for Chart 3 and Chart 4. When you are done creating charts, click **Add Page**.
 10. Features - Select features to include with the application. Features provide application-level functionality and can only be added once per application. To learn more, click the Help icon adjacent to Features.
 11. Settings - Specify settings used to generate this application. To learn more about an attribute, click the Help icon adjacent to Settings.
 12. Click **Create Application**.

10.3.5 Adding a Chart on a New Page Using a Local Database

Run the Create Page Wizard to add a new chart page using a local database.

1. To add a chart on a new page using a local database:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. Click **Create Page**.The Create Page Wizard appears.
4. For Create a Page:
 - a. Page Type - Select **Component** and then **Chart**.

 **Tip:**

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- b. Select select a chart type.
5. For Page and Region Attributes:
 - a. Page Number - Enter a page in which the chart object is to appear.
 - b. Page Name - Enter a page name.
 - c. Page Mode - Select a page mode.
 - **Normal** - The page displays as a normal Application Express application page.
 - **Modal Dialog** - The page displays as a modal dialog. A modal dialog is an overlay window which remains active and focused until the end user closes it. The underlying page is grayed out which prevents the end user from interacting with the rest of the page until the dialog closes.

- d. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page.
 - e. Click **Next**.
 6. For Navigation Preference, specify the type of navigation to include on this page and click **Next**. The navigation options (for example, navigation menu or tabs) depends upon the current application theme.
 7. The steps that follow depend upon the Source Type: **Table** or **SQL Query**.
 - If the Source Type is **Table**:
 - a. Location - Select **Local Database**.
 - b. Source Type - Select **Table**.
 - c. Table/View Owner - Select the owner of the table on which you are building the chart.
 - d. Table/View Name - Select the table or view on which the chart is based.
 - e. Page Items to Submit - Enter a comma separated list of page items on the current page to be set into session state when the chart data gets read with a separate request.
 - f. Maximum Rows - Enter the maximum number of rows you want to use to display the chart.
 - g. Click **Next**.
 - If the Source Type is **SQL Query**:
 - a. Location - Select **Local Database**.
 - b. Source Type - Select **SQL Query**.
 - c. SQL Query - Enter the `SQL SELECT` statement to be used for the chart. The `SQL SELECT` statement must include at least two columns.
 - d. Page Items to Submit - Enter a comma separated list of page items on the current page to be set into session state when the chart data gets read with a separate request.
 - e. Maximum Rows - Enter the maximum number of rows you want to use to display the chart.
 - f. Click **Next**.
 8. For Column Mapping:
 - a. Select the columns to be mapped to the chart. The options that display vary depending upon the chart type selected. To learn more about an attribute, click the field-level Help.
 - b. Click **Next**.
 9. Click **Create**.

10.3.6 Adding a Chart on a New Page Using External Data Sources

Run the Create Page Wizard to add a new chart page using an external data source.

The component(s) described in this topic include built-in support for REST Enabled SQL and REST Data Sources which enables read and write access to remote data

sources. In order to build a component on a remote data source, you must first create the application and configure the external data source.

1. To add a chart on a new page using an external data source:
 1. Run the Create Page Wizard:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Create Page**.
The Create Page Wizard appears.
 2. On Create a Page:
 - a. Page Type - Select **Component**.
 - b. Click **Chart**.
 3. For Chart Type, select a chart type.
 4. For Page and Region Attributes:
 - a. Page Number - Enter a page in which the chart object is to appear.
 - b. Page Name - Enter a page name.
 - c. Page Mode - Select a page mode. **Normal** presents the page as a normal Application Express application page. **Modal Dialog** presents the page as an overlay window positioned which remains active and focused until the end user dismisses (closes) it. The underlying page is grayed out and the end user is prevented from interacting with the rest of the page until the dialog is closed.
 - d. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page.
 - e. Click **Next**.
 5. For Navigation Preference, specify the type of navigation to include on this page and click **Next**. The navigation options (for example, navigation menu or tabs) depends upon the current application theme.
 6. For Source, select a remote data source:
 - **REST Enabled SQL Service** - Data is sourced from a remote database, where the connection is defined using REST Enabled SQL. To create or maintain REST Enabled SQL references, navigate to Shared Components, REST Enabled SQL.
 - **REST Data Source** - Data is sourced from a RESTful web service defined using REST Data Sources. REST Data Source are created and maintained within Shared Components.
 7. The steps that follow depend upon the Source Type: **Table** or **SQL Query**.
 - If the Source Type is **Table**:
 - a. Source Type - Select **Table**.
 - b. Table/View Owner - Select the owner of the table on which you are building the chart.

- c. Table/View Name - Select the table or view on which the chart is based.
 - d. Page Items to Submit - Enter a comma separated list of page items on the current page to be set into session state when the chart data gets read with a separate request.
 - e. Maximum Rows - Enter the maximum number of rows you want to use to display the chart.
 - f. Click **Next**.
 - If the Source Type is **SQL Query**:
 - a. Source Type - Select **SQL Query**.
 - b. SQL Query - Enter the `SQL SELECT` statement to be used for the chart. The `SQL SELECT` statement must include at least two columns.
 - c. Page Items to Submit - Enter a comma separated list of page items on the current page to be set into session state when the chart data gets read with a separate request.
 - d. Maximum Rows - Enter the maximum number of rows you want to use to display the chart.
 - e. Click **Next**.
 8. For Column Mapping:
 - a. Select the columns to be mapped to the chart. The options that display vary depending upon the chart type selected. To learn more about an attribute, click the field-level Help.
 - b. Click **Next**.
 9. Click **Create**.

10.3.7 Adding a Chart in Page Designer

Add a chart to a page by creating it manually in Page Designer.

1. To add a chart to an existing page in Page Designer:
 1. View the page to contain the chart in Page Designer.
 2. In the Gallery at the bottom of the central pane, click **Regions** and locate **Chart**.
The Gallery lists all controls or components you can add to a page. Passing the cursor over a control or component displays a tooltip that describes it.
 3. From the Gallery,
 - a. Right-click **Chart** to view the context menu.
 - b. Select **Add To** and then the desired location.

 **Tip:**

You can also click **Chart** in the Gallery and drag it to the appropriate location in the Layout tab.

4. Page Designer indicates what to do next. The Show Messages icon displays in the Page Developer toolbar.

- a. Click the **Show Messages** icon on the Page Designer toolbar.
The Messages dialog displays errors that must be addressed.
 - b. Select an error to highlight the associated attribute in the Property Editor.
5. Edit the Series:
- a. In the Rendering tab under the chart, expand the **Series** node and select the new series.
 - b. Under **Series** node, select a series.
 - c. **Source, Location** - Select the location of the database you want to use. Options include:
 - **Local Database** - Data is sourced from a local database. (This location is selected by default.)
 - **REST Enabled SQL** - Data is sourced from a remote database, where the connection is defined using REST Enabled SQL Reference.
 - **REST Source** - Data is sourced from a RESTful web service defined using REST Data Sources.
 - **Region Source** - Data is sourced from the location specified in the region source definition.
 - d. **Column Mapping, Label** - Select the column name to be used for defining the label(s) of the x-axis on the chart. For a Stock chart, the column should be of data type Date/Timestamp, to represent the stock information on a time axis
 - e. **Column Mapping, Value** - Select the column name to be used for defining the value on this chart. For a Box Plot chart, this column will be used for defining the minimum, quartiles, median, and maximum values of the numerical data set.

 **Note:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

6. Expand the **Axes** node:

 **Tip:**

The Axes node only displays for chart types that support axes (such as area, bar, bubble, combination, line, line with area, polar, radar, range, scatter, and stock).

- a. In the Rendering tab under the chart, expand the **Axes** node.
 - b. Under **Axes** node, select an Axis.
 - c. Edit the required axis attributes and define any data formatting to be applied to the axis values.
7. Edit the **Region** attributes.
- a. In the left pane (or Rendering tab), select the chart.

3. To edit the chart Attributes.
 - a. In the left pane (or Rendering tab), select the chart.
 - b. In the Property Editor, select the **Attributes** tab.
 - c. Review and edit the chart Attributes in the Property Editor.
4. To edit the Series:
 - a. In the Rendering tab under the chart, select the **Series**.
 - b. Review and edit the Series attributes in the Property Editor.
5. Click **Save**.

10.3.8.2 Switching Chart Type

Once you create a chart, you can switch its chart type by editing chart attributes.

1. To switch a chart type:
 1. View the page containing the chart in Page Designer.
 2. In the left pane (or Rendering tab), select the chart.
The Property Editor (right pane) displays two tabs.
 3. Edit the chart Attributes and select a new chart type:
 - a. In the Property Editor, select the **Attributes** tab.
The Property Editor displays chart Attributes. Attributes are organized in groups. To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.
 - b. **Chart, Type** - Select the chart type you want to switch to. For example, **Combination**.
 4. Edit the Series:
 - a. In the Rendering tab under the chart, select the **Series**.
The **Series** tab appears in the Property Editor.
 - b. **Column Mapping** - Ensure all required Column Mapping columns have been defined.
 - c. **Type** - Select the chart series type. For example, **Bar Range**.
Only certain chart types support combining different types of series on the same data plot. The Series Type attribute only displays for chart types **Combination**, **Polar**, **Radar**, and **Range**.
5. Click **Save** or **Save and Run Page**.

 **Note:**

Column mappings may differ for different chart types, so you must ensure all required column mappings are defined for the selected chart type.

10.3.8.3 Enabling Automatic Refresh

Charts can monitor information by enabling the Automatic Refresh, Interval attribute, or by using a dynamic action with the Refresh action.

- [Enabling the Automatic Refresh Attribute](#)
- [Creating a Refresh Dynamic Action](#)

10.3.8.3.1 Enabling the Automatic Refresh Attribute

Enabling the Automatic Refresh attribute updates the chart to reflect changes in the underlying data within a specified time interval.

1. To enable automatic refresh updates:
 1. View the page containing the chart in Page Designer.
 2. In the left pane (or Rendering tab), select the chart.
 3. In the Property Editor, select the **Attributes** tab.
 4. Find **Automatic Refresh**.
 5. In **Automatic Refresh, Interval** - Enter the interval in seconds between chart updates.

Very small updates intervals, such as 2 seconds, are discouraged since they may cause serious database performance issues.

6. Click **Save**.

10.3.8.3.2 Creating a Refresh Dynamic Action

1. To create a Refresh dynamic action:
 1. View the page containing the chart in Page Designer.
 2. Click the **Dynamic Actions** tab in the left pane.
 3. Under Dynamic Actions, right-click **Events** and select **Create Dynamic Action**.
 4. Page Designer indicates what to do next. If there is an error, the Show Messages icon displays in the Page Developer toolbar.
 - a. Click the **Show Messages** icon on the Page Designer toolbar.
The Messages dialog displays errors that must be addressed.
 - b. Select an error to highlight the associated attribute in the Property Editor.
 5. In the Property Editor, edit the following Dynamic Action attributes:
 - a. **Identification, Name** - Enter a name of the dynamic action.
 - b. **Execution Options, Sequence** - Specify the sequence for this component. The sequence determines the order of evaluation.
 - c. **When, Event** - Specify the event that causes the dynamic action to fire.
 - d. **When, Selection Type** - Select the type of page element or construct to be used to trigger the event. For examples, select the attribute in the Property Editor and click the Help tab in the center pane.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.

6. In the Rendering tab, select the first action under **True**:
 - a. **Identification, Action** - Select **Refresh**.
 - b. **Affected Elements, Selection Type** - Select **Region**.
 - c. **Affected Elements, Region** - Select the region containing the chart.
7. Click **Save**.

 **See Also:**

["Managing Dynamic Actions"](#)

10.3.8.4 Using Custom JavaScript with Charts

Control the look and feel of a chart by adding custom JavaScript.

Control the look and feel of a chart by adding custom JavaScript.

1. To use custom JavaScript:
 1. View the page in Page Designer:
Page Designer appears.
 2. In the left pane (or Rendering tab), select the chart.
 3. In the Property Editor, select the **Attributes** tab.
 4. Find **Advanced**.
 5. In **Advanced, JavaScript Initialization Code**, enter the code to customize your chart.

For example:

```
function( options ){  
    // Setup a callback function which gets called  
    // when data is retrieved, it allows to manipulate the series  
    options.dataFilter = function( data ) {  
  
        // e.g Set the first series of chart to the colour red  
        data.series[ 0 ].color = "red";  
    };  
    // Set chart initialization options  
    // e.g. Set chart type to Line  
    options.type = "line";  
    return options;  
}
```

6. Click **Save**.

 **Tip:**

For more information on supported chart options, see "[ojChart](#)" in JSDoc pages for the Oracle JavaScript Extension Toolkit (JET).

 **Note:**

The *Sample Charts* sample app contains a number of examples of using custom JavaScript with chart. To view sample apps, go to [Sample Apps](#).

10.4 Creating Maps

Create maps that visualize location data (real coordinates) based on data in a table.

- [About Supported Maps](#)
The map component consists of a background map and spatial geometry objects sourced from data in a table or from a REST Data Source.
- [Sample Maps](#)
View sample map pages.
- [Creating a Map Using the Create Application Wizard](#)
Run the Create Application Wizard to create a new application that contains a map page.
- [Adding a Map Region in Page Designer](#)
Manually create a map region in Page Designer by providing the SQL query.
- [Adding a Map to a New Page](#)
Run the Create Page Wizard to create a new page with a map.
- [Editing Maps](#)
Edit map region components in Page Designer.

10.4.1 About Supported Maps

The map component consists of a background map and spatial geometry objects sourced from data in a table or from a REST Data Source.

About the Background Map

The background map is static and comes from [Oracle Elocation Service](#). These background maps are ready to use and do not require any API keys. However, in order to display the background map, the end user's browser must have an internet connection and access to <https://maps.oracle.com>.

About Spatial Geometry Objects

Spatial geometry objects are drawn on the background map based on data in a table. That table can be sourced from local table or a SQL query. Maps created using the Create Page Wizard or in Page Designer, support both local database tables, REST Enabled SQL, and from REST Data Sources. Maps support a rich set of built-in marker icons and shapes. Supported spatial geometry objects include:

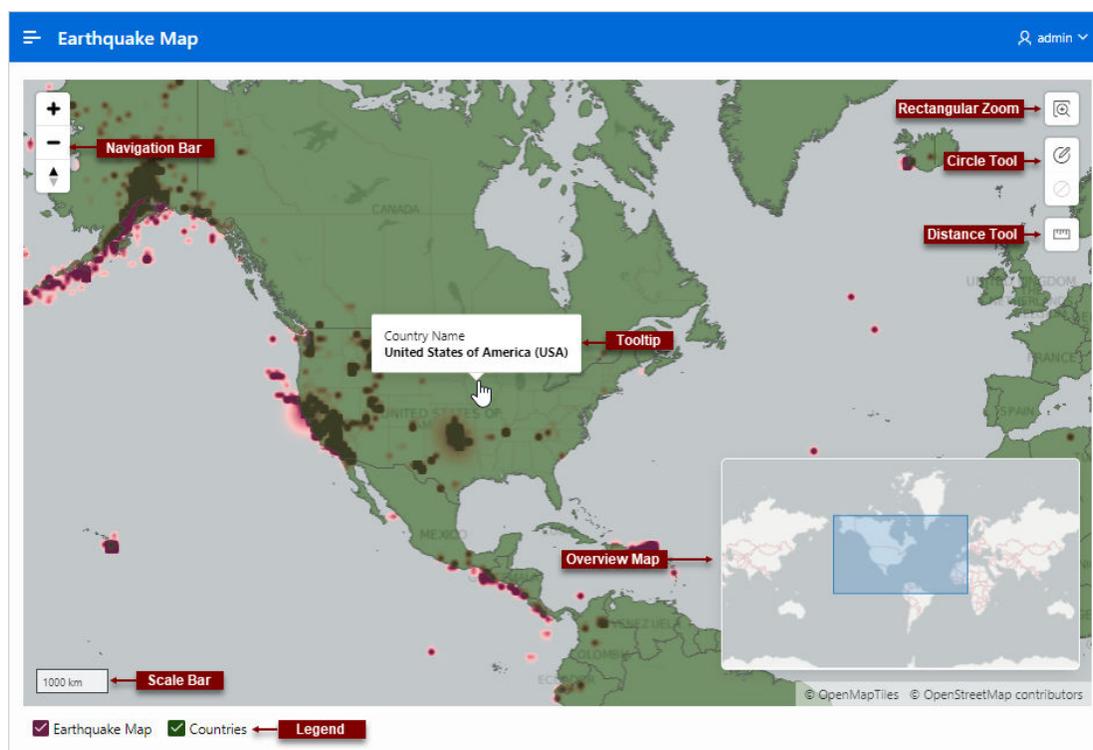
- **Points** - Points (for example, customer or supplier locations) display as markers.
- **Lines** - Lines represent features like roads or paths.
- **Polygons** - Polygons represent areas like parcels, states or countries.
- **Heat Map** - Heat Maps are used to visualize the point density. The more points that are clustered together, the more intense the color becomes. Use this option to visualize the spatial distribution of population or incidents.
- **Extruded Polygons** - Display as three-dimensional, extruded, objects. The height of the 3D object visualizes a column value.

You can source spatial geometry objects from either:

- **Geometry Column** - Supported datatypes include `SDO_GEOMETRY`, `VARCHAR2`, or `CLOB`. `VARCHAR2` and `CLOB` columns must contain geometry information in GeoJSON format.
- **Two Numeric Columns** - These columns must contain longitude and latitude values. This option only applies to Point and Heat Map objects.

About Map Controls

From a user's perspective, map regions include a number of controls that enable users to change the display at runtime.



The previous map include the following controls:

- **Navigation Bar** - Options include **Zoom**, **Zoom Out** and **Reset Bearing to North**.
- **Rectangle Zoom** - Zoom the map to an area by drawing a rectangle onto the map.
- **Circle Tool** - Enables end users to draw a circle onto the map. When finished, an event is triggered, so that the circle can be processed by Dynamic Actions or JavaScript code.
- **Distance Tool** - Zooms the map to an area by drawing a rectangle onto the map.

- Tooltip - Displays a scale bar on the map.
- Overview Map - Displays a scale bar on the map.
- Scale Bar - Displays a scale bar on the map.
- Legend - Displays an overview map in the lower right.

Not all of these controls are enabled by default. You can add or remove controls by editing the map region Attributes in Page Designer.



See Also:

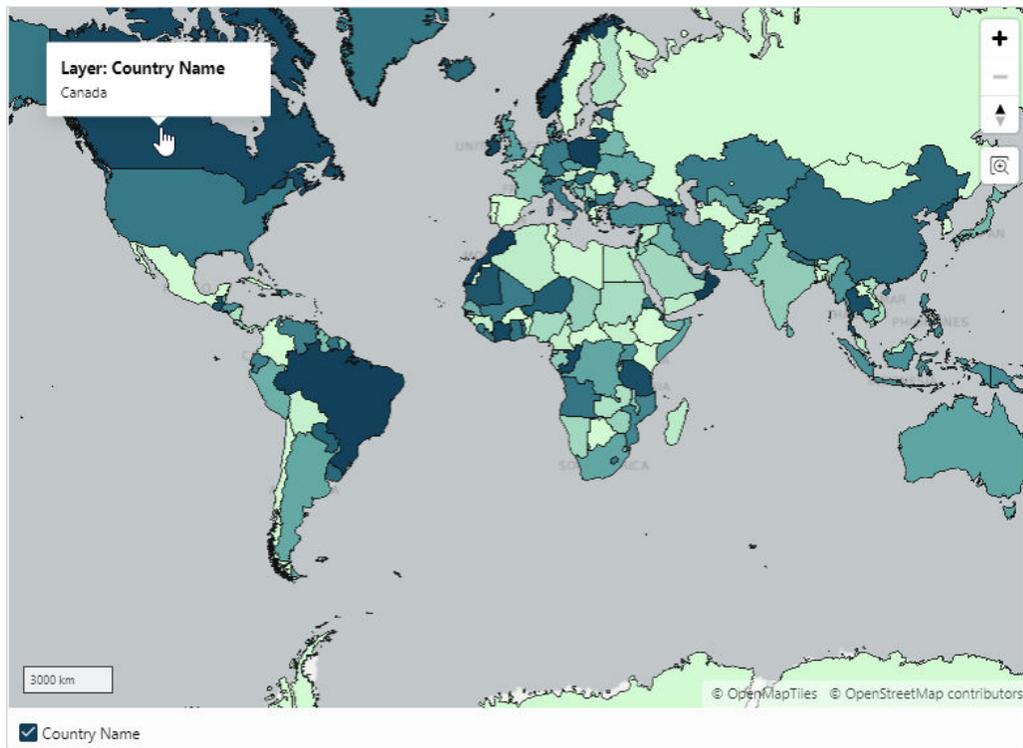
["Viewing and Editing a Map in Page Designer"](#)

10.4.2 Sample Maps

View sample map pages.

Sample Map with One Layer

The following sample map is built on a local table called `COUNTRIES_TABLE` and includes a Polygon object layer mapped to the `GEOMETRY` column and tooltips pulled from the `COUNTRY_NAME` column.



Sample Map with Two Layers

The following sample map is built on a local table called `EARTHQUAKE_TABLE` and features two object layers. The first layer is a Heat Map based on the `SDO_GEOMETRY`

column . The second layer features Polygons based on the COUNTRIES_TABLE column and mapped to the GEOMETRY column.



See Also:

["Viewing and Editing a Map in Page Designer"](#)

10.4.3 Creating a Map Using the Create Application Wizard

Run the Create Application Wizard to create a new application that contains a map page.

Tip:

The Create Application Wizard only supports maps created a local database. To create maps based on an external data source, use the Create Page Wizard or add a map region in Page Designer. See ["Adding a Map to a New Page"](#) and ["Adding a Map Region in Page Designer"](#).

To create a map using the Create Application Wizard:

1. On the Workspace home page, click the **App Builder** icon.
2. Click the **Create** button.
3. Click **New Application**.

4. For Name, enter the name used to identify the application to developers.
5. For Appearance, accept the default Theme Style and menu layout (Vita, Side Menu), or change it by clicking the **Set Appearance** icon adjacent to the Appearance field.
6. Under Pages:
 - a. Click **Add Page**.
 - b. Select **Map**.
7. On Create Map Page:
 - a. Page Name - Enter a name for this page.
 - b. Set Icon - Select an icon to display in the navigation menu for this page.
 - c. Table - Select a table on which to build the map.
 - d. Select the spatial geometry layer type. Options include:
 - **Points** - Points (for example, customer or supplier locations) are display as markers. The marker shape and color is configurable.
 - **Lines** - Lines represent features such as roads or paths. The stroke style and color is configurable.
 - **Polygons** - Polygons represent areas like parcels, states, or countries. The style and color are configurable for stroke and fill.
 - **Heat Map** - Heat Maps are used to visualize the point density. The more points that are clustered together, the more intense the color becomes. Use this option to visualize the spatial distribution of population or incidents.
 - **Extruded Polygons** - Display as three-dimensional, extruded, objects. The height of the 3D object visualizes a column value.
 - e. Geometry Column Type - Select how spatial objects are sourced. Options include:
 - **Geometry Column** - Supported datatypes include `SDO_GEOMETRY`, `VARCHAR2`, or `CLOB`.
`VARCHAR2` and `CLOB` columns must contain geometry information in GeoJSON format.
 - **Two Numeric Columns** - These columns must contain longitude and latitude values. This option only applies to Point and Heat Map layers.
 - f. What appears next depends upon the spatial objects (or geometries) and Geometry Type you select. Select the appropriate columns.
 - g. Advanced - Expand **Advanced** to configure these options:
 - Set as Home Page - Enable this to make this page the home page for the application.
 - Set as Administration Page - Enable this to have this page display under Administration.
 - Page Help - Enter text to be displayed when the user selects Page Help.
 - h. Click **Add Page**.

8. Features - Select features to include with the application. Features provide application-level functionality and can only be added once per application. To learn more, click the Help icon adjacent to **Features**.
9. Settings - Specify settings used to generate this application. To learn more about an attribute, click the Help icon adjacent to **Settings**.
10. Click **Create Application**.
The Application home page appears.
11. Click **Run Application** to view the map.

10.4.4 Adding a Map Region in Page Designer

Manually create a map region in Page Designer by providing the SQL query.

Adding a map in Page Designer supports spatial geometry objects (or layers) based on a local table, SQL query, REST Enabled SQL Service, or REST Data Sources.

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. If necessary, click the Layout tab in the central pane.
3. In the Gallery, click the **Regions** tab.
4. Right-click **Maps**, click **Add To**, and select the appropriate location.

Tip:

You also select **Map** with the mouse and drag it to the appropriate location in the Layout tab.

5. Page Designer indicates what to do next. If there is an error, the Show Messages icon displays in the Page Developer toolbar.
 - a. Click the **Show Messages** icon on the Page Designer toolbar.
The Messages dialog displays errors that must be addressed.
 - b. Select an error to highlight the associated attribute in the Property Editor.
6. In the Property Editor, edit the appropriate Layer attributes:
 - a. In Rendering tab (left pane), select the **New** layer.
 - b. Identification, Name - Enter a descriptive name for this layer.
 - c. Identification, Layer Type - Select the spatial geometry layer type. Options include:
 - **Points** - Points (for example, customer or supplier locations) are display as markers. The marker shape and color is configurable.
 - **Lines** - Lines represent features such as roads or paths. The stroke style and color is configurable.

- **Polygons** - Polygons represent areas like parcels, states, or countries. The style and color are configurable for stroke and fill.
 - **Heat Map** - Heat Maps are used to visualize the point density. The more points that are clustered together, the more intense the color becomes. Use this option to visualize the spatial distribution of population or incidents.
 - **Extruded Polygons** - Display as three-dimensional, extruded, objects. The height of the 3D object visualizes a column value.
7. Source - Identify the source of the map:
- a. Source, Location - Select the location of the data: Options include:
- **Local Database** - Data is sourced from the local database.
 - **REST Enabled SQL Service** - Data is sourced from a remote database, where the connection is defined using REST Enabled SQL. To create or maintain REST Enabled SQL references, navigate to **Shared Components, REST Enabled SQL**.
 - **REST Source** - Data is sourced from a RESTful web service defined using REST Data Sources. To create or maintain REST Data Sources, navigate to **Shared Components, REST Data Sources**.
 - **Region Source** - Data is sourced from the location specified in the region source definition.

What displays next depends upon the Source, Location you select. This task assumes the Source, Location is **Local Database**.

- b. Source, Type - Select how the data is queried. Options include:
- **Table/View** - The data is retrieved based on a table or view.
 - **SQL Query** - The data is retrieved based on a SQL Query.
 - **Function Body returning SQL Query** - The data is retrieved based on the SQL Query returned by executing a Function Body.
8. Column Mapping - Identify how and where spatial objects are sourced:
- Geometry Column Data Type - Identify the data type of the geometry column. Options include:
 - **SDO_GEOMETRY** - Oracle SDO_GEOMETRY type.
Local databases and REST Data Sources support the SDO_GEOMETRY column type. However, REST Enabled SQL data sources do not support the SDO_GEOMETRY column type.
 - **GeoJSON** - GeoJSON, as VARCHAR2 or CLOB types.
 - **Longitude/Latitude** - Longitude and Latitude, as two NUMBER columns.

What appears next depends upon the Geometry Column Data Type you select. Select the appropriate columns.

- **Primary Key Column** - Choose the column containing the unique key to identify a row. Use this to provide the primary key value to custom JavaScript code or map event handlers.
9. Click **Save**.
10. Click **Save and Run Page** to view the map

10.4.5 Adding a Map to a New Page

Run the Create Page Wizard to create a new page with a map.

The Create Page Wizard supports spatial geometry objects based on a local table, SQL query, REST Enabled SQL Service, or REST Data Sources.

To create a map page by running the Create Page Wizard:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.
3. Click **Create Page**.
4. For Create a Page:
 - a. Page Type - Select **Component**.



Tip:

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- b. Click **Map**.
5. On Create Map Page:
 - a. Page Number - If you enter a new page number, the wizard creates a new page. If you enter an existing page number, the wizard adds the component to that page.
 - b. Page Name - Specify a name for the page.
 - c. Page Mode - Identify the page mode. Options include **Normal** or **Modal Dialog**.
 - d. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page. If you elect to include breadcrumb navigation, additional attributes appear.
 - e. Click **Next**.
6. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
7. For Data Source, select a Data Source for the page:
 - **Local Database** - Data is sourced from the local database.
 - **REST Enabled SQL Service** - Data is sourced from a remote database, where the connection is defined using REST Enabled SQL. To create or maintain REST Enabled SQL references, navigate to **Shared Components, REST Enabled SQL**.
 - **REST Data Source** - Data is sourced from a RESTful web service defined using REST Data Sources. To create or maintain REST Data Sources, navigate to **Shared Components, REST Data Sources**.

 **Tip:**

The steps that follow differ depending upon the selected Data Source. This task assumes the Data Source is **Local Database**.

8. For Source Type - Specify the source of the new page:
 - a. Select a Source Type. Options include:
 - **Table:**
 - Table / View Owner - Select the owner of the table on which you are building the faceted search page.
 - Table/View Name - Select the table or view on which the page will be based.
 - **SQL Query:**
 - Enter a SQL SELECT statement - Enter the SQL query. To see an example, expand the **SQL Query Example** region.
 - b. Click **Next**.
9. On Create Page:
 - a. Select the type of spatial geometry layer. Options include:
 - **Points** - Points (for example, customer or supplier locations) are display as markers. The marker shape and color is configurable.
 - **Lines** - Lines represent features such as roads or paths. The stroke style and color is configurable.
 - **Polygons** - Polygons represent areas like parcels, states, or countries. The style and color are configurable for stroke and fill.
 - **Heat Map** - Heat Maps are used to visualize the point density. The more points that are clustered together, the more intense the color becomes. Use this option to visualize the spatial distribution of population or incidents.
 - **Extruded Polygons** - Display as three-dimensional, extruded, objects. The height of the 3D object visualizes a column value.
 - b. Geometry Type - Select how spatial objects are sourced. Options include:
 - **Geometry Column** - Supported datatypes include `SDO_GEOMETRY`, `VARCHAR2`, or `CLOB`.

Local databases and REST Data Sources support the `SDO_GEOMETRY` column type. However, REST Enabled SQL data sources do not support the `SDO_GEOMETRY` column type.

`VARCHAR2` and `CLOB` columns must contain geometry information in GeoJSON format.
 - **Two Numeric Columns** - These columns must contain longitude and latitude values. This option only applies to **Point** and **Heat Map** layers.
 - c. What appears next depends upon the spatial objects (or geometries) and Geometry Type you select. Select the appropriate columns.

- d. Create a Faceted Search Page - Enable this option to create the map page as a Faceted Search page. The Faceted Search region will contain only a Search facet, other facets can be added later in Page Designer.

10. Click **Create**.



Tip:

To learn more about external data sources, see "[Managing REST Enabled SQL References](#)" and "[Managing REST Data Sources](#)."

10.4.6 Editing Maps

Edit map region components in Page Designer.

- [Viewing and Editing a Map in Page Designer](#)
View and edit the components that comprise a map by viewing attributes in Page Designer.
- [Adding a New Layer to an Existing Map](#)
Edit the map region definition to add more spatial geometry objects.
- [Controlling Layer Visibility](#)
Control layer visibility by editing attributes in Page Designer.
- [Connecting a Map Region with a Report Region](#)
Connect a map region with a classic report region.

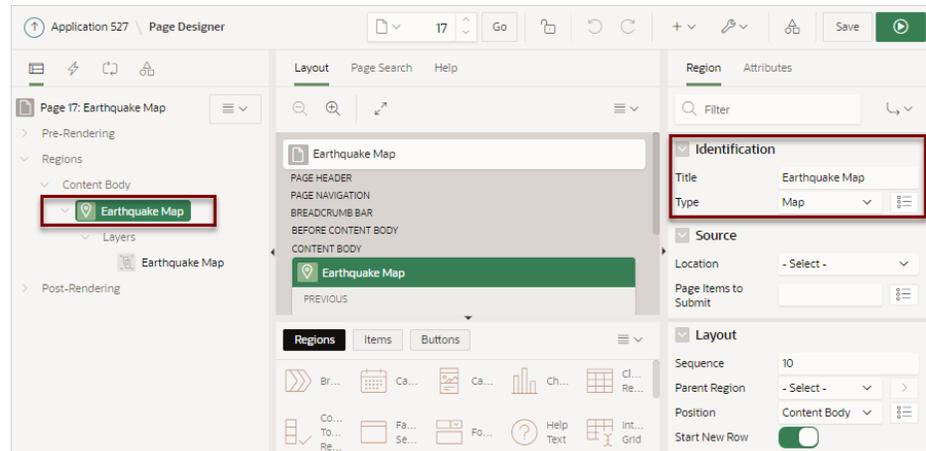
10.4.6.1 Viewing and Editing a Map in Page Designer

View and edit the components that comprise a map by viewing attributes in Page Designer.

A map features a map region which contains spatial geometry layers. This topic explores an earthquake map built on a local table named `EARTHQUAKE_TABLE` which features a Heat Map spatial geometry layer.

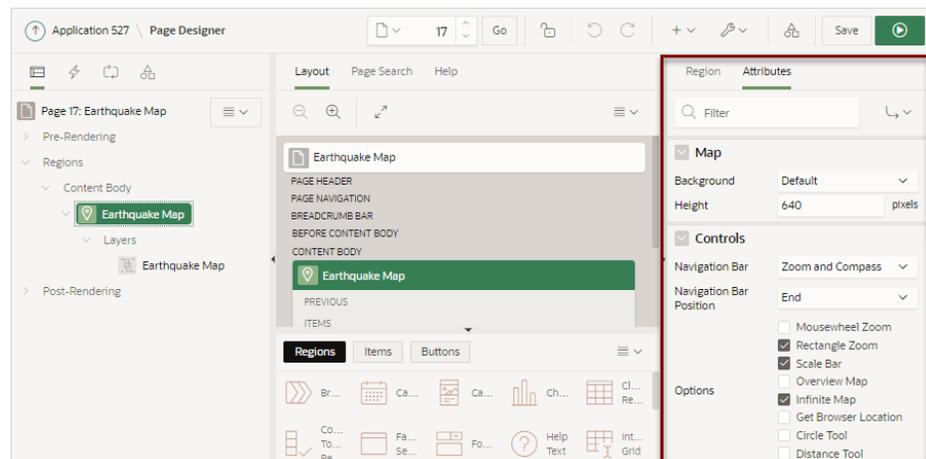
To view or edit a map in Page Designer:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears displaying Page attributes in the Property Editor (right pane).
2. Review the map region.
 - a. In the Rendering tab select the Map region. The Property Editor (right pane) displays two tabs: **Region** and **Attributes**.



In the previous example, note that Identification, Title indicates the map is named **Earthquake Map** and the Type is **Map**.

- b. In the Property Editor, click the **Attributes** tab.



Map Attributes determine basic map characteristics. In the previous example, note the attributes under **Controls**. Controls determine the various ways users can change the map display at runtime, for example:

- Navigation Bar - Options include **None**, **Zoom Only** and **Zoom and Compass**.
- Navigation Bar Position - **Start** positions the navigation bar on the starting position (typically to the left side) of the map. **End** positions the navigation bar on the ending position (typically to the right side) of the map.
- Mousewheel Zoom - Zoom in or out by using the mouse wheel.
- Rectangle Zoom - Zoom the map to an area by drawing a rectangle onto the map.
- Scale Bar - Display a scale bar on the map.
- Overview Map - Display an overview map in the lower right.
- Infinite Map - Enables infinite map scrolling.
- Get Browser - Displays the user's current location from their browser.

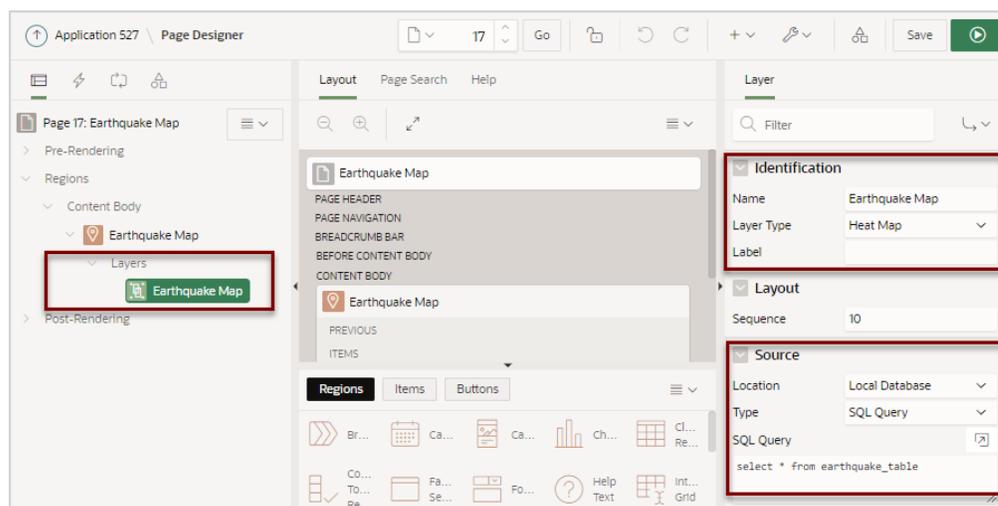
- Circle Tool - Enables end users to draw a circle onto the map. When finished, an event is triggered, so that the circle can be processed by Dynamic Actions or JavaScript code.
- Distance Tool - Enables end users to measure distances between points on the map.

Note that in the previous example only some of these controls are enabled.

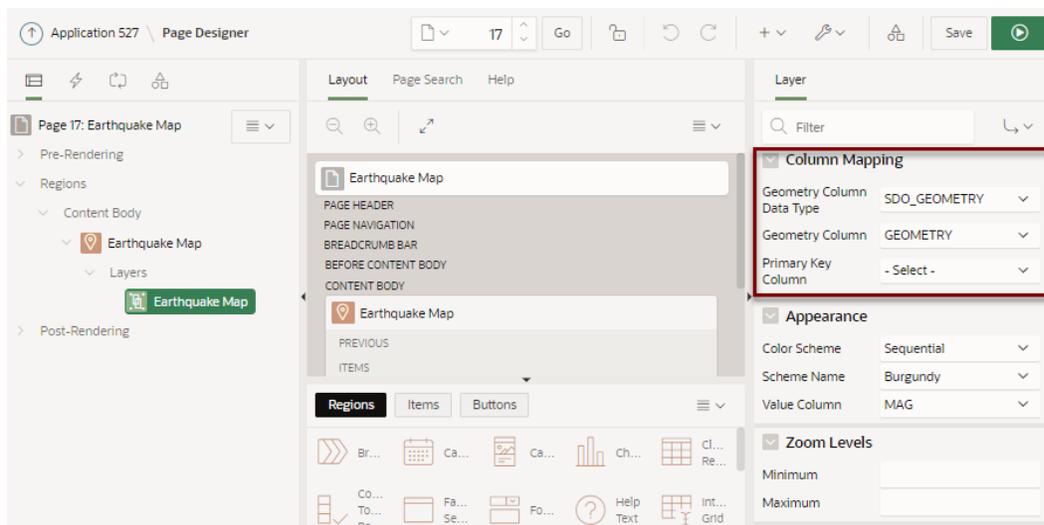
3. Review the map **Layers**. Maps have spatial geometry objects (or layers) which are drawn on the map based on data in a table.

- In the Rendering tab, select the Layer, **Earthquake Map**.

Note that the following example has a Heat Map layer which is sourced from a local database using a SQL Query.



4. Review the Column Mappings. In the Property Editor, scroll down to Column Mappings.



In the previous example, note that the Column Mapping attributes indicate the Geometry Column Data Type is **SDO_GEOMETRY** and the Geometry Column is **GEOMETRY**.

10.4.6.2 Adding a New Layer to an Existing Map

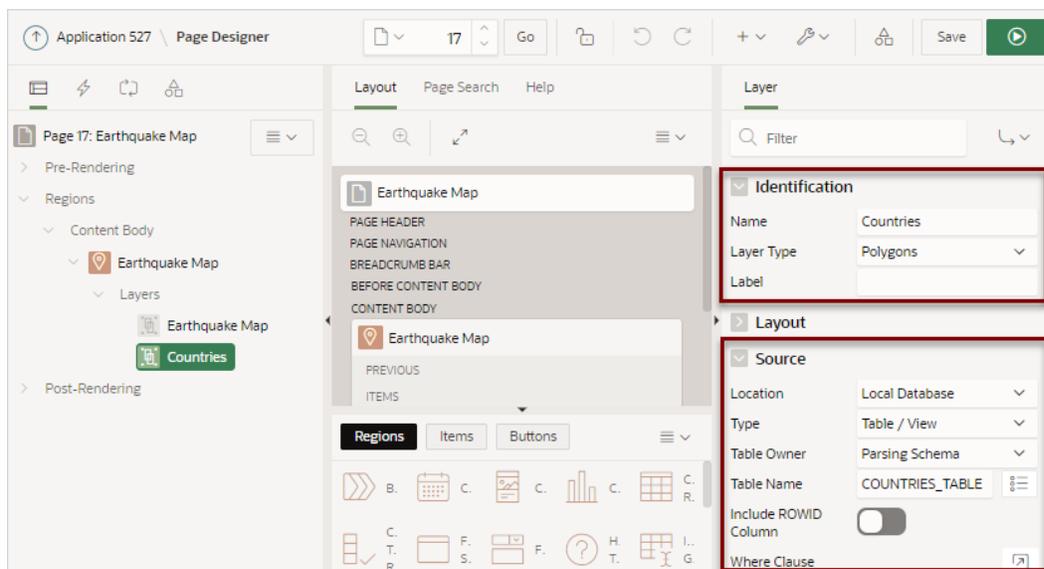
Edit the map region definition to add more spatial geometry objects.

Maps have spatial geometry objects which are drawn on the map based on data in a table. This topic demonstrates how to add a polygon object layer to an existing map that identifies the county. This topic includes an example which adds an object layer named `Countries` sourced from a local table named `COUNTRIES_TABLE` and mapped to the `GEOMETRY` column.

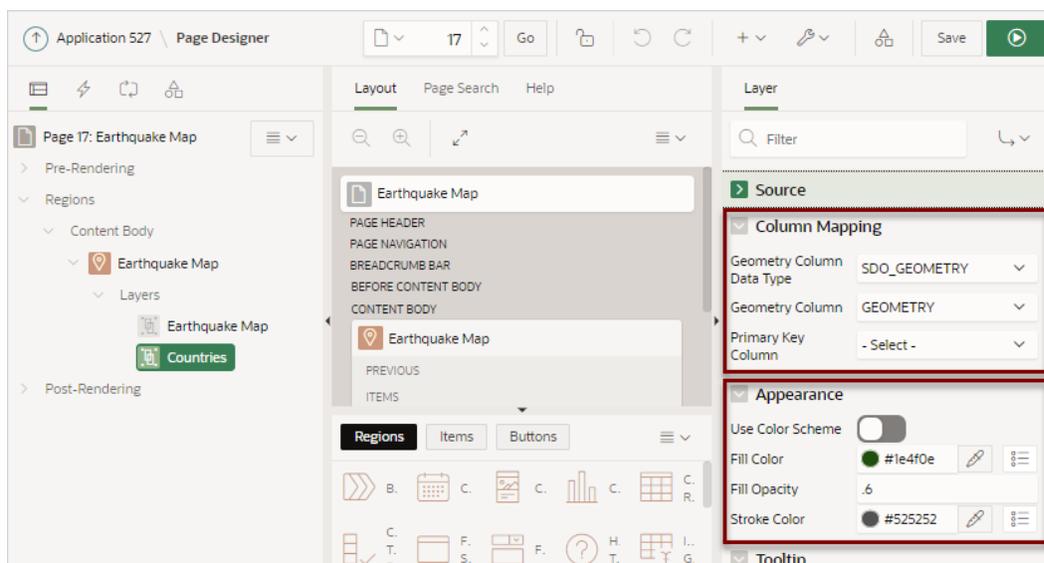
To add a new object layer to an existing map:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears displaying Page attributes in the Property Editor (right pane).
2. Add a spatial geometry layer. In the Rendering tab, right-click **Layers** and select **Create Layer**.
3. Page Designer indicates what to do next. If there is an error, the Show Messages icon displays in the Page Developer toolbar.
 - a. Click the **Show Messages** icon on the Page Designer toolbar.
The Messages dialog displays errors that must be addressed.
 - b. Select an error to highlight the associated attribute in the Property Editor.
4. Edit the Identification attributes:
 - a. Identification, Name - Enter a descriptive name (for example, **Countries**).
 - b. Identification, Layer Type - Select spatial geometry type (for example, **Polygons**).
5. Edit the Source attributes.
 - a. Source, Location - Determines the location of the data (for example, **Local Database**).
 - b. Source, Type - Select how the data is queried (for example, **Table / View**).
 - c. Source, Table Name - Select the table (for example, `COUNTRIES_TABLE`).



6. Edit the Column Mapping attributes:
 - a. Column Mapping, Geometry Column Data Type - Select the data type of the geometry column (for example, **SDO_GEOMETRY**).
 - b. Column Mapping, Geometry Column - Select the data type of the geometry column (for example, **GEOMETRY**).
7. Edit the Appearance attributes:
 - a. Appearance, Fill Color - Specify the fill color.
 - b. Appearance, Fill Opacity - Specify fill opacity. Ranges from zero (fully transparent) to 1.0 (opaque).
 - c. Appearance, Stroke Color - Specify the stroke color.



8. Configure the Tool Tip. The Tooltip displays when the user's mouse hovers over a polygon. The following example uses an HTML expression with column substitutions. However, you can also use the Template Directives, as with the Cards Region type.

- a. Tooltip, Advanced Formatting - Specify whether the tooltip displays using a column or advanced formatting using HTML expressions and supported substitution strings. This example enables **Advanced Formatting**.
- b. Appearance, HTML Expression - Enter HTML expressions to be shown as tooltip when hovering over an object on the map. Use `&COLUMN.` syntax to show column values in HTML. For example:

```
Country Name<br>
<b>&COUNTRY_NAME. (&ISO_A2.)</b>
```

 **Tip:**

For more information on the supported Template Directives, see [applyTemplate](#) in *Oracle Application Express JavaScript API Reference*.

9. Legend, Enable to Hide - Determines whether layer visibility can be toggled by clicking layer name in the legend. Prevent the legend from hiding the country polygons. Disable **Enable to Hide**.
10. Click **Save**.
11. Click **Save and Run Page**.

The map appears showing two layers: Earthquake Heat Map and Countries.



10.4.6.3 Controlling Layer Visibility

Control layer visibility by editing attributes in Page Designer.

This topic assumes you have a map that has two spatial geometry objects layers: Countries and Earthquake Map. The Countries layer is based on a local table named

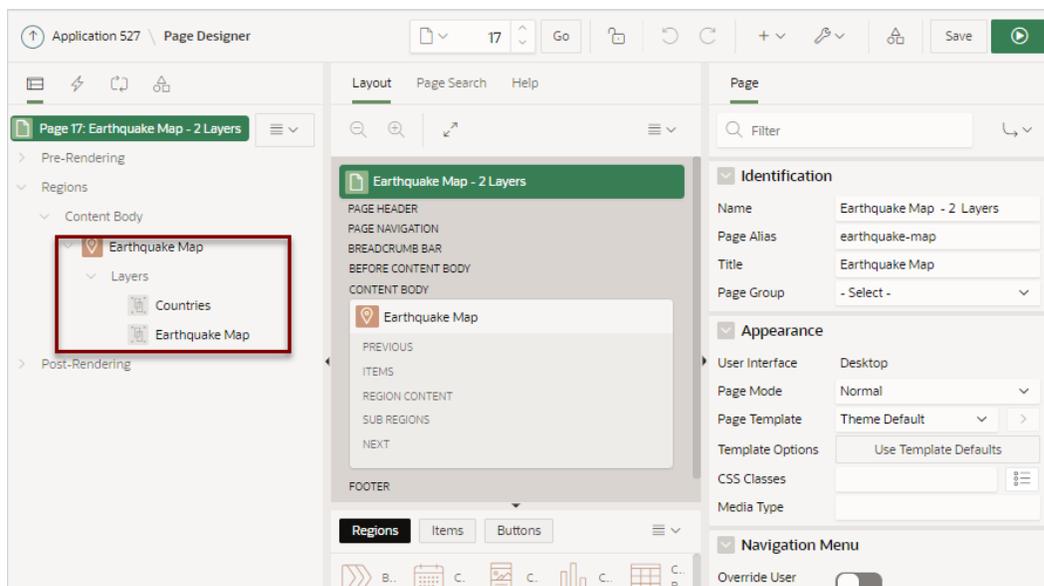
COUNTRIES_TABLE. Earthquake Map is sourced from a local table named EARTHQUAKE_TABLE and features a Heat Map spatial geometry layer.

This task demonstrates how to attributes in Page Designer and control the visibility of the Earthquake Map object layer. In this topic you specify zoom levels and add a server-side condition that specifies that only earthquakes with a magnitude of greater than two display.

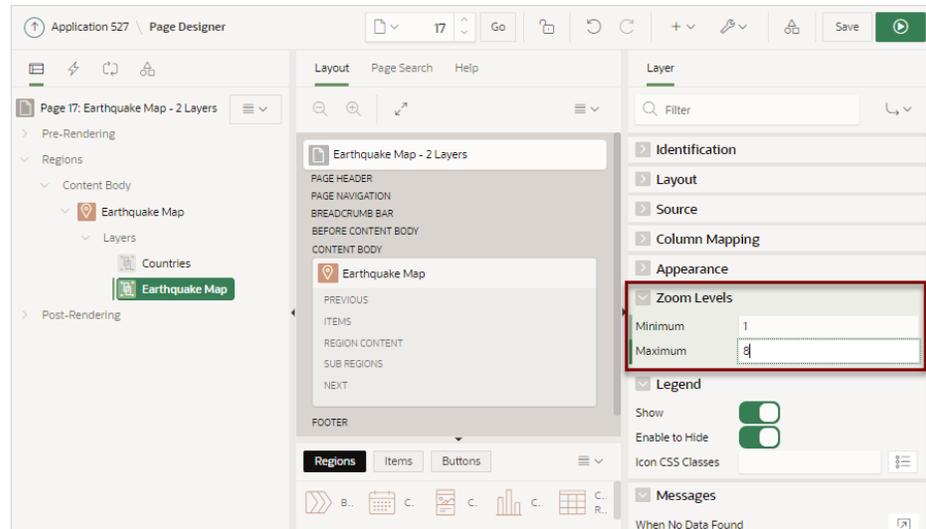
To control layer visibility:

1. View the map page in Page Designer:

Page Designer appears. In the following example, the map has two spatial geometry objects layers: Countries and Earthquake Map.

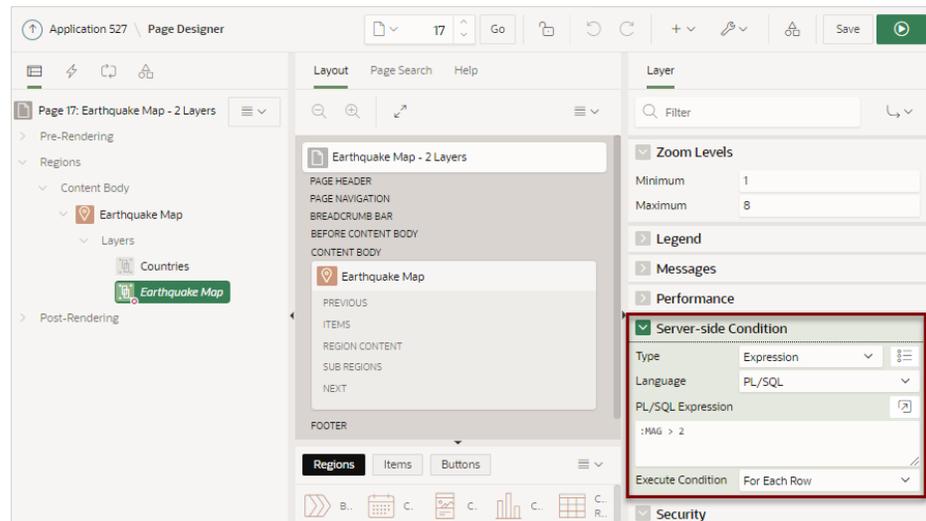


2. In the Rendering tab (left pane), under **Layers**, select **Earthquake Map**.
Layer attributes display in the Property Editor.
3. In the Property Editor, edit Zoom Levels attributes:
 - a. Zoom Levels, Minimum - Specify the Minimum zoom level for this layer to become visible (for example, enter 1).
 - b. Zoom Levels, Maximum - Specify the Maximum zoom level for this layer to become visible (for example, enter 8).



These settings decrease the available zoom levels from the default (1 to 18) to 1 to 8. When the user zooms outside of specified Zoom Levels, the layer disappears.

4. Create a server-side condition:
 - a. Server-side Condition, Type - Select **Expression**.
 - b. Server-side Condition, PL/SQL Expression - Enter `:MAG > 2`
 - c. Server-side Condition, Execute Condition - Select **For Each Row**.



5. Click **Save and Run Page** to view the application runtime. and only eight zoom levels are available.

The map appears. Only eight zoom levels are available and only earthquakes with a magnitude greater than 2 display.

10.4.6.4 Connecting a Map Region with a Report Region

Connect a map region with a classic report region.

This topic explains how to connect a map region with a classic report so that whenever the map region changes (that is, moves or zooms in or out), the report region

refreshes to reflect the change. In order to connect a map region with a report region, this example creates a page which includes the following:

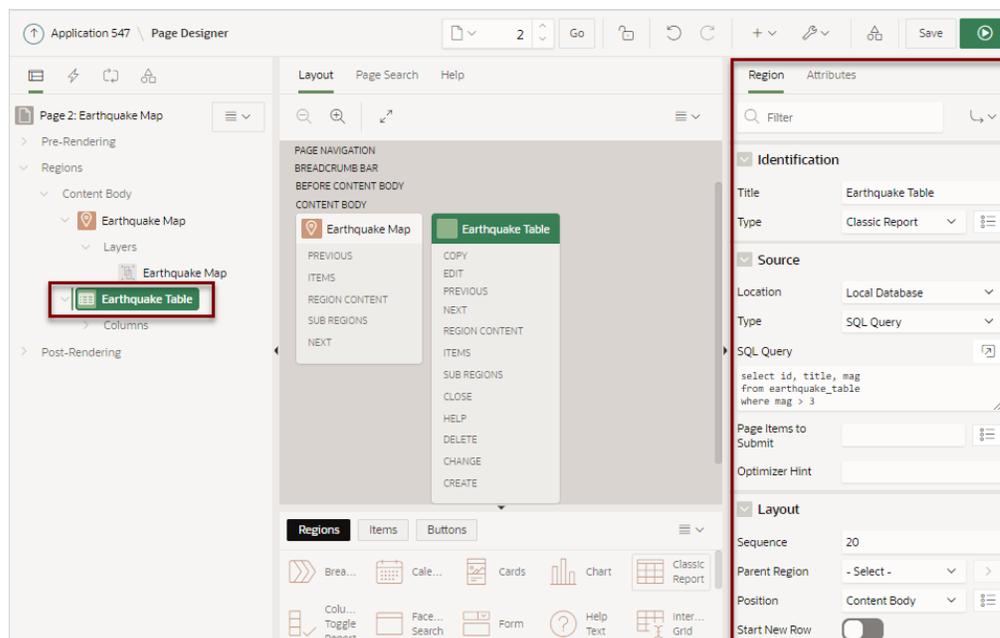
- A map containing an object layer named `Earthquake Map` sourced from a local table named `EARTHQUAKE_TABLE`.
- A classic report based on a SQL query also based on `EARTHQUAKE_TABLE`.
- To sync the map with the report, a hidden page item used to maintain the current map status (also known as a **bounding box**). A bounding box (usually shortened to **bbox**) is an area defined by two longitudes and two latitudes.
- A dynamic action to refresh the report as the map display changes.

 **Note:**

Because of a restrictions within Oracle Spatial, this example only works if the map shows less than half of the earth. Therefore, the report will not refresh for zoom levels 1 and 2 of the map. See "Coordinate Systems (Spatial Reference Systems)" in *Oracle Spatial Developer's Guide*.

To connect map with a report region:

1. Run the Create Application Wizard and create an application.
2. Run the Create Page Wizard and create a new map page:
 - a. On the Application home page, click **Create Page**.
 - b. Create a Page - Select **Map**.
 - c. Page Attributes - Enter a Page Name (for example, `Earthquake Map`) and click **Next**.
 - d. For Navigation Preference - Select how you want this page integrated into the Navigation Menu and click **Next**.
 - e. On Report Source:
 - Data Source - Select a Data Source for the page (for example, **Local Database**).
 - Source Type - Specify the source of the new page (for example, **Table**).
 - Table - Select a table on which to build the map (for example, `EARTHQUAKE_TABLE`).
 - Click **Next**.
 - f. On Create Page:
 - Select the spatial geometry layer type (for example, **Points**).
 - Geometry Column Type - Select how spatial objects are sourced. (for example, **Geometry Column**).
 - Geometry Column - Pick the spatial geometry column (for example, `GEOMETRY`).
 - Tooltip Column - Select the column to be used as tooltip (for example, `MAG`).
 - Click **Create**.
 - g. If you run the page, the earthquake map appears.



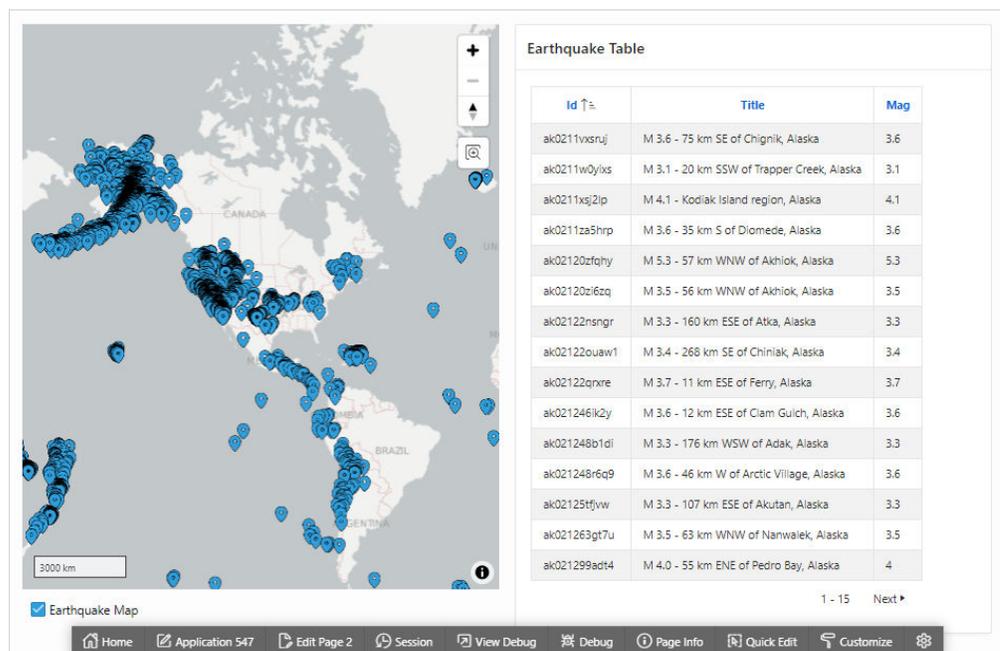
e. Edit the Classic Report region Attributes:

- Click the **Attributes** tab.
- Messages, When No Data Found - Enter:

No features on the map. If you're zoomed out to the whole earth, zoom in to see data.

f. Click **Save and Run Page**.

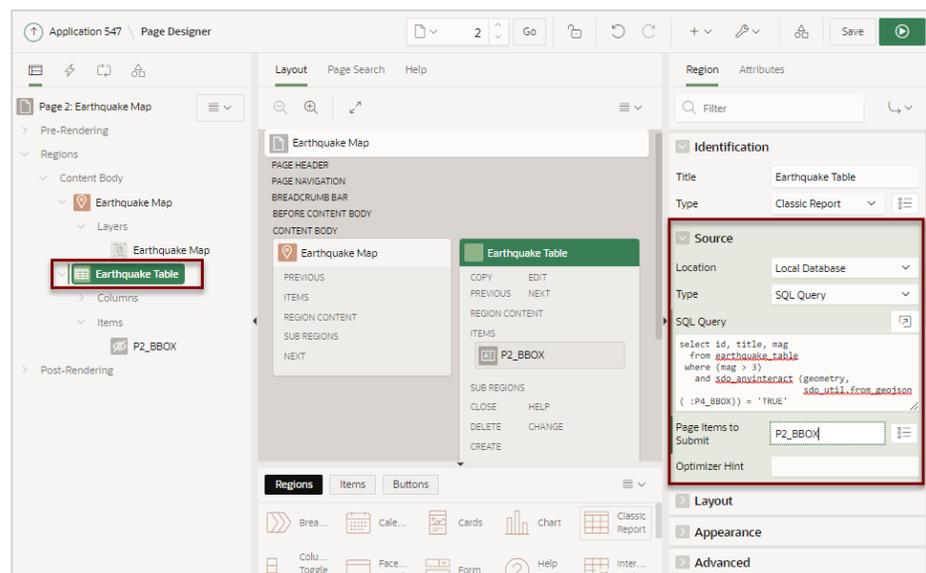
The new classic report displays to the right of the earthquake map.



g. Return to Page Designer. Click **Edit Page X** on the Runtime Developer toolbar, where X is the page number.

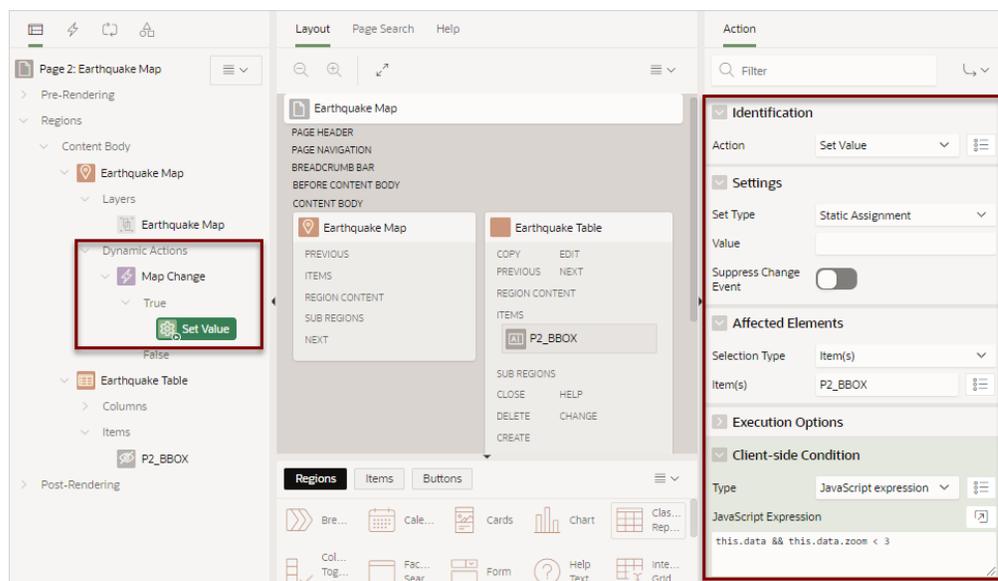
4. Add a hidden page item to maintain the current map status (also known as a **bounding box**).
 - a. In the Rendering tab, right-click **Earthquake Table** and select **Create Page Item**.
 - b. Edit the following Page Item attributes in the Property Editor:
 - Identification, Name - Enter `PX_BBOX`, where `X` is the page number.
 - Identification, Type - Select **Hidden**.
 - Settings, Value Protected - Disable this option.
5. Update the Earthquake Map region:
 - a. In the Rendering tab, select the **Earthquake Map** region.
 - b. In the Property Editor, click **Attributes**.
 - c. Advanced, Bounding Box Item - Select `PX_BBOX`, where `X` is the page number.
 - d. Click **Save**.
6. Update the SQL query that defines the classic report to include the spatial filter:
 - a. In the Rendering tab, select the **Earthquake Table** region.
 - b. In the Property Editor, update the following:
 - Source, SQL Query - Enter:


```
select id, title, mag
  from earthquake_table
 where (mag > 3)
       and sdo_anyinteract (geometry,
                           sdo_util.from_geojson (:PX_BBOX)) =
 'TRUE'
```
 - Source, Page Items to Submit - Select `PX_BBOX`, where `X` is the page number.



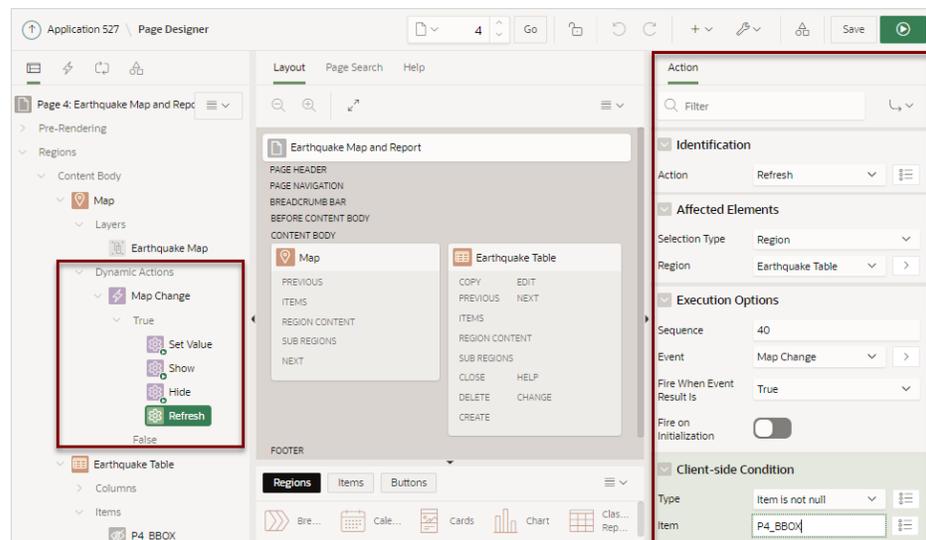
7. Add a dynamic action to refresh the report as the map display changes:

- a. In the Rendering tab, right-click the map region, **Earthquake Map** and select **Create Dynamic Action**.
 - b. In the Property Editor, edit the following Dynamic Action attributes:
 - Identification, Name - Enter a name for this dynamic action (for example, Map Change).
 - When, Event - Select **Map Changed [Map]**.
 - Client-side Condition, Type - Select **Item is not null**.
 - Client-side Condition, Items - Select **PX_BBOX**, where X is the page number.
 Next, add TRUE actions.
8. Add a Set Value Action which resets the PX_BBOX item (which is set by the map region) to NULL, if the current zoom level is below 3.
- a. In the Rendering tab, select the existing True action, **Show**.
 - b. Edit the following attributes in the Property Editor:
 - Identification, Action - Select **Set Value**.
 - Settings, Set Type - Select **Static Assignment**.
 - Affected Elements, Item(s) - Select **PX_BBOX**, where X is the page number.
 - Client-side Condition, Type - Select **JavaScript expression**.
 - Client-side Condition, JavaScript expression - Enter:
`this.data && this.data.zoom < 3`



9. Add a Show Action to show the report region if PX_BBOX is not NULL. This action in combination with the Set Value action will hide the report for zoom levels 0, 1 and 2.
 - a. In the Rendering tab, select the Map Change dynamic action and select **Create TRUE Action**.
 - b. Edit the following attributes in the Property Editor:
 - Identification, Action - Select **Show**.
 - Affected Elements, Selection Type - Select **Region**.

- Affected Elements, Region - Select **Earthquake Table**.
 - Client-side Condition, Type - Select **Item is not null**.
 - Client-side Condition, Item - Select **PX_BBOX**, where X is the page number.
10. Add Hide Action to hide the classic report if PX_BBOX is NULL.
- a. In the Rendering tab, select the Map Change dynamic action and select **Create TRUE Action**.
 - b. Edit the following attributes in the Property Editor:
 - Identification, Action - Select **Hide**.
 - Affected Elements, Selection Type - Select **Region**.
 - Affected Elements, Region - Select **Earthquake Table**.
 - Client-side Condition, Type - Select **Item is null**.
 - Client-side Condition, Item - Select **PX_BBOX**, where X is the page number.
 - Click **Save**.
11. Add Refresh Action to refresh the classic report if it is visible (that is if PX_BBOX is not NULL).
- a. In the Rendering tab, select the Map Change dynamic action and select **Create TRUE Action**.
 - b. Edit the following attributes in the Property Editor:
 - Identification, Action - Select **Refresh**.
 - Affected Elements, Selection Type - Select **Region**.
 - Affected Elements, Region - Select **Earthquake Table**.
 - Client-side Condition, Type - Select **Item is not null**.
 - Client-side Condition, Item - Select **PX_BBOX**, where X is the page number.
 - Click **Save**.



12. Click Save and Run Page.

Initially, the report does not appear.

13. In the navigation bar, click Zoom twice.

The Earthquake Table appears.

Id ↑	Title	Mag
c39546855	M 3.2 - 10km WNW of Calipatria, CA	3.2
c39546863	M 3.8 - 11km WNW of Calipatria, CA	3.82
c39546975	M 3.8 - 11km WNW of Calipatria, CA	3.76
c39547215	M 3.1 - 87km ESE of Maneadero, B.C., MX	3.07
c39550567	M 4.0 - 10km SE of Olancho, CA	4.03
c39552143	M 3.6 - 24km NNE of Trona, CA	3.6
c39572823	M 3.3 - 19km E of Little Lake, CA	3.26
c39575335	M 3.2 - 65km NNW of Stovepipe Wells, CA	3.21
c39794648	M 3.0 - 24km NNE of Trona, CA	3.03
c39796240	M 3.5 - 15km SSW of Olancho, CA	3.47
c39797144	M 3.2 - 9km NNW of Cabazon, CA	3.19
c39800544	M 3.1 - 8km W of Holtville, CA	3.05
c39800680	M 3.0 - 13km ESE of Puebla, B.C., MX	3.03
c39803176	M 3.0 - 3km E of Simi Valley, CA	3.02
c39803680	M 3.1 - 11km SW of Searles Valley, CA	3.1

If you reposition the map, Earthquake Table updates as well.

10.5 Creating Help for Your Application

Help created in App Builder displays on a dedicated Help page. To access Help, users click a link that takes them to a dedicated Help page. This Help page displays page and field-level Help topics specific to the page they are viewing.

- [Creating Help](#)
Developers can create both a dedicated Help page and item Help text for an application.
- [Using the Bulk Edit Item Help Report](#)
Edit all Help topics within an application at once using the Bulk Edit Item Help report
- [Seeding Item Help Topics](#)
For applications that do not yet contain Help, you can perform a mass update (or seed) of default Help text.
- [Creating a Help Navigation Bar Entry](#)
Once you have created your Help, the next step is to create a navigation bar entry so users can link to it.

10.5.1 Creating Help

Developers can create both a dedicated Help page and item Help text for an application.

- [About Creating Help](#)

- [Creating a Help Page and Region](#)
- [Defining Page Help](#)
- [Defining Item Help](#)

10.5.1.1 About Creating Help

App Builder includes built-in attributes to create Help for your application. Creating Help for your application involves the following steps:

- **Step 1:** Create a dedicated Help page and Help region. See "[Creating a Help Page and Region](#) ."
- **Step 2:** Define page Help text. See "[Defining Page Help](#) ."
- **Step 3:** Define item Help text. See "[Defining Item Help](#) ."
- **Step 4:** Create a navigation bar icon to link to your Help page. See "[Creating a Help Navigation Bar Entry](#)."

10.5.1.2 Creating a Help Page and Region

To create a Help page and region in Page Designer:

1. Create a blank page for your Help.
2. View the new page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

3. In the Gallery, right-click **Help Text** region, select **Add To**, and select the appropriate location.

 **Tip:**

You can also drag and drop from the Gallery. From the Gallery select the **Help Text** region and drag it to the appropriate location in the Layout tab.

4. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
 - **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
5. Edit the following attributes:
 - a. Identification, Title - Enter a title for the region.
 - b. Layout, Sequence - Enter the display sequence for this item. The sequence and other layout settings determine where this item is displayed in relation to other items within the region.

- c. Layout, Parent Region - Select the parent region to which this region belongs. If a parent region is selected then this region is rendered completely inside the parent region.
- d. Layout, Position - Specify the Sequence, Parent Region, and Position.
- e. Appearance, Template - Select a region template to define the appearance and layout of this region. Region templates are defined in the application theme. When a region is created, the template is automatically set to the default region template defined in the current theme.
- f. Appearance, Item Display Position - Select where page items display in relation to the main region content.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.

6. Click **Save**.

 **Tip:**

For more information on supported chart options, see "[ojChart](#)" in JSDoc pages for the Oracle JavaScript Extension Toolkit (JET).

 **See Also:**

["Adding a New Page to an Application"](#)

10.5.1.3 Defining Page Help

To define Page Help text:

1. View the new page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In the Rendering tab, click the page name.
3. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
 - **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.

4. In Property Editor - Page, find **Help** and enter text in **Help Text** attribute.
5. Click **Save**.

10.5.1.4 Defining Item Help

To define item Help:

1. View the new page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In the Rendering tab, click item for which you want to define Help.
3. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
 - **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
4. In the Property Editor, find **Help** and enter text in **Help** attribute.
5. Click **Save**.
6. Repeat the previous steps for each item requiring Help text.

10.5.2 Using the Bulk Edit Item Help Report

Edit all Help topics within an application at once using the Bulk Edit Item Help report

Developers can use the Bulk Edit Item Help report to view the item Label and Name, access the item, or link to the page containing the item.to the associate page

If you are including Help in your application, you can edit multiple Help topics at once using the Bulk Edit Item Help report.

To view the Bulk Edit Item Help report:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click the **Utilities** icon.
4. From Page Specific Utilities, select **Item Utilities**.
5. Click **Grid Edit of All Item Help Text**.
6. In Bulk Item Help Report, you can:
 - Update existing Help topics. Edit the Help text that appears and click **Apply Changes**.
 - Link to the page containing the item by clicking the page number.
 - Link to the Page Item by clicking the item name.



See Also:

"Seeding Item Help Topics"

10.5.3 Seeding Item Help Topics

For applications that do not yet contain Help, you can perform a mass update (or seed) of default Help text.

To seed Help topics:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click the **Utilities** icon.
4. From Page Specific Utilities, select **Item Utilities**.
5. Click **Grid Edit of All Item Help Text**.
6. Click **Seed Item Help Text**.
7. To edit existing item Help:
 - a. In Item Help Text, enter the default text to appear in all Help topics.
 - b. Click **Apply Changes**.
8. To create help text for all items that currently do not have help text, click **Seed Item Help Text** and follow the on-screen instructions.
9. Click **Apply Changes**.

10.5.4 Creating a Help Navigation Bar Entry

Once you have created your Help, the next step is to create a navigation bar entry so users can link to it.

To create a navigation bar entry:

1. Navigate to the Navigation Bar Entries page:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Classic Navigation Bar Entries**.
2. Click **Create**.

The Create Navigation Bar Entry Wizard appears.
3. For Method, select **From Scratch** and click **Next**.
4. For Type, select **Navigation to URL** and click **Next**.
5. For Attributes, specify the following:

- a. Sequence - Specify the order of evaluation for this component.
 - b. Entry Label - Enter display text for this navigation bar entry.
 - c. Icon Image Name - Enter an image name. For naming conventions, see field-level Help.
 - d. Image ALT - Enter ALT text for navigation icons that are images. If you do not specify an image name, then this text displays.
 - e. Image Height - Defines the height of the image.
 - f. Width - Defines the width of the image.
 - g. Click **Next**.
6. For Target:
- a. Target is a - Select **Page in this application**.
 - b. Page - Specify the page number of the help page you created in "[Creating Help](#)."
 - c. Request - Enter the following:

`&APP_PAGE_ID.`

By specifying substitution string `&APP_PAGE_ID` as the Request, you are instructing the Application Express engine to display Help text for the current page when the user clicks this icon.
 - d. Click **Next**.
7. To set a condition for displaying the navigation bar entry, select a condition type.
8. Click **Create**.

11

Using Themes and Theme Styles

Developers can alter a database application's user interface and page layout through themes and theme styles.

- [Using Themes](#)
Use themes and theme styles to increase your productivity when building an application.
- [Managing Themes and Subscriptions](#)
Developers can manage themes directly or through the use of theme subscriptions.
- [Creating Custom Themes](#)
Create a custom theme by modifying existing templates.
- [Using Custom Cascading Style Sheets](#)
Control the style of a web page by uploading and referencing a cascading style sheet.

11.1 Using Themes

Use themes and theme styles to increase your productivity when building an application.

- [About Themes](#)
Themes are collections of templates that enable developers to define the layout and style of an entire application.
- [Understanding the Universal Theme](#)
Universal Theme - 42 (Universal Theme) features a responsive design and enables developers to create web applications without extensive knowledge of HTML, CSS, or JavaScript.
- [Using Theme Styles](#)
A theme style is a CSS that is added to the base CSS. Using the Theme Roller utility, developers can change the appearance of an application. Universal Theme - 42 includes theme styles.
- [Using Theme Roller and Edit Logo](#)
Use Theme Roller and Edit Logo to quickly transform the appearance of an application without editing any code.
- [Understanding Template Options](#)
Template options provide developers with a declarative approach to applying different styles to components on an Oracle Application Express page.



See Also:

["Managing Themes and Subscriptions"](#)

11.1.1 About Themes

Themes are collections of templates that enable developers to define the layout and style of an entire application.

Themes provide developers with a complete set of templates that accommodate every UI pattern that may be needed in an application. Templates are organized first by template type and then by template class. Template types include page, region, report, list, button, label, and popup list of values (LOV).

Each template type has a number of template classes. A template class defines the purpose of a template within a template type. For example, a region template can be classified as a form region template, a report region template, and so on. These classifications enable Oracle Application Express to map templates among themes, making it easy to quickly change the entire look and feel of an application.

Administrators can add themes to the theme repository as follows:

- **Workspace Themes** - Workspace administrators can create themes that are available to all developers within the workspace. See "[Managing Workspace Themes](#)."
- **Public Themes** - Instance administrators can create public themes by adding them to the Oracle Application Express Administration Services. Once added, these public themes are available to all developers across all workspaces in an instance. See "Managing Public Themes" in *Oracle Application Express Administration Guide*.

11.1.2 Understanding the Universal Theme

Universal Theme - 42 (Universal Theme) features a responsive design and enables developers to create web applications without extensive knowledge of HTML, CSS, or JavaScript.

- [About the Universal Theme](#)
The Universal Theme features a responsive design, versatile UI components, and can be easily customized.
- [About Updating or Migrating to the Universal Theme](#)
Update or migrate existing apps to the newest Universal Theme to take advantage of new features and updates.
- [Refreshing the Universal Theme](#)
Update an application to use the latest Universal Theme to take advantage of new features, enhancements, and bug fixes as well as styling for new Application Express components.

11.1.2.1 About the Universal Theme

The Universal Theme features a responsive design, versatile UI components, and can be easily customized.

Applications you create with the Create Application Wizard use the Universal Theme. Advantages of the Universal Theme include:

- **Responsive Design** - Designed to work just as well on small screen devices (such as smartphones and tablets) as it does on larger screen devices (including

laptops and desktops). The UI components in Universal Theme work across varying screen resolutions while maintaining the same or similar functionality. In addition, Universal Theme takes full advantage of ultra high screen resolutions by utilizing vector graphics where possible, and relying upon CSS3 features for UI styling.

- **Versatile User Interface** - Provides all the components and building blocks necessary to build practically any type of business application user interface.

 **Tip:**

To browse all of the components provided with Universal Theme go to the [Components](#) page in the [Universal Theme application](#).

- **Easy Customization** - Effortlessly customize and fully control the look and feel of your applications without becoming an expert in UI design, HTML, CSS, or JavaScript. Using Theme Roller and Template Options, you can easily customize your application to fit your company's brand and customize the look and feel of various components using Template Options.
- **Support for Theme Styles** - The Universal Theme includes support for theme styles. A theme style is a CSS style sheet that is added to the base CSS. Developers can change the appearance of an application by altering the theme style using the Theme Roller utility.

About Responsive Design

The Universal Theme is an example of a responsive user interface theme.

Responsive design enables you to design web pages so that the layout fits the available space regardless of the device on which page displays (for example, a desktop computer, laptop computer, tablet, or smartphone).

By implementing a responsive design, the user gets the same full experience as they would on larger screens. On smart phones and tablets, the layout can adjust to the size of the specific device. During this resizing process, elements shift position, re-size, or become hidden. The goal of responsive design is to present all essential content in a user friendly way for all possible screen sizes. Keep in mind, that responsive design is not just a matter of picking the correct set of templates. As the application developer, you are responsible for using the templates and the available components to design a page that is truly responsive.

 **See Also:**

- The **Design, Components, Icons, and Reference** pages in the [Universal Theme](#) app
- "[Understanding Template Options](#)"
- "[Using Theme Styles](#)"

11.1.2.2 About Updating or Migrating to the Universal Theme

Update or migrate existing apps to the newest Universal Theme to take advantage of new features and updates.

Compared to themes in previous releases of Oracle Application Express, the Universal Template features cleaner templates, improved grid support, and responsive behavior.

Universal Theme migration paths include:

- **Update Existing Apps to the Latest Universal Theme** - If your app already uses the Universal Theme, you can easily update it to take advantages of new features and enhancements.

See "[Refreshing the Universal Theme](#)."

- **Migrate Existing Mobile Apps to the Universal Theme** - jQuery Mobile and the jQuery Mobile User Interface used in previous releases have been desupported. If you have an existing mobile application that uses the jQuery Mobile User Interface, you must migrate your existing application to the Universal Theme.

See the [Migrating from jQuery Mobile](#) page.

- **Migrate from Other Themes** - You can migrate other themes by running Switch Theme Wizard.

See the "Migrating from Other Themes" section on the [Migration Guides](#) page.



See Also:

[Universal Theme application](#)

11.1.2.3 Refreshing the Universal Theme

Update an application to use the latest Universal Theme to take advantage of new features, enhancements, and bug fixes as well as styling for new Application Express components.



Tip:

Before starting this procedure, Oracle recommends backing up your application by either exporting it or creating a copy. See [Exporting an Application](#) and [Copying a Database Application](#).

1. To update an application to use the latest Universal Theme
1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.

If the Universal Theme is not up-to-date, the Shared Components page displays a banner at the top of the page.

2. Click **Refresh Theme**.
3. Run and test your application.

**See Also:**

[Updating Universal Theme](#) page in the [Universal Theme](#) application

11.1.3 Using Theme Styles

A theme style is a CSS that is added to the base CSS. Using the Theme Roller utility, developers can change the appearance of an application. Universal Theme - 42 includes theme styles.

- [About Theme Styles](#)
A theme style is a CSS style sheet that is added to the base CSS to alter the look and feel of an application.
- [Creating a Theme Style](#)
Create a theme style by selecting an existing style and selecting Add Style.
- [Editing a Theme Style](#)
Edit a theme style from the Themes page.
- [Selecting a Theme Style on the User Interface Page](#)
Select a theme style on the application User Interface page.
- [Enabling Users to Select a Theme Style](#)
Enable users to select a theme style in a running application.

11.1.3.1 About Theme Styles

A theme style is a CSS style sheet that is added to the base CSS to alter the look and feel of an application.

Newer themes such as *Universal Theme - 42* can have a base CSS file plus the theme style CSS file. The theme style CSS file are referenced in the page template using the #THEME_STYLE_CSS# substitution string. The Application Express engine replaces this substitution string with the CSS file references defined in the theme style attributes. Use theme styles to customize themes, to switch to a different color scheme, apply a flat look, or make a theme responsive. A theme can have multiple theme styles with one style set as active. You can modify a theme style CSS file using Theme Roller.

Selecting a Theme Style

Once defined, developers can select a theme style by:

- Editing the Theme Styles attribute when running the Create Application Wizard. See "[Understanding Page Types, Features, and Settings](#)."
- Accessing the Create/Edit Theme page. See "[Editing a Theme Style](#)."
- Select a new theme style on the application User Interface page. See "[Selecting a Theme Style on the User Interface Page](#)."

11.1.3.2 Creating a Theme Style

Create a theme style by selecting an existing style and selecting Add Style.

1. To create a theme style:

1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.
2. Select a theme and click the **Styles** tab.
3. Click **Add Style**.

The Theme Styles page appears.
4. For Settings:
 - a. Name - Provide a short descriptive name for the theme style.
 - b. Is Current - Select whether this style is the current style used by the theme.
 - c. Is Public - Select whether this style can be chosen by end users.
 - d. Accessibility Tested - Specify if this Theme Style has been tested to the applicable accessibility guidelines. For Theme Styles created by Oracle, please see our product VPAT for the accessibility guidelines we follow..
 - e. File URLs - Enter Cascading Style Sheet file URLs to be loaded on every page if the theme style is current. Each URL has to be written into a new line. If you provide a minified version of your file you can use the substitution string `#MIN#` to include `.min` or `#MIN_DIRECTORY#` to include minified/ in your file URL for a regular page view and an empty string if the page is viewed in debug mode. You also have access to the substitution string `#APP_VERSION#` if you want to include the application's version in the file URL. File URLs you enter here will replace the `#THEME_STYLE_CSS#` substitution string in the page template. See field-level Help to view examples.
 - f. CSS Classes - Enter CSS classes to be appended to the `#PAGE_CSS_CLASSES#` substitution string and applied to every page of the application if this Theme Style is currently active.
5. For Theme Roller Attributes:
 - a. Read Only - Select **On** to prevent any updates to the theme style. Select **Off** to allow the theme style to be edited and overwritten using Theme Roller.
 - b. Input Parameter File URLs - Enter the LESS file URLs that will be used to generate this theme style when using Theme Roller.
 - c. Output CSS File URL- Enter the URL for the CSS file that will be generated by Theme Roller for this theme style. .
 - d. Theme Roller JSON Configuration, JSON Configuration - The JSON configuration is generated by Theme Roller when the theme style is saved.

Oracle does not recommend manually updating the configuration. However, you can copy a JSON configuration from another theme style, such as a theme style in another application, to manually update the configuration.
6. For Comments - Enter any comments or notes here. These comments will never be displayed when running the application.
7. Click **Create**.

11.1.3.3 Editing a Theme Style

Edit a theme style from the Themes page.

1. To edit a theme style:
1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.
2. Click the theme name.
3. Select a theme and click the **Styles** tab.
4. Select a theme style.
5. To make changes to the current theme style, edit the appropriate attributes and click **Apply Changes**.

To learn more about an attribute, see field-level help.
6. To delete the current theme style, click **Delete**.

11.1.3.4 Selecting a Theme Style on the User Interface Page

Select a theme style on the application User Interface page.

1. To select a theme style from the User Interface page:
1. Navigate to the User Interface page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, click **User Interface Attributes**.

The User Interface page appears.
2. Attributes, Theme Style - Select a new theme style.

The Theme Styles page appears.
3. Click **Apply Changes**.

11.1.3.5 Enabling Users to Select a Theme Style

Enable users to select a theme style in a running application.

Once enabled, a Customize link appears in the running application, typically in the lower left corner. When the user clicks the Customize link a pop-up displays listing available theme styles. When a user selects a theme style, the theme style is stored persistently as a user preference and will be retained during future sessions.

1. To enable users to select a theme style:
1. Create an application which has at least two theme styles.

2. Go to the application User Interface page:
 - a. Click **Shared Components**.
 - b. Under User Interface, click **User Interface Attributes**.
The User Interface Attributes page appears..
3. Under Attributes, enable **Enable End Users to choose Theme Style**.
4. Click **Apply Changes**.

11.1.4 Using Theme Roller and Edit Logo

Use Theme Roller and Edit Logo to quickly transform the appearance of an application without editing any code.



Note:

Concurrent use of the Live Template Options, Theme Roller, and Logo Editor is not supported.

- [About Theme Roller and Edit Logo](#)
Learn about the Theme Roller and Edit Logo options available on the Customize menu on the Runtime Developer toolbar.
- [Using the Theme Roller Dialog](#)
Use the Theme Roller dialog to quickly change the appearance of an application without editing any code.
- [About Developer Console Integration](#)
Use the exposed function `apex.utr.config()` in your web browser developer's console to get and set the custom CSS code and LESS compilation configuration
- [About the Redwood Light Theme Style](#)
The Redwood Light theme style features a number of unique class options in Theme Roller.
- [Using Edit Logo](#)
Use Edit Logo to quickly change the logo that displays at runtime.

11.1.4.1 About Theme Roller and Edit Logo

Learn about the Theme Roller and Edit Logo options available on the Customize menu on the Runtime Developer toolbar.

When you run an application from App Builder and view a page, the Runtime Developer toolbar displays at the bottom of any editable running page. Clicking the Customize menu displays two menu options: **Theme Roller** and **Edit Logo**.

The screenshot displays the 'Update Projects' interface. At the top, there's a blue header with 'Demonstration - Projects' and user information 'admin'. Below the header, the title 'Update Projects' is centered. A search bar and 'Go' button are on the left, and 'Reset' and 'Create' buttons are on the right. The main content is a table with the following data:

Project	Name	Description	Assignee	Start Date	End Date	Cost	Is Complete
Configure Web Environment	Identify Server Requirements	Determine which databases will be used to install Web development tool for Development, QA, and Production. Also specify which Web Listeners will be used for the three environments.	Tameka Hall	1/10/2021	1/11/2021	2,000	Y
Configure Web Environment	Install Web development tool	Install the latest version of Web development tool from the vendor into the databases for Development, QA, and Production. Note: For QA and Production, Web development tool should be configured as "run time" only.	Mei Yu	1/12/2021	1/12/2021	1,000	Y
Configure Web	Assign Workspace	In development assign a minimum of two Workspace administrators to each workspace. These administrators will then be responsible	Harold Youngblood	1/14/2021	1/14/2021		

The 'Theme Roller' dialog is positioned over the bottom right of the table, showing 'Theme Roller' and 'Edit Logo' options. The bottom of the image shows a runtime developer toolbar with icons for Home, Application 362, Edit Page 10, Session, View Debug, Debug, Page Info, Quick Edit, and Customize.

Theme Roller is a live CSS editor that enables you to quickly change the theme style, colors, rounded corners and other application attributes.

In order for Theme Roller to appear on the Runtime Developer toolbar:

- Theme styles must be defined.
- At least one theme styles must have the **Input Parameter File URLs** attribute defined.

Edit Logo offers a quick way to add or edit the logo users see at runtime.

See Also:

- ["Creating a Theme Style"](#)
- ["Editing a Theme Style"](#)
- ["Using the Theme Roller Dialog"](#)
- ["Using Edit Logo"](#)

11.1.4.2 Using the Theme Roller Dialog

Use the Theme Roller dialog to quickly change the appearance of an application without editing any code.

Theme Roller is a live CSS editor that enables developers to quickly change the colors, rounded corners and other attributes of their applications without touching a line of code. Out-of-the-box themes cannot be overwritten but can be saved as a new theme and modified accordingly.

 **Tip:**

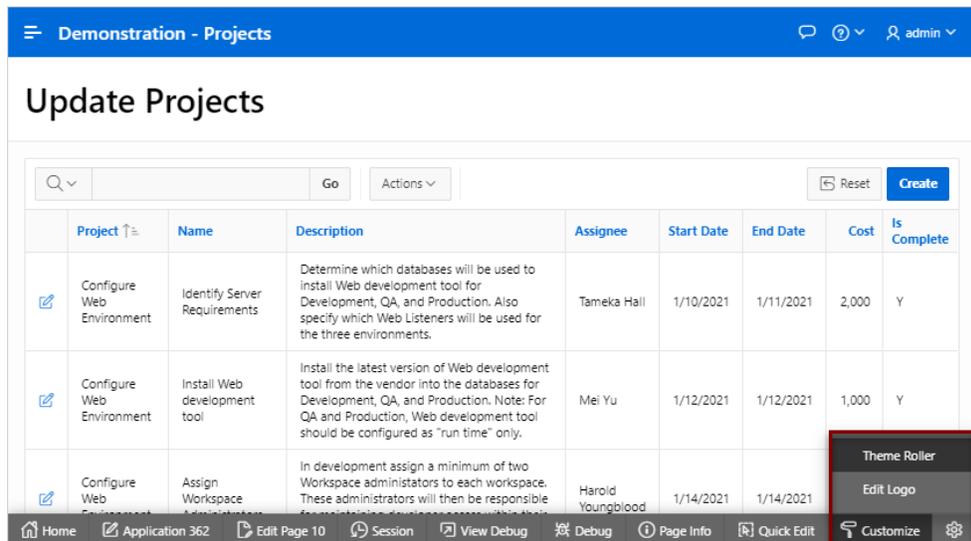
Theme Roller displays on the Runtime Developer toolbar if theme styles have been defined and at least one theme styles has the **Input Parameter File URLs** attribute defined.

To use the Theme Roller dialog:

1. Preview the page by running it.

The Runtime Developer toolbar displays at the bottom of any editable running page.

2. On the Runtime Developer Toolbar, click **Customize** and then select **Theme Roller**.

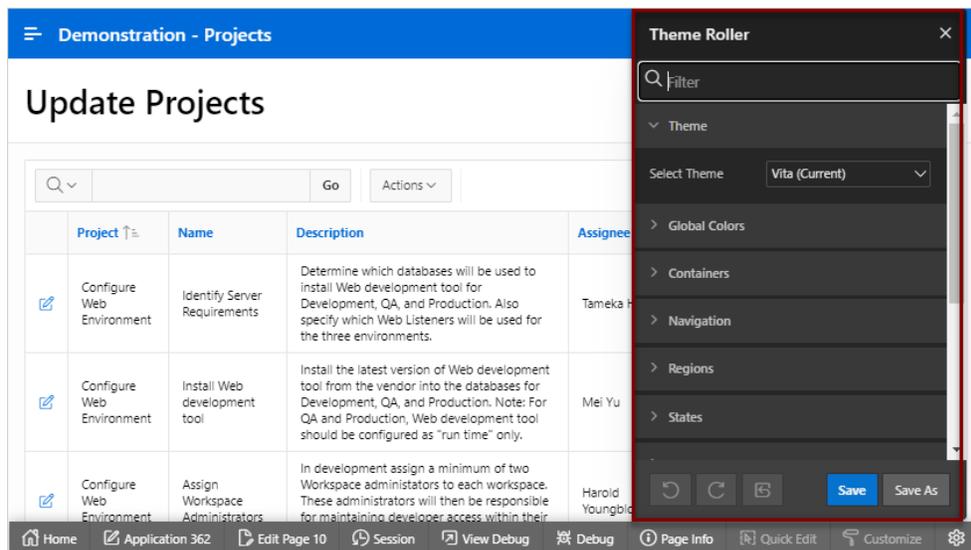


The screenshot shows the 'Update Projects' page in the Runtime Developer toolbar. The page title is 'Update Projects' and the user is 'admin'. The page contains a table with the following data:

Project	Name	Description	Assignee	Start Date	End Date	Cost	Is Complete
Configure Web Environment	Identify Server Requirements	Determine which databases will be used to install Web development tool for Development, QA, and Production. Also specify which Web Listeners will be used for the three environments.	Tameka Hall	1/10/2021	1/11/2021	2,000	Y
Configure Web Environment	Install Web development tool	Install the latest version of Web development tool from the vendor into the databases for Development, QA, and Production. Note: For QA and Production, Web development tool should be configured as "run time" only.	Mei Yu	1/12/2021	1/12/2021	1,000	Y
Configure Web Environment	Assign Workspace Administrators	In development assign a minimum of two Workspace administrators to each workspace. These administrators will then be responsible for maintaining developer access within their	Harold Youngblood	1/14/2021	1/14/2021		

The 'Theme Roller' dialog is visible in the bottom right corner, showing the 'Theme' dropdown menu and the 'Vita (Current)' theme selected. The dialog also has a 'Filter' search box and a 'Save' button.

Theme Roller fetches the styles for your application and loads them in the editor. The Theme Roller dialog appears.



The screenshot shows the 'Update Projects' page in the Runtime Developer toolbar. The 'Theme Roller' dialog is open, showing a list of themes. The 'Vita (Current)' theme is selected. The dialog also has a 'Filter' search box and a 'Save' button.

3. To search for an attribute, enter search terms in the Search field at the top of dialog. Only attributes that contain the search term appear.

4. To select or modify a theme:

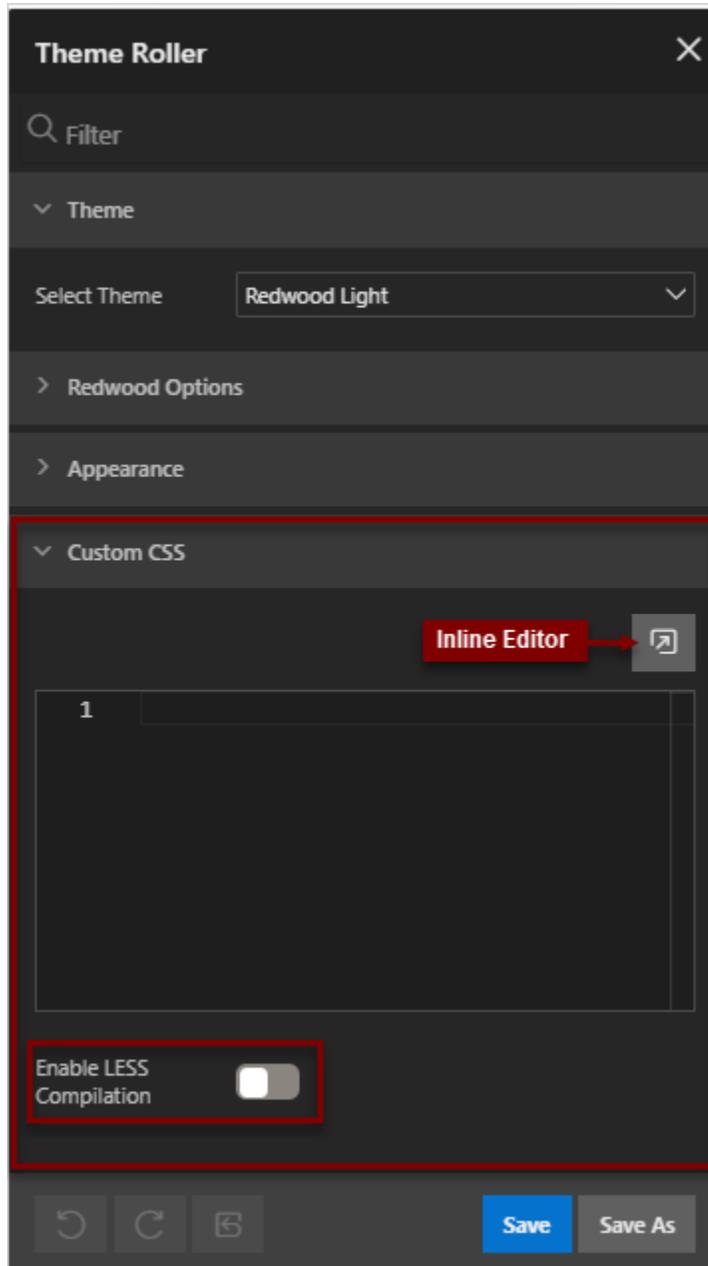
a. Theme, Select Theme - Select a theme from the drop-down list. In the next illustration, the Theme is set to Redwood Light.

b. Expand or collapse sections by clicking on the section name.

c. Modify the attributes.

When you modify an attribute the following buttons become active at the bottom of the dialog: **Undo**, **Redo**, and **Reset**.

5. Custom CSS - Enter CSS or or LESS-compatible code in the Code Editor. If you are including LESS-compatible code, you must enable the **Enable LESS Compilation** switch.



6. Save the theme by clicking one of the following:
 - **Save** - If the theme is editable, **Save** saves any style change and sets the theme as the application's current style.
 - **Save As** - Click **Save As** to save the theme as a new style and sets it as the application's current style.

11.1.4.3 About Developer Console Integration

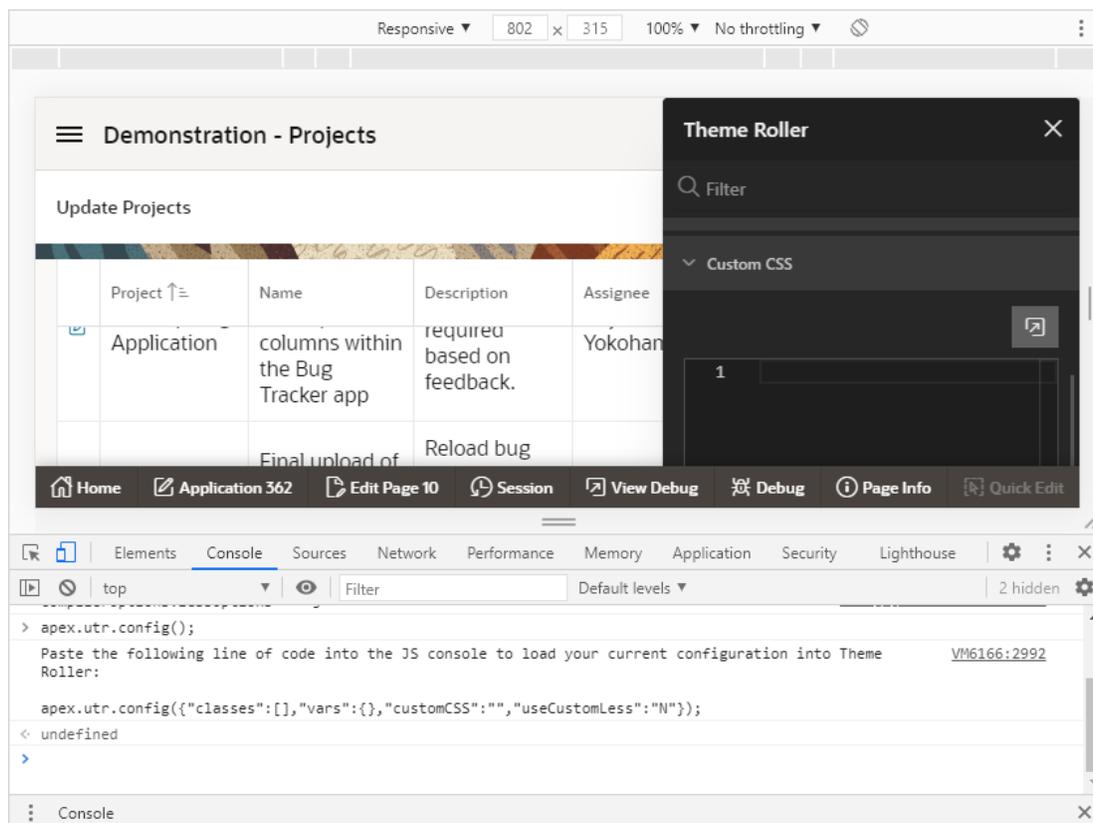
Use the exposed function `apex.utr.config()`; in your web browser developer's console to get and set the custom CSS code and LESS compilation configuration

To get styles, write `apex.utr.config()` without parameters into the console:

```
apex.utr.config();
```

Paste the following line of code into the JS console to load your current configuration into Theme Roller:

```
apex.utr.config({"classes":[],"vars":  
{}, "customCSS": "", "useCustomLess": "Y"});
```



To set styles, add less or css code in the customCSS object of the JSON configuration into the console:

```
apex.utr.config({"classes":[],"vars":{},"customCSS":"h1 { color: #111; font-  
family: 'Helvetica Neue', sans-serif; ... }", "useCustomLess": "Y"});
```

The custom CSS will be added to the theme roller Code Editor and applied to the page automatically.

11.1.4.4 About the Redwood Light Theme Style

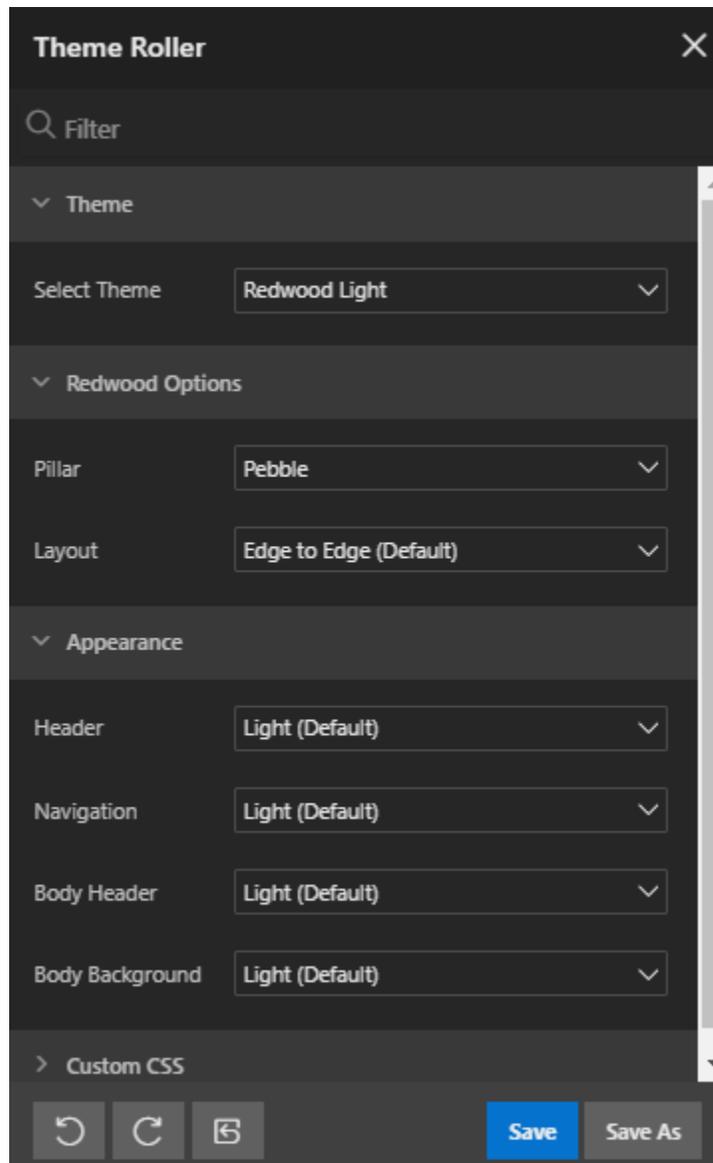
The Redwood Light theme style features a number of unique class options in Theme Roller.

As shown in the following image, selecting the Redwood Light theme style includes a number of unique class options:

- **Pillar** - The Pillar class enables users to change the background and header images.
- **Layout** - The Layout class enables users to switch the following layout options: **Edge to Edge**, **Floating**, or **Contained**.

- **Appearance** - Attributes under Appearance include Header, Navigation, Body Header, and Background.

The following image shows Theme Roller with the Redwood Light theme style selected.



11.1.4.5 Using Edit Logo

Use Edit Logo to quickly change the logo that displays at runtime.

To include a logo, your page template must include the #LOGO# substitution string.

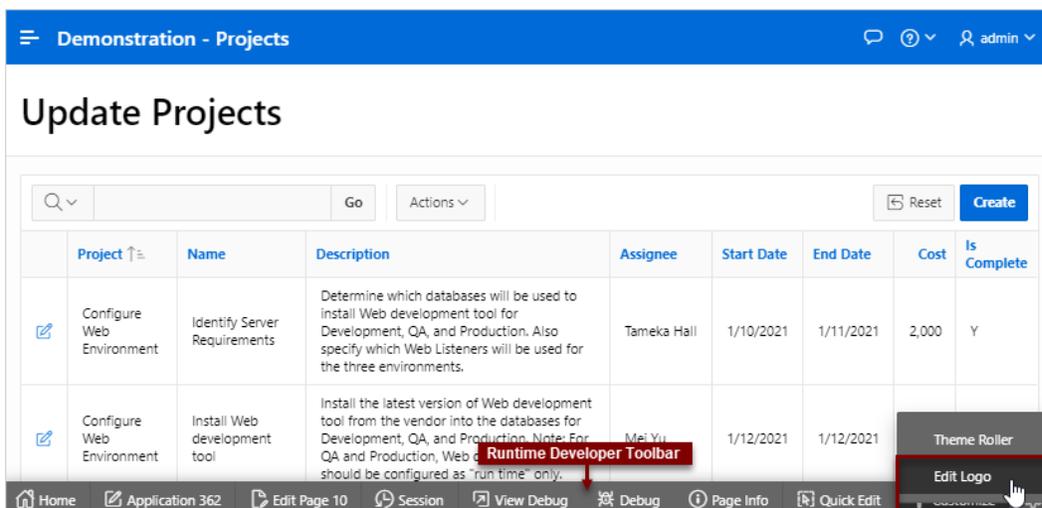
Note:

You can also edit an application logo by editing the application User Interface attributes. See "[Defining an Application Logo](#)."

1. To use Edit Logo:
1. Preview the page by running it.

The Runtime Developer toolbar displays at the bottom of any editable running page.

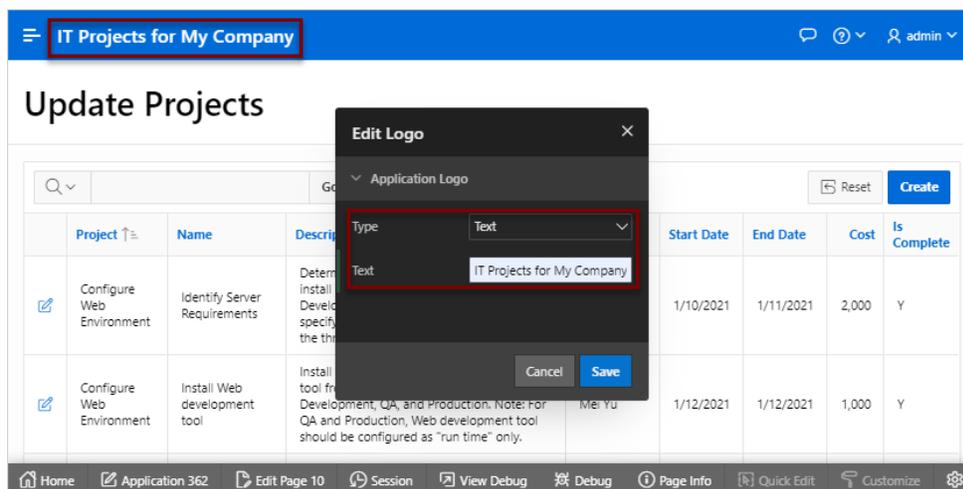
2. On the Runtime Developer Toolbar, click **Customize** and then select **Edit Logo**.



The Edit Logo dialog appears.

3. Type - Select the type of logo. Options include:
 - **None** - No logo is shown in the app.
 - **Text** - Defines a text only logo.
 - Type - Select **Text**.
 - Text - Enter the text that should be display as the application logo.
 - **Image** - Creates a logo based on a valid image file type and under 500 kb in size.
 - Type - Select **Image**.
 - Specify the image - Drag and drop the file, or click **Choose File** and navigate to the image.
 - **Image and Text**:
 - Type - Select **Image and Text**.
 - Specify the image - Drag and drop the file, or click **Choose File** and navigate to the image.
 - **Custom** define custom HTML to serve as the application's logo:
 Due to security concerns, however, this cannot be configured using Edit Logo. When you select Custom, the **User Interface Attributes** button appears. Click **User Interface Attributes** and add the **Custom** logo on the User Interface Attributes page.

In following example, Type is set to **Text** and the Text reads IT Projects for My Company. Note that the revised logo, IT Projects for My Company, displays at the top of the page.



4. Click **Save**.

The confirmation message appears:

Logo saved successfully

5. Click **Cancel** to exit the dialog.

11.1.5 Understanding Template Options

Template options provide developers with a declarative approach to applying different styles to components on an Oracle Application Express page.

- [About Template Options](#)
Use template options to declaratively apply CSS modifiers to the templates they have chosen for pages, regions, reports, lists, breadcrumbs, items and buttons.
- [About Default Template Options](#)
Developers can select default template options that are not part of a template option group.
- [About Template Option Groups and Presets](#)
Developers can define the purpose of related template options by creating template option groups.



See Also:

"Using Template Options" and "Using Quick Edit to Modify Live Template Options"

11.1.5.1 About Template Options

Use template options to declaratively apply CSS modifiers to the templates they have chosen for pages, regions, reports, lists, breadcrumbs, items and buttons.

A **CSS modifier** is a reference to a CSS class defined in a CSS style sheet. CSS modifiers enable a developer to use the same HTML markup but present it in a variety of different styles simply by applying a CSS. Template options reduce the need to have

a large number of nearly identical templates defined in a theme in order to achieve different styles for button colors, region widths, font settings, item label markup, and so on.

Examples of how developers can use template options include:

- Applying different colors or accents
- Applying different spacing and padding
- Rendering buttons in different styles, with and without icons
- Displaying form fields with different alignments.

Without template options, applying these variations would require a large number of nearly identical templates, or in-depth knowledge of CSS. Components that support template options include: pages; regions; classic reports; breadcrumbs; lists; items and labels; and buttons.

11.1.5.2 About Default Template Options

Developers can select default template options that are not part of a template option group.

App Builder automatically applies default template options by rendering the component that references the template. Default template options are not written to an actual component. Instead, a `#DEFAULT#` substitution string is defined for the component, thus enabling developers to centrally modify the template option defaults.

Developers can choose not to use the template option defaults, which removes the `#DEFAULT#` substitution string from the component. If template option defaults are disabled, then developers can selectively apply available template options to a component. All template options that are selected directly when editing the component are written to the component's metadata, represented by their corresponding CSS classes string. At runtime, the selected template options and default template option are part of the default are combined with the component's CSS classes string and applied to the component.

11.1.5.3 About Template Option Groups and Presets

Developers can define the purpose of related template options by creating template option groups.

Examples of template option groups include Button Size, Button Style, List Examples, List Style, and Form Label Position. When developers create a template option group, they can specify a template option preset at the template-level. For example, suppose you have a button template that has the template options *Large* and *Small*. If you define *Small* as the preset, then any new button referencing the template would automatically have the template option *Small* applied to it when it is created. Template options that are part of a group are optional unless a present is defined at the template-level.

11.2 Managing Themes and Subscriptions

Developers can manage themes directly or through the use of theme subscriptions.

- [Managing Theme Subscriptions](#)
Developers can manage themes using of theme subscriptions.
- [Accessing New Themes](#)
Only themes currently associated with an application display on the Themes page. To access other themes, you run the Create Theme Wizard.

- [Editing Themes](#)
Review or edit a theme by updating theme attributes.
- [Switching Themes](#)
Migrate an application to a new theme by running the Switch Theme Wizard.
- [Changing a Theme Identification Number](#)
Use the Change Theme ID utility to change a theme ID to another identification number.
- [Copying a Theme](#)
Copying a theme is useful when experimenting with editing a theme or to export a theme with a different ID.
- [Deleting a Theme](#)
Delete inactive themes.
- [Creating a Master Theme Application](#)
Create a master theme application.
- [Managing Workspace Themes](#)
Workspace administrators manage the Theme repository for a workspace.
- [Managing Instance Themes](#)
Instance administrators manage the Theme repository for an entire Oracle Application Express instance. Only an Instance administrators can add or delete a theme from the repository.
- [About Exporting and Importing Themes](#)
Export a theme in the same way you export any related application files.
- [Viewing Theme Reports](#)
Access the following reports to better manage themes and templates.

11.2.1 Managing Theme Subscriptions

Developers can manage themes using of theme subscriptions.

- [About Theme Subscriptions](#)
Subscribing to a master theme enables the theme to be upgraded during future Oracle Application Express releases.
- [About Modifying a Theme Subscription](#)
Modify a template without breaking the subscription to the master theme by creating a local copy of the template in your workspace.
- [Verifying if a Theme Refresh Is Needed](#)
Use the Verify Theme Subscription Wizard to review all theme attributes, templates, and template options in the subscribing theme and view errors for those that are not in sync with the master theme.
- [Refreshing a Subscribed Theme](#)
Refresh a subscribed theme on the Create/Edit Theme page.
- [Unsubscribing to a Theme](#)
Unsubscribe from a theme to remove the subscription from all templates, styles, files and so on that are part of the theme.
- [Re-subscribing to a Built-in Theme](#)
If a theme is currently unsubscribed, you can return to a subscribed version of this theme.

11.2.1.1 About Theme Subscriptions

Subscribing to a master theme enables the theme to be upgraded during future Oracle Application Express releases.

Developers subscribe to a theme when:

- **Running the Create Application Wizard.**

When a developer runs the Create Application Wizard and selects a built-in theme, the theme is automatically subscribed to a master theme. As an alternative to using a built-in theme, the Create Application Wizard provides the option to copy a theme from an existing application. When copying a theme from an existing applications, developers can choose if they wish to have this theme be subscribed to. See "[Understanding Page Types, Features, and Settings](#)."

- **Creating a new theme from the Theme repository.**

When you create a new theme the associated application automatically subscribes to it. See "[Accessing New Themes](#)."

Once an application subscribes to a master theme only the default templates can be changed. All theme attributes, subscribed template options, and subscribed templates are set to read-only. In other words, only the default templates can be changed. The advantage of subscribing to a master theme is that the theme can be upgraded during future Oracle Application Express releases. When a theme is subscribed to, developers cannot modify the theme or template metadata when they access it from the theme or template edit pages.

11.2.1.2 About Modifying a Theme Subscription

Modify a template without breaking the subscription to the master theme by creating a local copy of the template in your workspace.

Local template copies are not subscribed to and are therefore editable. You can take the same approach with theme styles. You can create a local copy of a theme style and then add it to a subscribed theme. Theme styles created locally are editable but will be excluded from theme refreshes.



See Also:

["Copying a Theme"](#)

11.2.1.3 Verifying if a Theme Refresh Is Needed

Use the Verify Theme Subscription Wizard to review all theme attributes, templates, and template options in the subscribing theme and view errors for those that are not in sync with the master theme.

This wizard also highlights any templates that are defined in the master theme but not yet published to the subscribing theme.

1. To run the Verify Theme Subscription Wizard:
1. Navigate to the Themes page:

- a. On the Workspace home page, click the **App Builder** icon.
- b. Select an application.
- c. Click **Shared Components**.
- d. Under User Interface, select **Themes**.

The Themes page appears. A check mark in the Is Current column indicates which theme is selected.

2. Select the theme.

The Create/Edit Theme page appears.

3. Locate Theme Subscription and click **Verify**.
4. Follow the on-screen instructions.

To publish changes from the master theme to the subscribing theme, click **Refresh** at the end of the wizard.

11.2.1.4 Refreshing a Subscribed Theme

Refresh a subscribed theme on the Create/Edit Theme page.

1. To refresh a subscribed theme:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.

The Themes page appears. A check mark in the Is Current column indicates which theme is selected.

2. Select the theme.

The Create/Edit Theme page appears.

3. Locate Theme Subscription and click **Refresh Theme**.

 **Tip:**

If the theme is not subscribed, the Refresh Theme button does not appear. See "[Re-subscribing to a Built-in Theme](#)."

4. Click **Apply Changes**.

11.2.1.5 Unsubscribing to a Theme

Unsubscribe from a theme to remove the subscription from all templates, styles, files and so on that are part of the theme.

**Note:**

Unsubscribing from a theme prevents future theme updates. Be aware that re-subscribing to a theme is multiple step process that involves copying and switching themes. To learn more, see "[Re-subscribing to a Built-in Theme](#)."

1. To unsubscribe from a theme:
1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.

The Themes page appears. A check mark in the Is Current column indicates which theme is selected.

2. Select the theme.

The Create/Edit Theme page appears.
3. Under Theme Subscription, click **Unsubscribe**.

A warning dialog displays.
4. Click **Unsubscribe Theme**.

11.2.1.6 Re-subscribing to a Built-in Theme

If a theme is currently unsubscribed, you can return to a subscribed version of this theme.

Re-subscribing to a theme is a multiple step process. First, you change the theme identification number. Second, you run the Create Theme Wizard and create the theme again. Third, you switch the current application to the use the new theme. Fourth, you delete the original theme.

1. To re-subscribe to a theme.
1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.

The Themes page appears. A check mark in the Is Current column indicates which theme is selected.

2. From the Tasks list, select **Change Identification Number** and change the theme to a new identification number. See "[Changing a Theme Identification Number](#)."
3. Run the Create Theme Wizard and create the theme again. See "[Accessing New Themes](#)."
4. Switch the current application to the use the new theme. See "[Switching Themes](#)."
5. Delete the original theme from which you created a new identification number. See "[Deleting a Theme](#)."

11.2.2 Accessing New Themes

Only themes currently associated with an application display on the Themes page. To access other themes, you run the Create Theme Wizard.

Once you create a theme, you can access it on the Themes page. You can create a theme from scratch or select an existing theme from the repository.



Tip:

When you create a new theme, the associated application automatically subscribes to it. See "[Managing Themes and Subscriptions](#)."

1. To access a new theme by running the Create Theme Wizard:
1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.

The Themes page appears. A check mark in the Is Current column indicates which theme is selected.

2. Click **Create**.
3. Select a creation method. Options include:
 - **From the Repository** - View and select a theme from the repository.
 - **As a copy from another application** - Select the application and then the theme.
 - **From Scratch** - Create a theme from scratch.
 - **From Export** - Create a theme to import from the export repository.
4. Follow the on-screen instructions.

To learn more about an attribute, see field-level Help.

 **See Also:**
["Editing Themes"](#)

11.2.3 Editing Themes

Review or edit a theme by updating theme attributes.

- [Editing a Theme](#)
- [Theme Attributes](#)

 **See Also:**
["Creating Custom Themes"](#)

11.2.3.1 Editing a Theme

1. To review or edit a theme:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. Click **Shared Components**.
 4. Under User Interface, select **Themes**.
The Themes page appears.
 5. On the Themes page, click the **View Report** icon.
The Themes page appears as a report. A check mark in the Is Current column indicates which theme is selected.
 6. Click the theme name.
The Create/Edit Theme page appears and is divided into sections.
 7. Edit the appropriate Theme attributes as described in "[Theme Attributes](#)."
 8. To save any changes, click **Apply Changes**.

11.2.3.2 Theme Attributes

Learn about Theme attributes available on the Create/Edit Theme Attributes page. To learn more about an attribute and view examples, see field-level Help.

- [Name](#)
- [Theme Subscription](#)
- [JavaScript and Cascading Style Sheets](#)
- [Component Defaults](#)
- [Region Defaults](#)

- [Dialog Defaults](#)
- [Transition Defaults](#)
- [Global Templates Options](#)
- [Icons](#)
- [Image](#)
- [Styles](#)
- [Files](#)

11.2.3.2.1 Name

[Table 11-1](#) describes the attributes under Name.

Table 11-1 Name

Attribute	Description
Application	Identifies the current application ID. See Also: "Editing the Application Definition"
Theme Number	Identifies the number of a theme. A theme is a collection of templates which define the user interface of an application.
Name	Enter a short descriptive name for the theme.
Navigation Type	Identifies the selected Navigation Type. Valid options include: Tabs or List. See Also: "Managing Tabs" and "Creating Lists"
Navigation Bar Implementation	Identifies the selected Navigation Bar Implementation. Valid options include: Classic or List. See Also: "Navigation Bar"
Description	Enter a description for the theme.

11.2.3.2.2 Theme Subscription

Displays themes to which this application subscribes. When an application subscribes to a theme, all theme attributes, subscribed template options, and subscribed templates are set to read-only.



See Also:

["Managing Theme Subscriptions"](#)

11.2.3.2.3 JavaScript and Cascading Style Sheets

[Table 11-2](#) describes the attributes under JavaScript and Cascading Style Sheets.

Table 11-2 JavaScript and Cascading Style Sheets

Attribute	Description
JavaScript File URLs	<p>Enter JavaScript file URLs for code to be loaded on every page. Each URL has to be written into a new line. If you provide a minified version of your file, you can use the substitution string #MIN# to include .min or #MIN_DIRECTORY# to include minified/ in your file URL for a regular page view and an empty string if the page is viewed in debug mode. JavaScript file URLs you enter here replaces the #THEME_JAVASCRIPT# substitution string in the page template</p> <p>To view examples, see field-level Help.</p>
CSS File URLs	<p>Enter Cascading Style Sheet file URLs to be loaded on every page. Each URL has to be written into a new line. If you provide a minified version of your file you can use the substitution string #MIN# to include .min or #MIN_DIRECTORY# to include minified/ in your file URL for a regular page view and an empty string if the page is viewed in debug mode. You also have access to the substitution string #APP_VERSION# if you want to include the application's version in the file URL. File URLs you enter here will replace the #THEME_CSS# substitution string in the page template.</p> <p>To view examples, see field-level Help.</p>

11.2.3.2.4 Component Defaults

[Table 11-3](#) describes the default templates by component type.

Table 11-3 Component Default Templates

Attribute	Description
Page	Identifies the default template for displaying pages. If a developer does not explicitly choose a template, then the Application Express engine uses the template specified here.
Navigation Bar List	Specifies the default navigation bar list template used when you define the navigation bar type as List in your application. If a developer does not explicitly choose a template, then the Application Express engine uses the template specified here.
Navigation Menu List Position	Specifies the default navigation menu list position.
Navigation Menu List (Top)	Specifies the default navigation menu list template used when you create a new list to be displayed on the top of the page.
Navigation Menu List (Side)	Specifies the default navigation menu list template used when you create a new list to be displayed on the side of the page.
Login Page	Specifies the default template for displaying pages. If a developer does not explicitly choose a template then the Application Express engine uses the template specified here.
Error Page	Optional. Specifies a page template to use for errors that display on a separate page as opposed to those that display inline. Leave this attribute blank if you do not wish to use a template designed to display errors. This setting only applies to Normal pages.

Table 11-3 (Cont.) Component Default Templates

Attribute	Description
Printer Friendly Page	Identifies the template to be used when the Application Express engine is in printer friendly mode. When calling the Application Express to render a page, you have the option to identify a printer friendly attribute with values of Yes or No . If you select Yes , then the page displays using a printer friendly template. The Application Express engine displays all text within HTML form fields as text. The printer friendly template does not need to have the #FORM_OPEN# or #FORM_CLOSE# tags. The objective is to be able to display information with few tables and in a format suitable for printing.
Breadcrumb	Identifies the default breadcrumb template used when you create a breadcrumb.
Button	Identifies the default button template used when you create a button.
Legacy Calendar	Specifies the default calendar template used when you create a calendar.
Default Label	Specifies the default label template used when you create new label
Optional Label	Specifies the default optional label template used when you create new label.
Page Template Options	Template options allow for selecting a number of CSS customization settings to be applied to the current page template. Template options and their corresponding CSS classes are defined at the page template level. The page template needs to have the substitution string #PAGE_CSS_CLASSES# defined in either the page header or body. The string #PAGE_CSS_CLASSES# is substituted for any manually entered page CSS classes, which are combined with the CSS classes defined by the selected template options.
Required Label	Specifies the default required label template used when you create new label.
List	Specifies the default list template used when you create a list.
Region	Specifies the default region template used when you create a region.
Classic Report	Identifies the default region template used when you create a report.
Header Toolbar	Identifies the default header toolbar region template used when you create a new page that includes a header or footer tool bars.
Footer Toolbar	Identifies the default header toolbar region template used when you create a new page that includes a header or footer tool bars.

11.2.3.2.5 Region Defaults

[Table 11-4](#) describes the default templates available under Region Defaults.

Table 11-4 Region Defaults

Attribute	Description
Breadcrumb	Identifies the default breadcrumb template used when you create a breadcrumb.
Charts	Specifies the default chart template used when you create a chart.
Forms	Specifies the default form template used when you create a form.
Lists	Specifies the default region template used when you create a list.

Table 11-4 (Cont.) Region Defaults

Attribute	Description
Reports	Specifies the default region template used when you create a report.
Tabular Forms	Specifies the default region template used when you create a tabular form.
Wizards	Specifies the default region template used when you create a new wizard component.
Interactive Reports	Specifies the default region template used when you create an interactive report

11.2.3.2.6 Dialog Defaults

[Table 11-5](#) describes the default templates available under Dialog Defaults.

Table 11-5 Dialog Defaults

Attribute	Description
Dialog Content Region	Specifies the default region template used when you create a content region on a Dialog using the Create Page Wizard and Create Application Wizard.
Dialog Button Region	Specifies the default region template used when you create a button region on a Dialog using the Create Page Wizard and Create Application Wizard.
Dialog Page	Specifies the default template for displaying modal or non-modal dialog pages. If a developer does not explicitly choose a template then the Application Express engine uses the template specified here. This template will also be used for errors that display on a separate page as opposed to those that display inline.

11.2.3.2.7 Transition Defaults

**Tip:**

The jQuery Mobile theme (Mobile - 51) has been desupported).

Transition Defaults is only visible for the jQuery Mobile theme. [Table 11-6](#) describes attributes available under Transition Defaults.

Table 11-6 Transition Defaults

Attribute	Description
Page Transition	Specifies the transition which should be used when navigating to a new page or when the page is getting submitted.
Popup Transition	Specifies the transition which should be used when a popup is opened.

11.2.3.2.8 Global Templates Options

Global template options are defined at the theme-level and are available for all components of a given type.



See Also:

"[Understanding Template Options](#)" and "[Managing Global Template Options](#)"

11.2.3.2.9 Icons

Table 11-7 describes attributes under Icons.

Table 11-7 Icons

Attribute	Description
Library	Select the icon library that is loaded when Oracle Application Express displays a page. The icons within the library are also be listed in the picker for Region and Button Icon CSS Classes, implemented within Page Designer.
Custom Library File URLs	Enter Cascading Style Sheet file URLs for custom icons to be loaded on every page. Each URL has to be written into a new line. If you provide a minified version of your file you can use the substitution string <code>#MIN#</code> to include <code>.min</code> or <code>#MIN_DIRECTORY#</code> to include <code>minified/</code> in your file URL for a regular page view and an empty string if the page is viewed in debug mode. You also have access to the substitution string <code>#APP_VERSION#</code> if you want to include the application's version in the file URL. File URLs you enter here will replace the <code>#THEME_CSS#</code> substitution string in the page template. To view examples, see field-level Help.
Custom Classes	Specify a comma delimited list of CSS class names which is listed in the picker for Region and Button Icon CSS Classes, implemented within Page Designer.
Custom Prefix Class	Specify a CSS class that will at runtime prefix the Icon CSS Classes defined for Regions, Buttons and Lists, if they are not using a class of the Icon Library.
Date Picker Icon Name	Enter the name and location of the image to be used when items of type Date Picker are displayed. For example: <code>#IMAGE_PREFIX#new_cal.bmp</code>
Date Picker Icon Attributes	Enter the image attributes for the Calendar Icon. For example: <code>width="16" height="16" alt="Display Calendar"</code>

11.2.3.2.10 Image

Use the **Custom Image** attribute to specify whether this theme uses a default theme image or an uploaded theme image. Select **On** or **Off**.

11.2.3.2.11 Styles

Displays theme styles available to the current theme. Theme Styles define the CSS for your application's theme and control the user interface of your application. Theme styles are referenced in the page template using the `#THEME_STYLE_CSS#` substitution string. The Theme Style currently used displays a check mark under **Is Current**.



See Also:

["Using Theme Styles"](#)

11.2.3.2.12 Files

The **File Prefix** attribute displays the virtual path the Web server uses to point to the files of the theme. Do not specify anything to reference files which are stored with your theme definition in the database. For performance reasons you can also store your theme files on your Web Server. Use `#IMAGE_PREFIX#` or any valid URL to reference them under Styles.



See Also:

["Managing Static Application Files"](#) and ["Managing Static Workspace Files"](#)

11.2.4 Switching Themes

Migrate an application to a new theme by running the Switch Theme Wizard.

- [About Switching the Active Theme](#)
Switching to another theme, assigns all components with assigned templates to corresponding templates in the new theme.
- [Switching an Active Theme](#)
Run the Switch Theme Wizard to migrate an application to a new theme.

11.2.4.1 About Switching the Active Theme

Switching to another theme, assigns all components with assigned templates to corresponding templates in the new theme.

App Builder accomplishes template mapping through the assignment of template class identifiers.

When switching an active theme, remember:

- You can only switch to a theme if the theme exists. For example, before you can switch to a theme available in the repository, you must first create it. See ["Accessing New Themes"](#).
- If the wizard locates multiple matches (that is, when several templates share the same template type and templates class), the wizard defaults to a template matching type,

class, and name. If no match is found, you must select another template with the same type and class.

- If no matching template is found (that is, no template with the same type and class exists) then you are prompted to select a template with the same type but with a different class. Then, a warning displays explaining this issue might lead to problems with page functionality, or issues with the page display. When no template of the same template type exists, then the theme cannot be switched. You are blocked from switching themes.

11.2.4.2 Switching an Active Theme

Run the Switch Theme Wizard to migrate an application to a new theme.

To complete this procedure, you must have at least two themes installed. If you do not have at least two themes installed, on the Themes page click **Create Theme**. You can create a theme from scratch or simply select an existing theme from the repository. See "[Accessing New Themes](#)."

Tip:

Before starting this procedure, Oracle recommends creating back up your application by either exporting the application or creating a copy.

1. To switch an active theme:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.

The Themes page appears. A check mark in the Is Current column indicates which theme is selected.

2. Click **Switch Theme**.

The Switch Theme page appears.
3. For Identify Theme:
 - a. Currently Active Theme - Select the current theme for the application. A theme identifies a collection of templates which define the look and feel of the application.
 - b. Switch to Theme - Select the new theme for the application.
 - c. Click **Next**.

The Verify Compatibility page appears.

4. Review the Status column to identify problematic mappings:
 - A **check** indicates the mapping was successful.
 - A **warning** indicates there are more than one template in the theme you are switching to with the identified class. The warning provides a select list from which to choose the appropriate template.

- An **error** indicates that App Builder was unable to map the class among the themes. Ensure that a class is identified for the templates in both themes.

 **Note:**

Failure to resolve warnings may result in a loss of functionality and applications that do not display well.

5. Click **Next** to continue.
6. Click **Switch Theme**.

 **See Also:**

- ["Refreshing the Universal Theme"](#)
- ["Exporting an Application"](#)
- ["Copying a Database Application"](#)

11.2.5 Changing a Theme Identification Number

Use the Change Theme ID utility to change a theme ID to another identification number.

Each theme has an identification number (ID). Changing a theme ID is useful when you want to export a theme with a different number and then import it into another application.

1. To change a theme identification number:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.The Themes page appears.
 2. On the Tasks list, click **Change Identification Number**.
 3. For Theme Number:
 - a. Identify Theme - Select a theme.
 - b. New Theme Identification Number - Specify an identification number.
 - c. Click **Next**.
 4. Confirm your changes and click **Change Theme ID**.

11.2.6 Copying a Theme

Copying a theme is useful when experimenting with editing a theme or to export a theme with a different ID.

Each theme is identified by a numeric identification number (ID). When you copy a theme, you specify a theme ID.

1. To copy a theme:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.The Themes page appears.
 2. On the Tasks list, click **Copy Theme**.
 3. For Theme Number:
 - a. Application - Identifies the current application.
 - b. Copy From Theme - Select the theme you want to copy.
 - c. Copy to this Theme ID - Enter a new ID for the theme.
 - d. Subscribe Theme - Select **On** or **Off**.
 - e. Click **Next**.
 4. Confirm your changes and click **Copy Theme**.



See Also:

["Managing Theme Subscriptions"](#)

11.2.7 Deleting a Theme

Delete inactive themes.

When you delete a theme, App Builder only removes inactive templates.



Tip:

Themes are tied to an application. If you modify a theme, those changes only apply to the application being edited. If you delete a theme, any template modifications are lost. To keep template modifications, you must export the theme. See ["Exporting Themes."](#)

1. To delete an active theme:

1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.The Themes page appears.
2. On the Tasks list, click **Delete Theme**.
3. From Delete Theme, select the theme you want to delete and click **Next**.
4. Click **Delete Theme**.

11.2.8 Creating a Master Theme Application

Create a master theme application.

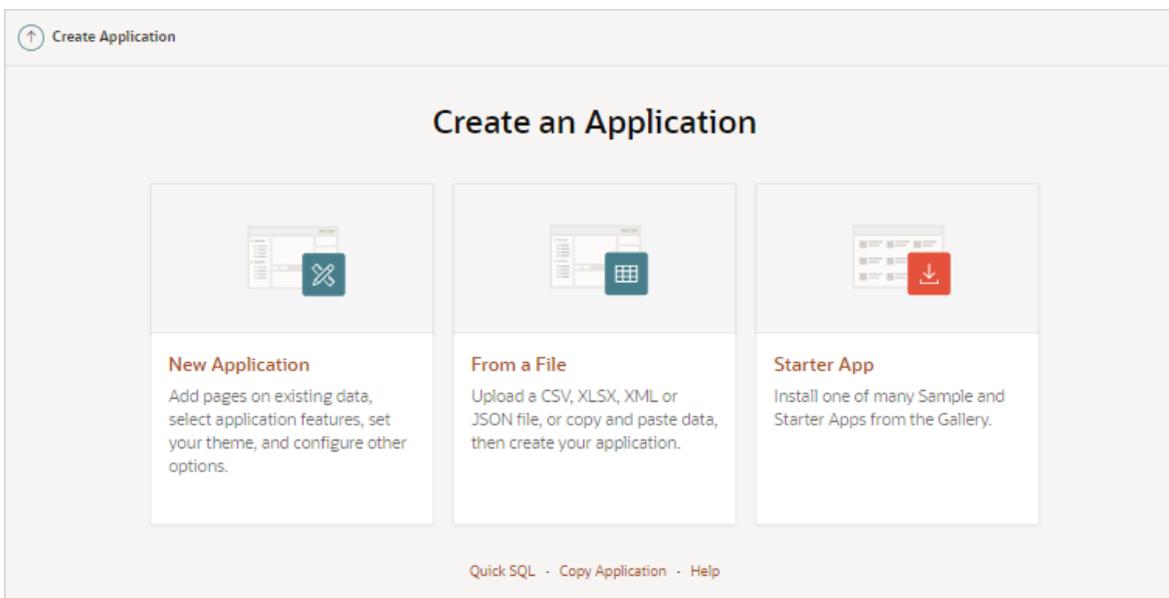
Oracle recommends starting with an existing productivity or sample application that uses *Universal Theme - 42* (for example, *Sample Database Application*).

- [Creating a Master Theme Application by Creating a New Application](#)
Create a master theme application by creating a new application.
- [Creating a Master Theme Application from an Existing Application](#)
Create a master theme application by copying an existing theme and subscribing to it and then switching to the new theme.

11.2.8.1 Creating a Master Theme Application by Creating a New Application

Create a master theme application by creating a new application.

1. To create a master theme application:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Click the **Create** button.The Create Application Wizard appears.



3. Select the **Copy Application** link at the bottom of the window and click **Next**.
4. For Identify Copy Target:
 - a. Copy From - Select an application that uses *Universal Theme - 42* (for example, select an existing productivity or sample application).
 - b. Copy To - Enter a short descriptive name for the application to distinguish the new application in select lists and reports.
 - c. New Application ID - Specify an integer value that identifies the application. The application ID must be unique within your Application Express instance. Application IDs in the range of 3000 to 9000 are reserved for internal use by Application Express
 - d. Copy Supporting Object Definitions - You can copy supporting object definitions, configuration options, and scripts with your application. Select **Yes** to include database object definitions, image definitions, and seed data SQL statements encapsulated in a single file. Select **No** to not include supporting object definitions.
5. Confirm your selection and click **Create Application**.

11.2.8.2 Creating a Master Theme Application from an Existing Application

Create a master theme application by copying an existing theme and subscribing to it and then switching to the new theme.

To create a master theme application from an existing application:

1. Copy the theme from an application that uses Universal Theme - 42 (for example, *Sample Database Application*) and subscribe to it. See "[Copying a Theme](#)."
2. Switch to the new theme. See "[Switching Themes](#)."
3. Follow the on-screen instructions.

11.2.9 Managing Workspace Themes

Workspace administrators manage the Theme repository for a workspace.

- [Adding a Workspace Theme to the Theme Repository](#)
Workspace administrators can add a theme to the Theme repository and make it available to all developers within a workspace.
- [Viewing an Existing Workspace Theme](#)
View existing Workspace themes on the Workspace Themes page.
- [Deleting a Workspace Theme](#)
Workspace administrators can delete workspace themes from the Theme repository .
- [Modifying a Workspace Theme](#)
Workspace administrators can modify a workspace theme by creating an application using the theme, modifying it, and then manually adding it to the workspace Theme repository
- [Exporting a Workspace Theme](#)
Export a theme in the same way you export any related application files.



See Also:

"Managing Public Themes" in *Oracle Application Express Administration Guide*

11.2.9.1 Adding a Workspace Theme to the Theme Repository

Workspace administrators can add a theme to the Theme repository and make it available to all developers within a workspace.

1. To add a theme to the Theme repository:
1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.

The Themes page appears.

2. On the Tasks list, click **Manage Workspace Themes**.
3. Select **Create Workspace Theme** and click **Next**.



Tip:

If no workspace themes exist, the wizard selects **Create** for you.

4. For Create Workspace Theme:
 - a. Application - Select the application.
 - b. Application Theme to Copy - Select the theme to copy to the workspace theme repository.

- c. **Subscribe Theme** - Select whether to subscribe the workspace theme to the selected application theme. This option enables you to refresh the workspace theme with changes made to the selected application theme.
 - d. Click **Next**.
 5.
 - a. **Theme Number** - Enter a number with a value greater than 100. This number uniquely identifies this theme within a workspace.
 - b. **Theme Name** - Enter a theme name. This name can be the same or different from the application theme name.
 - c. **Description** - Enter a description of the theme.
 - d. Click **Next**.
 6. Click **Create Workspace Theme**.

11.2.9.2 Viewing an Existing Workspace Theme

View existing Workspace themes on the Workspace Themes page.

1. To view an existing workspace theme:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.The Themes page appears.
 2. From the Tasks List, click **Manage Workspace Themes**.The Workspace Themes page appears.

 **Tip:**

You cannot edit a workspace theme directly. To modify a workspace theme, you must create an application using the theme, modify it, and then manually add it to the workspace theme repository. See "[Modifying a Workspace Theme](#)."

11.2.9.3 Deleting a Workspace Theme

Workspace administrators can delete workspace themes from the Theme repository .

1. To delete a workspace theme:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.

The Themes page appears.

2. From the Tasks List, click **Manage Workspace Themes**.

The Workspace Themes page appears.

3. Select the theme name.
4. Click **Delete**.
5. Confirm your delete request and click **OK**.

11.2.9.4 Modifying a Workspace Theme

Workspace administrators can modify a workspace theme by creating an application using the theme, modifying it, and then manually adding it to the workspace Theme repository

You cannot edit a workspace theme directly. To modify a workspace theme, you must create an application using the theme, modify it, and then manually add it to the Workspace Theme repository.

1. To modify a workspace theme:
 1. Create an application using the theme you want to modify. See "[Creating Database Applications](#)."
 2. Modify the theme. See "[Editing Themes](#)."
 3. Delete the existing workspace theme. See "[Deleting a Workspace Theme](#)."
 4. Add the modified theme to the Theme repository. See "[Adding a Workspace Theme to the Theme Repository](#)."

11.2.9.5 Exporting a Workspace Theme

Export a theme in the same way you export any related application files.

Exporting a workspace theme involves the following steps:

1. Create an application using the theme. See "[Creating Database Applications](#)."
2. Export the application. See "[Exporting an Application](#)."
3. Import the Export File into the target Oracle Application Express instance. See "[Importing an Application, Page or Component Export](#)."
4. If you did not install your Export File after importing, you can install them in the Export Repository. See "[Installing Export Files](#)."

11.2.10 Managing Instance Themes

Instance administrators manage the Theme repository for an entire Oracle Application Express instance. Only an Instance administrators can add or delete a theme from the repository.



See Also:

"Managing Public Themes" in *Oracle Application Express Administration Guide*

11.2.11 About Exporting and Importing Themes

Export a theme in the same way you export any related application files.

Exporting a theme from one development instance to another involves the following steps:

1. Create an application using the theme. See "[Creating Database Applications](#)."
2. Export the theme. See "[Exporting Themes](#)."
3. Import the exported file into the target Oracle Application Express instance. See "[Importing Export Files](#)."
4. Install the exported file from the Export Repository. See "[Installing Export Files](#)."

11.2.12 Viewing Theme Reports

Access the following reports to better manage themes and templates.

- [Viewing All Templates in a Theme](#)
- [Viewing Theme Template Counts](#)
- [Viewing File References](#)
- [Viewing Class References](#)
- [Viewing Template Substitution Strings](#)

11.2.12.1 Viewing All Templates in a Theme

1. To view all templates that comprise a theme:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.

The Themes page appears.

2. Click **Reports**.
3. On the Theme Reports page:
 - a. Report - Select **Application Templates**.
 - b. Theme - Select either **42. Universal Theme** or **All Themes**.
 - c. Click **Go**.

A list of templates appears with the template type, template name, theme, and template class.

4. To edit a template, select the template name.

11.2.12.2 Viewing Theme Template Counts

The Theme Template Count report lists which template classes currently have associated templates.

1. To view the Theme Template Count report:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.The Themes page appears.
 2. Click **Reports**.
 3. On the Theme Reports page:
 - a. Report - Select **Theme Template Counts**.
 - b. Theme - Select a theme or select **All**.
 - c. Click **Go**.

11.2.12.3 Viewing File References

The File References report displays a list of all files associated with templates, shared components, or page components in the current application.

1. To view the File References report:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.The Themes page appears.
 2. Click **Reports**.
 3. On the Theme Reports page:
 - a. Report - Select **File References**.
 - b. Theme - Select a theme or select **All**.
 - c. Click **Go**.
 4. On the File References page:
 - a. Show - Select the type of component to include in the report. If you do not make a selection, no results are returned.
 - b. Show Files - Select one of the following:
 - **With context** displays the component, the theme identification number, the component name, the image (if applicable), and the page number. Select the page number.

- **Without context** displays only the file name and the image (if applicable).
 - c. File Extensions - Select the type of extensions for which to search.
 - d. Click **Go**.
5. To download a comma-delimited file (.csv) version of this report, click **Download** at the bottom of the page.

11.2.12.4 Viewing Class References

The Class References report displays a list of classes associated with templates, shared components, or page components in the current application.

1. To view the Class References report:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.The Themes page appears.
 2. Click **Reports**.
 3. On the Theme Reports page:
 - a. Report - Select **Class References**.
 - b. Theme - Select a theme or select **All**.
 - c. Click **Go**.
 4. On the Class References page:
 - a. Show - Select the components to check for a class reference. If you do not make a selection, no results are returned.
 - b. Show Class Names - Select one of the following:
 - **With context** displays the component, the theme identification number, the component name, the image (if applicable), and the page number.
 - **Without context** displays only the referenced class.
 - c. Click **Go**.
 5. To download a comma-delimited file (.csv) version of this report, click **Download** at the bottom of the page.

11.2.12.5 Viewing Template Substitution Strings

Use the Template Substitution Strings report to view all supported substitution strings by component.

1. To view the Substitution String report:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.

- c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.
- The Themes page appears.
2. Click **Reports**.
 3. On the Theme Reports page:
 - a. Report - Select **Template Substitution Strings**.
 - b. Theme - Select which themes to include in the report.
 - c. Click **Go**.
 4. To link to a template definition, select the component name.

**See Also:**

["Using Substitution Strings"](#)

11.3 Creating Custom Themes

Create a custom theme by modifying existing templates.

The Application Express engine creates an application user interface based on a named collection of templates called a **theme**. Templates control the look and feel of the components in an application. If you must create a custom template, it is generally easier to start with an existing template and then modify it. Once you have created one or more default templates, you can modify those templates to fit your specific needs.

- [About Cascading Style Sheets](#)
A Cascading Style Sheet (CSS) provides a way to control the style of a web page without changing its structure.
- [About Calling the JavaScript File from the Page Template](#)
Reference a `.js` file in the page template.
- [About Using Escaping Syntax in Substitution Strings](#)
Use escaping syntax in substitution strings.
- [Selecting a Default Page Template](#)
Select a default page template by either selecting a default page template within a specific theme, or by selecting a specific page template on a page-by-page basis.
- [Creating a New Template](#)
To create a custom template, copy and then modify an existing template.
- [Using Template Options](#)
Template options provide a declarative way for developers to apply different styles to components on an Oracle Application Express page.
- [Viewing Template Reports](#)
View reports describing template utilization, subscriptions, published templates, and edit history.
- [Managing Templates](#)
Manage templates by navigating to the Templates page in Shared Components.

- [Breadcrumb Templates](#)
Breadcrumb templates control the display of breadcrumb entries.
- [Button Templates](#)
Customize the look and feel of a button using button templates. Button templates are optional.
- [Legacy Calendar Templates](#)
Control the appearance and placement of a legacy calendar using legacy calendar templates.
- [Label Templates](#)
Centrally manage HTML markup of page item labels using label templates.
- [List Templates](#)
Control the appearance of a list using list templates.
- [Page Templates](#)
Define the appearance of a page using page templates.
- [Popup LOV Templates](#)
Use Popup LOV templates control how popup lists display for all items defined as POPUP.
- [Region Templates](#)
Region templates control the appearance and placement of region attributes.
- [Report Templates](#)
Report column templates provide you with control over the results of a row from a SQL query. This type of template defines a cell, not an entire row.



See Also:

"Using Themes," "Managing Themes and Subscriptions," and "Managing Theme Subscriptions"

11.3.1 About Cascading Style Sheets

A Cascading Style Sheet (CSS) provides a way to control the style of a web page without changing its structure.

When used properly, a CSS separates visual attributes such as color, margins, and fonts from the structure of the HTML document. Oracle Application Express includes themes that contain templates that reference their own CSS. The style rules defined in each CSS for a particular theme also determine the way reports and regions display.

When using built-in themes, you can find the theme specific CSS files in the following locations:

```
/i/themes/theme_xx  
/i/themes/theme_xx/css
```

Theme specific image can be found in the following locations:

```
/i/themes/theme_xx  
/i/themes/theme_xx/images
```

Where `xx` is the theme number. Theme specific CSS files include the Oracle Application Express version number to preserve backward compatibility for imported applications using older versions of a theme.

**See Also:**

["Using Custom Cascading Style Sheets"](#)

11.3.2 About Calling the JavaScript File from the Page Template

Reference a `.js` file in the page template.

Referencing a `.js` file in the page template makes all the JavaScript in that file accessible to the application. This is the most efficient approach since a `.js` file loads on the first page view of your application and is then cached by the browser.

**See Also:**

["JavaScript"](#)

11.3.3 About Using Escaping Syntax in Substitution Strings

Use escaping syntax in substitution strings.

Developers can append an exclamation mark (!) followed by a predefined filter name to substitution strings to escape special characters in the substitution value. Output escaping is an important security technique to avoid Cross Site Scripting (XSS) attacks in the browser.

**See Also:**

["Controlling Output Escaping in Substitution Strings"](#)

11.3.4 Selecting a Default Page Template

Select a default page template by either selecting a default page template within a specific theme, or by selecting a specific page template on a page-by-page basis.

By default, the Application Express engine uses the Page template specified on the Themes page.

- [Selecting a Page-level Template Within a Theme](#)
- [Selecting a Page-level Template for a Specific Page](#)

11.3.4.1 Selecting a Page-level Template Within a Theme

1. To specify a default page template within a theme:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.The Themes page appears.
 2. Select a theme name.
The Create/Edit Theme page appears.
 3. Scroll down to Component Defaults.
 4. From Page, make a new selection.
 5. Click **Apply Changes** at the top of the page.

 **See Also:**
["Editing Themes"](#)

11.3.4.2 Selecting a Page-level Template for a Specific Page

1. To specify a page-level template for a specific page:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select the application.
 3. Select the application page.
Page Designer displays the page.
 4. To edit the page-level template:
 - a. In the Rendering tab, click the page title.
 - b. In the Property Editor, locate the **Appearance**. From Page Template, select a new template.
 - c. Click **Save**.

11.3.5 Creating a New Template

To create a custom template, copy and then modify an existing template.

Once you have created one or more default templates, you can modify those templates to fit your specific needs.

1. To create a custom template:
 1. On the Workspace home page, click the **App Builder** icon.

2. Select the application to which you want to copy the template.
3. Click **Shared Components**.
4. Under User Interface, select **Templates**.
5. Click **Create**.
6. Select the type of template you want to create and click **Next**.
7. Select a creation method:
 - **From Scratch**
 - **As a Copy of an Existing Template**
8. Follow the on-screen instructions.

**Tip:**

Make sure you associate your template with the correct theme.

11.3.6 Using Template Options

Template options provide a declarative way for developers to apply different styles to components on an Oracle Application Express page.

- [Managing Global Template Option Groups](#)
Developers can define the purpose of related template options by creating template option groups. Examples of template option groups include Button Size, Button Style, List Examples, List Style, and Form Label Position.
- [Managing Global Template Options](#)
Global template options are defined at the theme-level.
- [Managing Template Options](#)
Template options enable developers to declaratively apply CSS modifiers to the templates they have chosen for pages, regions, reports, lists, breadcrumbs, items and buttons.

**See Also:**

["Understanding Template Options"](#) and ["About Template Option Groups and Presets"](#)

11.3.6.1 Managing Global Template Option Groups

Developers can define the purpose of related template options by creating template option groups. Examples of template option groups include Button Size, Button Style, List Examples, List Style, and Form Label Position.

- [Creating a Global Template Option Group](#)
Global template option groups are defined at the theme-level and are available for all components of a given type.

- [Editing Global Template Option Groups](#)
Edit global template option groups by navigating to the Themes page.



See Also:

"[About Template Option Groups and Presets](#)" and "[Understanding Template Options](#)"

11.3.6.1.1 Creating a Global Template Option Group

Global template option groups are defined at the theme-level and are available for all components of a given type.

When developers create a template option group, they can specify a template option preset at the template-level. For example, suppose you have a button template that has the template options Large and Small. If you define Small as the preset, then any new button referencing the template would automatically have the template option Small applied to it when it is created. Template options that are part of a group are optional unless defined at the template-level.

1. To create a global template option group:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.

The Themes page appears.

2. Select a theme.
3. Locate **Global Template Options**.
4. Click **Edit Template Option Groups**.
Template Options Groups dialog appears.
5. To create a group:
 - a. Click **Create**.
 - b. Edit the appropriate attributes.
To learn more about an attribute, see field-level Help.
 - c. Click **Create**.

11.3.6.1.2 Editing Global Template Option Groups

Edit global template option groups by navigating to the Themes page.

1. To edit global template option groups:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.

2. Select a theme.
3. Locate **Global Template Options**.
4. Click **Add Template Option**.
Template Options Groups dialog appears.
5. On Template Options:
 - a. Display Sequence - Specify the sequence for this option.
 - b. Template Type - Select the type of template for which the template option is defined.
 - c. Group - Enter a unique group name. Group names enable you to group template options and avoid the selection of conflicting option.
 - d. Display Name - Enter a name for the template option.
 - e. Option Identifier - Enter an alphanumeric, upper case identifier for the template option. Identifiers map a template option to a corresponding template option when switching themes.
 - f. CSS Classes - Enter one or more CSS classes that define this template option.
 - g. Help Text - Enter a description of the template option.
 - h. Click **Create** or **Create and Add Another**.

11.3.6.2.2 Editing Global Template Options

Edit existing global template options on the Themes page under Global Template Options.

1. To edit a global template option:
 1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Themes**.The Themes page appears.
 2. Select a theme.
 3. Locate **Global Template Options**.
 4. To edit a template option:
 - a. Click the display name.
 - b. Edit the appropriate attributes. To learn more about an attribute, see field-level Help.

 **WARNING:**

If you edit the name of a CSS class, all components that reference that CSS class name must be updated manually. The Option Identifier cannot be modified since it is needed for mapping purposes.

- c. Click **Apply Changes**.
5. To delete a template option:
 - a. Click the display name.
 - b. Click **Delete**.

11.3.6.3 Managing Template Options

Template options enable developers to declaratively apply CSS modifiers to the templates they have chosen for pages, regions, reports, lists, breadcrumbs, items and buttons.

- [Creating Template Options](#)
Create a template option by declaratively modifying a template.
- [Editing Template Options](#)
Edit an existing template option on the Templates page.
- [Using Quick Edit to Modify Live Template Options](#)
Using the Live Template Options dialog to alter a component's template options without refreshing the page.

**See Also:**

["Understanding Template Options"](#)

11.3.6.3.1 Creating Template Options

Create a template option by declaratively modifying a template.

1. To create a template option:
 1. Navigate to the Templates page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Templates**.

The Templates page appears.

2. Select a template.
3. Select **Template Options**.
4. Click **Add Template Option**.
5. Edit the appropriate attributes. To learn more about an attribute, see field-level Help.

6. Click **Create** or **Create and Add Another**.

11.3.6.3.2 Editing Template Options

Edit an existing template option on the Templates page.

1. To edit a template option:
 1. Navigate to the Templates page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Templates**.

The Templates page appears.

2. Select a template.
3. Select **Template Options**.
4. Edit the appropriate attributes and click **Apply Changes**.

To learn more about an attribute, see field-level Help.

 **Tip:**

If you edit the name of a CSS class, all components that reference that CSS class name must be updated manually. The Option Identifier cannot be modified since it is needed for mapping purposes.

5. To delete a template option, click **Delete**.
6. To view global template options, expand **Global Template Options**.

11.3.6.3.3 Using Quick Edit to Modify Live Template Options

Using the Live Template Options dialog to alter a component's template options without refreshing the page.

Developers can also use Quick Edit on the Runtime Developer toolbar to access the Live Template Options dialog. Using the Live Template Options dialog, developers can alter component's template options without refreshing the page.

1. To access the Live Template Options:
 1. Run the page.
 2. From the Runtime Developer toolbar, click **Quick Edit**.
 3. Move the mouse over the component for which you want to modify template options. Click the **Wrench** icon in the upper right corner.

Sample Database Application - Customer Details

* First Name 

* Last Name

Street Address Line 2

City * State

* Zip Code

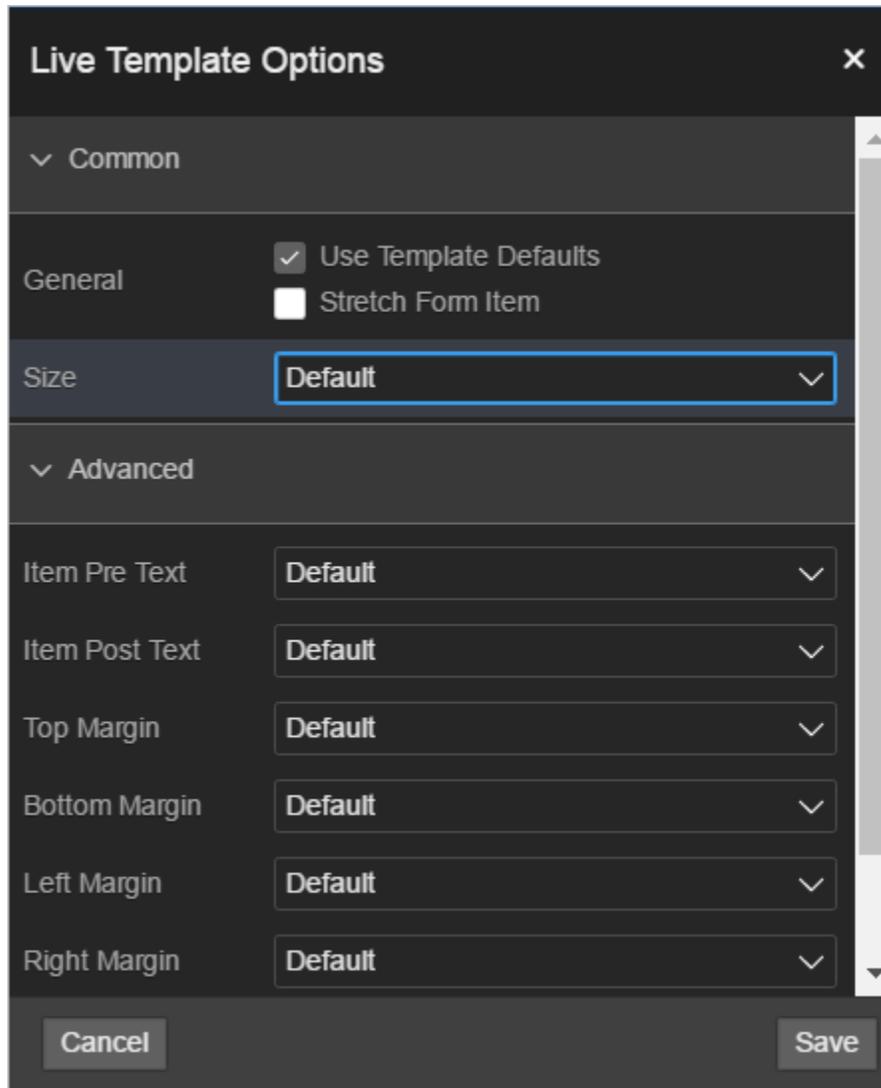
* Credit Limit

Phone Number Alternate Number

Email URL

Tags

The Live Template Options dialog appears. For region-based components, such as lists and classic reports, the dialog includes an Attributes tab.



4. Select the appropriate tab, edit the appropriate attributes, and click **Save**.



See Also:

["Runtime Developer Toolbar"](#)

11.3.7 Viewing Template Reports

View reports describing template utilization, subscriptions, published templates, and edit history.

1. To view template reports for the current application:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. Click **Shared Components**.

4. Under User Interface, select **Templates**.

The Templates page displays as an interactive report. To customize the view, use the Search bar at the top of the page.

5. To view template reports, click the following tabs:
 - **Subscription** - Displays subscribed templates in your application.
 - **Publish** - displays templates that have been subscribed to by other templates in your workspace. To publish master template content to subscribing templates, select those you want to publish and click Publish Checked.
 - **Utilization** - Displays template utilization in the current application for all template types. The number in the References column indicates the total number of pages that use the specific template.
 - **History** - Displays recent modifications made to Page and Region Templates in this application.

11.3.8 Managing Templates

Manage templates by navigating to the Templates page in Shared Components.

- [Viewing Templates on the Templates Page](#)
View templates on the Templates page in Shared Components
- [Viewing Templates Associated with a Specific Page](#)
View templates associated with a page by viewing the Page Designer.
- [Replacing Templates](#)
Update the template associated with a component using the Replace Templates Wizard.
- [Replacing All Templates within an Application](#)
Replace all templates within an application with templates from another application.
- [Viewing Region Position Utilization by Page Template](#)
View region position utilization by page template.
- [Unsubscribing to Templates](#)
Unsubscribe to templates.
- [Publishing Templates](#)
Publish master template content to subscribing templates.



See Also:

["Viewing All Templates in a Theme"](#)

11.3.8.1 Viewing Templates on the Templates Page

View templates on the Templates page in Shared Components

1. To view existing templates:
 1. Navigate to the Templates page:
 - a. On the Workspace home page, click the **App Builder** icon.

- b. Select an application.
- c. Click **Shared Components**.
- d. Under User Interface, select **Templates**.

The Templates page appears.

2. To view or edit a template definition, click the template name.

The template definition appears.

3. Edit the appropriate attributes. To learn more about an attribute, see field-level Help.

If you edit a template, you can make changes in one window and run your application in another by selecting the **Return to Page** check box on the right side of the template definition page. Selecting this check box keeps the page you are editing current after you click Apply Changes.

4. Click **Apply Changes**.

11.3.8.2 Viewing Templates Associated with a Specific Page

View templates associated with a page by viewing the Page Designer.

1. To view templates associated with a specific page:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. View the page in Page Designer:
 - a. In the Rendering tab, click the page title.
 - b. In the Property Editor, locate **Appearance. Page Template** displays the current template.
 - c. To save any changes, click **Save**.



See Also:

["Viewing a Page in Page Designer"](#)

11.3.8.3 Replacing Templates

Update the template associated with a component using the Replace Templates Wizard.

1. To replace the template associated with a component:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select the application.
 3. Click **Shared Components**.
 4. Under User Interface, select **Templates**.

To customize the view, use the Search bar at the top of the page.

5. From the Task list, select **Replace Templates**.
6. For Template Type:
 - a. User Interface- Select user interface.
 - b. Template Type - Identifies the template type to be replaced.
 - c. Click **Next**.
7. For Replace Templates:
 - a. Change From - Select the template you want to change.
 - b. Change To - Select the template you want to change to.
 - c. Click **Next**.
8. Click **Finish**.

11.3.8.4 Replacing All Templates within an Application

Replace all templates within an application with templates from another application.

1. To replace all templates within an application:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select the application.
 3. Click **Shared Components**.
 4. Under User Interface, select **Templates**.
To customize the view, use the Search bar at the top of the page.
 5. From the Task list, select **Replace templates in this application with templates from another application**.
 6. For Replace Templates:
 - Replace from Application - Select an application.
 - User Interface - Select the type of user interface for which this application has been developed.
 - Click **Next**.
 7. On Replace Templates, select a New Template for each component and then select an Action:
 - **Replace** copies the template definition
 - **Replace/Subscribe** copies the templates and adds a subscription.
 8. Click **Replace Templates**.

11.3.8.5 Viewing Region Position Utilization by Page Template

View region position utilization by page template.

Regions are organized on a page by position (or Display Point). The possible display points for a region are determined by the page-level template.

1. To view region position utilization by page template:
 1. On the Workspace home page, click the **App Builder** icon.

2. Select the application.
3. Click **Shared Components**.
4. Under User Interface, select **Templates**.
To customize the view, use the Search bar at the top of the page.
5. From the Task list, select **View page template region position utilization**.
The Region Display Point Utilization report appears.

11.3.8.6 Unsubscribing to Templates

Unsubscribe to templates.

A subscribed template is a template that has its definition maintained in another template referred to as the referenced template. If your application uses subscribed templates, you can unsubscribe to templates on the Unsubscribe Templates page.

1. To unsubscribe to templates:
 1. Navigate to the Templates page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Templates**.
The Templates page appears.
 2. From the Task list, select **Unsubscribe Templates**.
The Unsubscribe Templates page appears.
 3. Select a theme.
 4. To unsubscribe to a specific template type within the current theme, select the template type and click **Unsubscribe**.

11.3.8.7 Publishing Templates

Publish master template content to subscribing templates.

Use the Publish Templates page to view templates that are subscribed to by other templates in your workspace.

1. To publish master template content:
 1. Navigate to the Templates page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under User Interface, select **Templates**.
The Templates page appears.
 2. Click the **Publish** tab.
The Published Templates page appears.

3. Select those you want to publish and click **Publish Checked**.

11.3.9 Breadcrumb Templates

Breadcrumb templates control the display of breadcrumb entries.

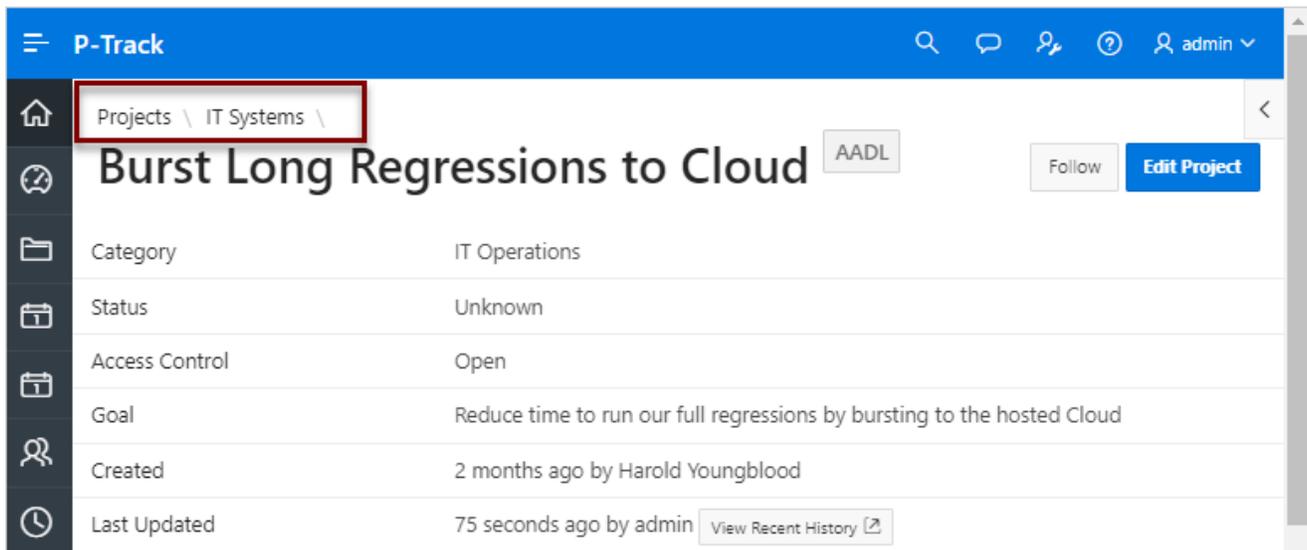
 **See also:**
"Using Themes"

- [About Breadcrumb Style Navigation](#)
Breadcrumbs provide users with hierarchical navigation and can be displayed as a list of links or as a breadcrumb path.
- [Breadcrumb Template Attributes](#)
This section describes common breadcrumb template attributes.

11.3.9.1 About Breadcrumb Style Navigation

Breadcrumbs provide users with hierarchical navigation and can be displayed as a list of links or as a breadcrumb path.

You select a breadcrumb template when you create a region. Breadcrumbs usually indicate where the current page is relative to other pages in the application. Users can click a specific page to instantly view it. The following is an example of breadcrumb navigation in *Sample Database Application*.



The screenshot shows a web application interface with a blue header bar labeled "P-Track". The breadcrumb path "Projects \ IT Systems \ " is highlighted with a red box. Below the breadcrumb, the main content area displays "Burst Long Regressions to Cloud" with a table of details.

Category	IT Operations
Status	Unknown
Access Control	Open
Goal	Reduce time to run our full regressions by bursting to the hosted Cloud
Created	2 months ago by Harold Youngblood
Last Updated	75 seconds ago by admin View Recent History

**See Also:**["Creating Breadcrumbs"](#)

11.3.9.2 Breadcrumb Template Attributes

This section describes common breadcrumb template attributes.

- [Name](#)
- [Definition](#)
- [Substitution Strings](#)

11.3.9.2.1 Name

Name identifies the name of the template. Use the **Translatable** check box to indicate that the template contains text strings that require translation. **Theme** indicates the theme to which the template is a member. **Template Class** identifies a specific use for the template. When you switch to a theme, all templates in one theme are mapped to corresponding templates in another theme. App Builder accomplishes this template mapping through the assignment of a template class.

11.3.9.2.2 Definition

Definition attributes control how a breadcrumb displays [Table 11-8](#) describes Definition attributes.

Table 11-8 Definition attributes

Attribute	Description
Before First	Defines text that displays before the first breadcrumb entry. Use the substitution string <code>#COMPONENT_CSS_CLASSES#</code> to apply a CSS class to your breadcrumb template. You edit component CSS classes by editing the region attributes. See Also: "Editing Region Attributes "
Current Page Breadcrumb Entry	Defines the look of a breadcrumb entry that corresponds to the current page.
Non Current Page Breadcrumb Entry	Defines the look of a breadcrumb entry that does not correspond to the current page.
After Last	Defines text that displays after the last breadcrumb entry.
Between Level	Defines text that displays between levels of breadcrumb entries.
Maximum Levels	Specifies the number of levels that appear when displaying breadcrumbs in a breadcrumb style.

11.3.9.2.3 Substitution Strings

Substitution strings are used within subtemplates to reference component values. [Table 11-9](#) describes the available button template substitution strings.

**Tip:**

All template substitution strings must be in uppercase letters and begin and end with a number sign (#). To view a report of substitution strings supported by a given template, see the Substitution Stings section of the Edit Breadcrumb Template page.

Table 11-9 Breadcrumb Template Substitution Strings

Referenced From	Substitution String	Description
Before First	#COMPONENT_CSS_CLASSES#	Component CSS classes. The #COMPONENT_CSS_CLASSES# string must be included in the before-first attribute for templates that have template options defined. The #COMPONENT_CSS_CLASSES# string is where the corresponding template option classes are injected at runtime.
Current Entry	#LINK#	URL Link.
Current Entry	#LONG_NAME#	Breadcrumb Long Name.
Current Entry	#NAME#	Breadcrumb Label.
Current Entry	#NAME_ESC_SC#	Breadcrumb Label (escaping HTML characters).
Non Current Entry	#LINK#	URL Link.
Non Current Entry	#LONG_NAME#	Breadcrumb Long Name.
Non Current Entry	#NAME#	Breadcrumb Label.
Non Current Entry	#NAME_ESC_SC#	Breadcrumb Label (escaping HTML characters).

11.3.10 Button Templates

Customize the look and feel of a button using button templates. Button templates are optional.

- [Button Template Attributes](#)

11.3.10.1 Button Template Attributes

You can use multiple images or HTML tags to build a button. This section describes common button template attributes.

- [Name](#)
- [Definition](#)
- [Substitution Strings](#)

11.3.10.1.1 Name

Template Name identifies the name of the template. Use the **Translatable** check box to indicate if the template contains text strings that require translation. **Theme** indicates the theme to which the template is a member.

Template Class identifies a specific use for the template. When you switch to a theme, all templates in one theme are mapped to corresponding templates in another theme. App Builder accomplishes this template mapping through the assignment of a template class.

11.3.10.1.2 Definition

Normal Template defines the button template that displays if the button type is **Normal**. For example, `&ITEM_NAME`. values can be substituted at rendering time. **Hot Template** defines the button template that displays if the button type is **Hot**. You have the option of including standard application substitutions. For example, `&ITEM_NAME`. values can be substituted at rendering time.

To learn more about supported substitution strings, see field-level Help.



Tip:

All substitution string must be in uppercase.

11.3.10.1.3 Substitution Strings

Substitution strings are used within subtemplates to reference component values. [Table 11-10](#) describes the available button template substitution strings.



Tip:

All template substitution strings must be in uppercase letters and begin and end with a number sign (#). To view a report of substitution strings supported by a given template, see the Substitution Stings section of the Edit Page Template page.

Table 11-10 Button Template Substitution Strings

Referenced From	Substitution String	Description
Hot Template	<code>#BUTTON_ATTRIBUTES#</code>	Button attributes.
Hot Template	<code>#BUTTON_CSS_CLASSES#</code>	Button CSS classes. You must include the <code>#BUTTON_CSS_CLASSES#</code> string for templates that have template options defined. The <code>#BUTTON_CSS_CLASSES#</code> string is where the corresponding template option classes are injected at runtime.
Hot Template	<code>#BUTTON_ID#</code>	Generated button ID will be either the button's Static ID if defined, or if not will be an internally generated ID in the format 'B' [Internal Button ID].
Hot Template	<code>#ICON_CSS_CLASSES#</code>	Icon CSS classes.
Hot Template	<code>#JAVASCRIPT#</code>	Used in an onclick attribute.
Hot Template	<code>#LABEL#</code>	Button label.
Hot Template	<code>#LINK#</code>	To be used in a href attribute.

Table 11-10 (Cont.) Button Template Substitution Strings

Referenced From	Substitution String	Description
Template	#BUTTON_ATTRIBUTES#	Button attributes.
Template	#BUTTON_CSS_CLASSES#	Button CSS classes. You must include the #BUTTON_CSS_CLASSES# string for templates that have template options defined. The #BUTTON_CSS_CLASSES# string is where the corresponding template option classes are injected at runtime.
Template	#BUTTON_ID#	Generated button ID will be either the button's Static ID if defined, or if not will be an internally generated ID in the format 'B' [Internal Button ID].
Template	#ICON_CSS_CLASSES#	Icon CSS classes.
Template	#JAVASCRIPT#	Used in an onclick attribute.
Template	#LABEL#	Button label.
Template	#LINK#	To be used in a href attribute.

11.3.11 Legacy Calendar Templates

Control the appearance and placement of a legacy calendar using legacy calendar templates.

Calendar templates frequently use HTML tables to arrange dates. You place calendar attributes using substitution strings such as #DD# and #MONTH#.

- [Supported Legacy Calendar Template Substitution Strings](#)
- [Legacy Calendar Template Attributes](#)



See Also:

["Managing Legacy Calendars"](#)

11.3.11.1 Supported Legacy Calendar Template Substitution Strings

A list of supported substitution strings appears on the right side of the Edit Calendar Template page. Note that template substitution strings must be in uppercase letters and begin and end with a number sign (#).

11.3.11.2 Legacy Calendar Template Attributes

This section describes sections of the Edit Calendar Template page.

- [Name](#)
- [Subscription](#)
- [Comments](#)

11.3.11.2.1 Name

Name identifies the name of the template. Use the **Translatable** check box to indicate if the template contains text strings that require translation. **Theme** indicates the theme to which the template is a member.

Template Class identifies a specific use for the template. When you switch to a theme, all templates in one theme are mapped to corresponding templates in another theme. App Builder accomplishes this template mapping through the assignment of a template class.

11.3.11.2.2 Subscription

Use Subscription to apply an existing template to the current application.

Use **Reference Master Label Template From** to select an existing template in this workspace or another template in your workspace's schema. By selecting an existing template, you become a subscriber to that template.

To load a copy of a master template, click **Refresh**.

11.3.11.2.3 Comments

Use this attribute to record comments about this component.

Monthly Calendar, Weekly Calendar, Daily Calendar, Custom Calendar and List Calendar

Use the Monthly Calendar, Weekly Calendar, Daily Calendar, and List Calendar attributes to control the appearance and placement of specific calendars.

11.3.12 Label Templates

Centrally manage HTML markup of page item labels using label templates.

Every item can have an optional label. You can control how these labels display using label templates. For example, you could create a label template called Required Field that references an image (such as an asterisk) to indicate to the user that the field is required.

Label templates also enable you to define a before-and-after text string that gets prepended and appended to the item.

- [Label Template Attributes](#)
- [About Using #CURRENT_ITEM_HELP_TEXT# to Create Item Help](#)

11.3.12.1 Label Template Attributes

This section describes attributes on the Edit Label Template page. To learn more about a specific attribute, see field-level Help.

- [Name](#)
- [Definition](#)
- [Error Display](#)

- [Field Container](#)
- [Substitution Strings](#)

11.3.12.1.1 Name

Template Name identifies the name of the template. Use the **Translatable** check box to indicate that the template contains text strings that require translation. **Theme** indicates the theme to which the template is a member.

Template Class identifies a specific use for the template. When you switch to a theme, all templates in one theme are mapped to corresponding templates in another theme. App Builder accomplishes this template mapping through the assignment of a template class.

11.3.12.1.2 Definition

Definition attributes include:



Tip:

For a list of supported substitution strings and to view examples, see field-level Help.

- **Before Label** - Enter HTML to display before the item label. The `#ITEM_CSS_CLASSES#` substitution string must be included for templates that have template options defined.
- **After Label** - Enter HTML to display after the item label. Since the label automatically displays before the HTML in this region, any open HTML tags in the Before Label region should be closed.
- **Before Item** - Enter HTML to be displayed directly before the form item. This is typically used to wrap an item into a DIV container or to display a help button before or after the form item.
- **After Item** - Enter HTML to be displayed directly after the form item. This is typically used to wrap an item into a DIV container or to display a help button before or after the form item.
- **Item Pre Text** - Enter HTML for the Item Pre Text subtemplate to format the content stored as Pre Text in the item attributes. This subtemplate can be referenced in the **Before Element** template with the `#ITEM_PRE_TEXT#` substitution.
- **Item Post Text** - Enter HTML for the Item Post Text subtemplate to format the content stored as Post Text in the item attributes. This subtemplate can then be referenced in the **After Element** template with the `#ITEM_POST_TEXT#` substitution.
- **Help Template** - The help sub template enables developers to define the link or button used to invoke the item level help. This sub template is only rendered for items that have help defined. See "[About Using #CURRENT_ITEM_HELP_TEXT# to Create Item Help.](#)"
- **Inline Help Template** - The help sub template enables developers to define inline help text to be displayed immediately with the item. This sub template is only rendered for items that have inline help text defined.

11.3.12.1.3 Error Display

Error Display attributes include:

 **Tip:**

For a list of supported substitution strings and to view examples, see field-level Help.

- **On Error Before Label** - Enter HTML to precede the item label when an application displays an inline validation error message for the item.
- **On Error After Label** - Enter HTML to be appended to the item label when an application displays an inline validation error message for the item.
- **Error Template** - Enter the HTML rendered to display the inline validation error message. Use the `#ERROR_MESSAGE#` substitution string to reference the message text. The error template can be included in the before and after item attributes using the `#ERROR_TEMPLATE#` substitution string.

11.3.12.1.4 Field Container

Field Container attributes include:

 **Tip:**

For a list of supported substitution strings and to view examples, see field-level Help.

- **Before Label and Item** - Enter HTML to be displayed before the label and item. This is typically used to wrap an item into a DIV container or field set. The Before Label and Item attribute is only rendered for pages that do not use a table grid to display form items. This includes any page using a mobile page template.
- **After Label and Item** - Enter HTML to be displayed after the label and item. This is typically used to wrap an item into a DIV container or field set. The after item and label attribute is only rendered for pages that don't use a table grid to display form items. This includes any page using a mobile page template.

11.3.12.1.5 Substitution Strings

Lists substitution string usage for this template. Substitution strings are used within subtemplates to reference component values.

11.3.12.2 About Using `#CURRENT_ITEM_HELP_TEXT#` to Create Item Help

Use the `#CURRENT_ITEM_HELP_TEXT#` substitution string to create inline page Help text when a page is rendered. For example, you can use this substitution string to create page Help text which displays as a tooltip when the mouse hovers over the page item label. This placeholder enables you to include help text on the page when it is rendered without having to perform an expensive Ajax call.

**Tip:**

Only use this placeholder if the Help text is short. The generated page always includes the help text of all page items.

Example Label Template

Before Label:

```
<label for="#CURRENT_ITEM_NAME#" id="#LABEL_ID#">  
<span class="helpText">#CURRENT_ITEM_HELP_TEXT#</span>
```

After Label:

```
</label>
```

11.3.13 List Templates

Control the appearance of a list using list templates.

- [About Hierarchical Lists](#)
- [List Template Attributes](#)

11.3.13.1 About Hierarchical Lists

A list is a shared collection of links. Oracle Application Express supports hierarchical lists. To create a hierarchical list, you must:

- Select a list template that supports hierarchical lists. To determine which list templates support hierarchical lists, look for templates having the naming convention "with Sublist."

**Tip:**

To determine which list templates support hierarchical lists, look for templates having the naming convention "with Sublist."

- Select a Parent List Entry when you create each list entry.

**See Also:**

["Creating Lists"](#)

11.3.13.2 List Template Attributes

This section describes attributes on the Edit List Template page. To learn more about a specific attribute, see field-level Help.

- [Name](#)

- [Before List Entry](#)
- [Template Definition](#)
- [Template Definitions for First Entry](#)
- [Before Sublist Entry](#)
- [Sublist Entry](#)
- [After Sub List Entry](#)
- [After List Entry](#)
- [Substitution Strings](#)

11.3.13.2.1 Name

Name identifies the name of the template. Use the **Translatable** check box to indicate that the template contains text strings that require translation. **Theme** indicates the theme to which the template is a member.

Template Class identifies a specific use for the template. When you switch to a new theme, all templates in one theme are mapped to corresponding templates in another theme. App Builder accomplishes this template mapping through the assignment of a template class.

11.3.13.2.2 Before List Entry

Enter HTML that displays before any list elements. You can use this attribute to open an HTML table or HTML table row. The `#COMPONENT_CSS_CLASSES#` substitution string must be included in the List Template Before Rows attribute for templates that have template options defined.

11.3.13.2.3 Template Definition

Defines current and noncurrent list templates. Supported substitution strings include `#LINK#`, `#TEXT#`, `#TEXT_ESC_SC#`, `#ICON_CSS_CLASSES#`, `#IMAGE_PREFIX#`, `#IMAGE#`, `#IMAGE_ATTR#`, and `#A01#...#A10#`.

Template Definition attributes include:

- **List Template Current.** Enter HTML or text to be substituted for the selected (or current) list template.
- **List Template Current with Sub List Items.** Enter HTML or text to be substituted for the selected (or current) list template when an item has sublist items. If not specified, the current list item template is used.
- **List Template Noncurrent.** Enter HTML or text to be substituted for the unselected (or noncurrent) list template.
- **List Template Noncurrent with Sub List Items.** Enter HTML or text to be substituted for the unselected (or noncurrent) list template used when an item has sublist items. If not specified, the current list item template is used.
- **Between List Elements.** Enter HTML that displays between list elements. This attribute is ignored if no HTML is specified.

11.3.13.2.4 Template Definitions for First Entry

Available attributes include:

- **List Template Current (First).** If defined, this is used for the first list item. Enter HTML or text to be substituted for the selected (or current) list template.
- **List Template Current with Sub List Items (First).** If defined, this is used for the first list item. HTML or text to be substituted for the selected (or current) list template used when item has sub list items.
- **List Template Noncurrent (First).** If defined, this is used for the first list item. Enter HTML or text to be substituted for the unselected (or noncurrent) list template.
- **List Template Noncurrent with Sub List Items (First).** If defined, this is used for the first list item. HTML or text to be substituted for the unselected (or noncurrent) list template used when item has sub list items.

11.3.13.2.5 Before Sublist Entry

Enter HTML that displays before any sublist elements.

11.3.13.2.6 Sublist Entry

Defines current and noncurrent list templates. Supported substitution strings include #LINK#, #TEXT#, #ICON_CSS_CLASSES#, #IMAGE_PREFIX#, #IMAGE#, #IMAGE_ATTR#, #ICON_CSS_CLASSES#, #A01#...#A10#, #LIST_ITEM_ID#, and #PARENT_LIST_ITEM_ID#.

Sub List Entry attributes include:

- **Sub List Template Current.** Enter HTML or text to be substituted for the selected (or current) list template.
- **Sub List Template Current with Sub List Items.** Enter HTML or text to be substituted for the selected (or current) list template when an item has sublist items. If not specified, the current list item template is used.
- **Sub List Template Noncurrent.** Enter HTML or text to be substituted for the unselected (or noncurrent) list template.
- **Sub List Template Noncurrent with Sub List Items.** Enter HTML or text to be substituted for the unselected (or noncurrent) list template used when an item has sublist items. If not specified, the current list item template is used.
- **Between Sub List Items.** Enter HTML that displays between list elements. This attribute is ignored if no HTML is specified.

11.3.13.2.7 After Sub List Entry

Enter HTML that displays after displaying sublist elements.

11.3.13.2.8 After List Entry

Enter HTML that displays after displaying all list elements. You can use this attribute to close an HTML table opened in the Before List Elements attribute.

11.3.13.2.9 Substitution Strings

Lists substitution string usage for this template. Substitution strings are used within subtemplates to reference component values.

11.3.14 Page Templates

Define the appearance of a page using page templates.

- [Page Template Attributes](#)
- [Required Dialog Page Template Attributes](#)

11.3.14.1 Page Template Attributes

About Page Templates

Each template consists of a header template, a body template, a footer template, and several subtemplates. If you do not specify a page template as a page-level attribute, then the Application Express engine uses the default page template defined on the Create/Edit Theme page.

Page templates combine static HTML with substitution strings that are replaced at runtime. You use substitution strings to indicate the existence and placement of a component within a page template. You can further specify how a component should display using subtemplates.

This section describes specific sections of the Edit Page Template page. To learn more about a specific attribute, such as supported substitution strings, see field-level Help.

- [Name](#)
- [Definition](#)
- [JavaScript](#)
- [Cascading Style Sheet](#)
- [Subtemplate](#)
- [Image Based Tab Attributes](#)
- [Layout](#)
- [Display Points](#)
- [Dialog](#)
- [Error Page Template Control](#)
- [Substitution Strings](#)

11.3.14.1.1 Name

Name identifies the name of the template. **Theme** indicates the theme to which the template is a member.

Template Class identifies a specific use for the template. When you switch to a new theme, all templates in one theme are mapped to corresponding templates in another

theme. App Builder accomplishes this template mapping through the assignment of a template class.

Use the **Translatable** check box to indicate if this template contains text strings that require translation.

Template Type identifies the page template type. If set to **Dialog Page**, the template is only be available for selection by a page with a page mode of **Modal** or **Non-Modal**. If set to **Normal Page**, the template is only be available for selection by a page with a page mode of **Normal**.



See Also:

"Creating Dialog Pages" and "Required Dialog Page Template Attributes"

11.3.14.1.2 Definition

Each template consists of a header, a body, a footer, and subtemplates. Use substitution strings to include dynamic content. All template substitution strings must be in uppercase letters and begin and end with a number sign (#).



Tip:

For a list of supported substitution strings and to view examples, see field-level Help.

Definition attributes include:

- **Header** - Enter HTML that defines the <Head> section of the HTML document. Oracle recommends you include at least #TITLE# and #HEAD# in this template section.
- **Body** - Enter HTML that makes up the <Body> section of the HTML document. Include substitution strings to define where the body content is placed and to define additional positions for regions.
- **Footer** - Enter HTML to define third section in the page template that displays after the Body.

11.3.14.1.3 JavaScript

Available attributes include:



Tip:

For a list of supported substitution strings and to view examples, see field-level Help.

- **File URLs** - Enter JavaScript file URLs for code to be loaded on this page. Each URL must be written into a new line. If you provide a minified version of your file you can use

the substitution string `#MIN#` to include `.min` in your file URL for a regular page view and an empty string if the page is viewed in debug mode. You can also use the substitution string `#APP_VERSION#` to include the application's version in the file URL. JavaScript file URLs you enter here replaces the `#TEMPLATE_JAVASCRIPT#` substitution string in the page template.

Do not include opening or closing script tags, just write the URL.

- **Function and Global Variable Declaration** - Enter JavaScript code (for example, functions or global variable declarations) for code to be used in this page template. Consider putting it into an external file to avoid duplication and to leverage browser caching of static files. Code you enter here replaces the `#TEMPLATE_JAVASCRIPT#` substitution string in the page template.

Do not include opening or closing script tags, just include the JavaScript code.

To reference a shortcut, use `"SHORTCUTNAME"`.

- **Execute when Page Loads** - Enter JavaScript code to execute when the page loads. The code is executed after the JavaScript code generated by Oracle Application Express. Code you enter here replaces the `#GENERATED_JAVASCRIPT#` substitution string in the page template.
- **Dialog Initialization Code** - This attribute only displays if the Template Type is **Dialog Page**. Enter JavaScript code to initialize the page as a dialog. The substitution strings will be replaced with their respective values at rendering time.
- **Dialog Closure Code**. This attribute only displays if the Template Type is **Dialog Page**. Enter JavaScript code to close the dialog page.
- **Dialog Cancel Code**. This attribute only applies if the Template Type is **Dialog Page**. Enter JavaScript code to cancel the dialog page.

11.3.14.1.4 Cascading Style Sheet

Available attributes include:

- **File URLs** - Enter Cascading Style Sheet file URLs to be loaded for this page template. Each URL has to be written into a new line. If you provide a minified version of your file you can use the substitution string `#MIN#` to include `.min` in your file URL for a regular page view and an empty string if the page is viewed in debug mode. You can also use the substitution string `#APP_VERSION#` to include the application's version in the file URL. File URLs you enter here replace the `#TEMPLATE_CSS#` substitution string in the template.

Do not include opening or closing script tags, just include the file URL.

- **Inline** - Enter Cascading Style Sheet code to be used for this page template. Consider putting it into an external file to avoid duplication and to leverage browser caching of static files. Code you enter here replaces the `#TEMPLATE_CSS#` substitution string in the template.

Do not include opening or closing style tags, just include the cascading style sheet code.

11.3.14.1.5 Subtemplate

Enter the HTML for subtemplates below. Subtemplates are placed inside the body of the page template using substitution strings.

Subtemplates include:

- **Success Message** - Enter HTML to replace the string `#SUCCESS_MESSAGE#` in the template body, header, or footer.
- **Navigation Bar** - Enter HTML or text to replace the string `#NAVIGATION_BAR#` in the template header, body, or footer. Use the substitution string `#BAR_BODY#` to indicate where in the Navigation Bar the entries should appear.
- **Navigation Bar Entry** - Enter HTML or text to be substituted into the navigation bar `#BAR_BODY#` substitution string for each navigation bar entry.
- **Notification** - Enter HTML or text to be substituted when the `#NOTIFICATION_MESSAGE#` substitution string is referenced in the template header, body, or footer.

11.3.14.1.6 Image Based Tab Attributes

Use this subtemplate for tabs that are entirely based on images. Available attributes include:

- **Current Image Tab** - Enter HTML to be used to indicate that an image-based tab is currently selected. Include the `#TAB_TEXT#` substitution string to show the displayed name of the tab.
- **Non Current Image Tab** - Enter the HTML to be used to indicate that an image tab is not currently selected. Include the `#TAB_TEXT#` substitution string to show the displayed name of the tab.

11.3.14.1.7 Layout

Specified the type of layout used for the page. The Type you select determines what attributes displays. To learn more about an attribute, see field-level Help.

From Type, select a layout:

- **HTML Table** - Uses HTML Tables to position regions, page items, and buttons.
- **Fixed Number of Columns** - Used for grids which divide the screen into a fixed number of grid columns.
- **Variable Number of Columns** - Used for grids which can display up to "n" number of grid columns depending on how the regions, page items and buttons are positioned.

11.3.14.1.8 Display Points

Available attributes include:

- **Breadcrumb Display Point** - Applies to generated components that use breadcrumbs. It defines where the breadcrumbs are placed on the page. Sidebar Display Point
- **Sidebar Display Point** - Applies to generated components that use Sidebars. It defines where sidebars are placed on the page.

11.3.14.1.9 Dialog

Dialog attributes only appear if you select a Template Type of **Dialog Page**. These settings are overwritten by a similar attributes specified at page-level.

Available Dialog attributes include:

- **Width** - Enter the width of the dialog, in pixels or a percentage.
- **Height** - Enter the height of the dialog in pixels, for example, 500.

- **Maximum Width** - Enter the maximum width of the dialog, in pixels.
- **CSS Classes** - Enter additional CSS classes you wish to be applied to the dialog, as a space delimited list.
- **Allow Embed in Frames** - Your page template level browser frame options are listed below, along with the current setting for each. Make a selection to control if the browser is allowed to display your application's pages within a frame. The current setting will be the default for each modal and non-modal page using this page template. To learn more, see field-level Help.

Oracle Application Express embeds modal dialogs in iframes. If you set the application security attribute Browser Frame to **Deny**, checking **Allow Embed In Frame** for Modal Dialog will instead use **Allow from same origin** for dialog pages that use this template



See Also:

["Required Dialog Page Template Attributes"](#)

11.3.14.1.10 Error Page Template Control

Use this attribute when a page template is designated as an error template.

11.3.14.1.11 Substitution Strings

[Table 11-11](#) describes the available page template substitution strings. Substitution strings are used within subtemplates to reference component values.



Tip:

All template substitution strings must be in uppercase letters and begin and end with a number sign (#). To view a report of substitution strings supported by a given template, see the Substitution Strings section of the Edit Page Template page.

Table 11-11 Page Template Substitution Strings

Referenced From	Substitution String	Description
All	#HIGH_CONTRAST_TOGGLE#	High Contrast toggle.
All	#PAGE_STATIC_ID#	Page Static ID (for example 'P100')
All	#PARENT_TAB_CELLS#	Display of parent tabs.
All	#REGION_POSITION_01#	Region Position 1.
All	#REGION_POSITION_02#	Region Position 2.
All	#REGION_POSITION_03#	Region Position 3.
All	#REGION_POSITION_04#	Region Position 4.
All	#REGION_POSITION_05#	Region Position 5.

Table 11-11 (Cont.) Page Template Substitution Strings

Referenced From	Substitution String	Description
All	#REGION_POSITION_06#	Region Position 6.
All	#REGION_POSITION_07#	Region Position 7.
All	#REGION_POSITION_08#	Region Position 8.
All	#REQUESTED_URL#	Page URL requested by the browser
All	#SCREEN_READER_TOGGLE#	Screen Reader toggle.
All	#SWITCH_UI_TO_DESKTOP#	Hyperlink for home page of desktop user interface.
All	#SWITCH_UI_TO_JQM_SMARTPHONE#	Hyperlink for home page of smart phone user interface.
All	#TITLE#	Defines the page title. Typically included within HTML title tags.
Body	#BODY#	Page Body.
Body	#BOX_BODY#	Where the Body displays. If the Body is null, then #BOX_BODY# is used instead.
Body	#FORM_OPEN#	Where the HTML open form tag <form> is placed. You must include this substitution string to submit a form.
Body	#GENERATED_CSS#	Cascading style sheet files created by components.
Body	#GLOBAL_NOTIFICATION#	Displays the Global Notification attribute. Global notifications are intended to communicate system status, such as pending system downtime. You can also use APEX_APPLICATION.G_GLOBAL_NOTIFICATION to set this value programmatically. See Also: "Global Notification"
Body	#LOGO#	Application image or log. In the Logo section of the Edit Application Definition page, you can identify an image and image attributes for an application logo. To use this feature, you must also include the #LOGO# substitution string in the Header or Body page template. See Also: "Logo"
Body	#NAVIGATION_BAR#	Navigation bar. See Also: "Subtemplate" for information about the Navigation Bar subtemplate
Body	#NOTIFICATION_MESSAGE#	Defines where a summary of inline error messages displays. Inline error messages can display next to a field, inline in the notification area, or both.
Body	#SUCCESS_MESSAGE#	Success message. Defines where page success and error messages appear. If the page process runs without raising errors, then this text displays. You can customize the display of the success message for each template by adding HTML to be displayed before and after the success message.
Body	#TAB_CELLS#	Display of standard tabs.

Table 11-11 (Cont.) Page Template Substitution Strings

Referenced From	Substitution String	Description
Body	#TEMPLATE_JAVASCRIPT#	Display of standard tabs.
Footer	#CUSTOMIZE#	Customize link.
Footer	#FORM_CLOSE#	Where the HTML close form tag <form> is placed.
Footer	#BUILT_WITH_LOVE_USING_APEX#	Displays "Built with ♥ using Oracle APEX."
Header	#APEX_CSS#	Cascading Style Sheet files used by Application Express.
Header	#APEX_JAVASCRIPT#	JavaScript files and code used by Oracle Application Express.
Header	#APPLICATION_CSS#	CSS files defined on user interface level.
Header	#APPLICATION_JAVASCRIPT#	JavaScript files defined on user interface level.
Header	#GENERATED_JAVASCRIPT#	JavaScript code created by components as needed.
Header	#HEAD#	Used after the <head> open tag but before the </head> close tag. You can optionally define the contents of #HEAD# for each page (for example, to reference additional style sheets or JavaScript libraries).
Header	#ONLOAD#	Page onload. Use this string as a substitute in a JavaScript call to be executed when a page is loaded by the web browser. The JavaScript to be called can vary for each page.
Header	#PAGE_CSS#	Cascading style sheet files and inline style defined on the page-level.
Header	#PAGE_JAVASCRIPT#	JavaScript files and code defined on the page-level.
Header	#TEMPLATE_CSS#	Cascading style sheet files and inline style defined on page template-level.
Header	#THEME_CSS#	Cascading Style Sheet files defined at the theme-level.
Header	#THEME_JAVASCRIPT#	JavaScript files defined on theme-level.
Header	#THEME_STYLE_CSS#	Cascading Style Sheet files defined on the theme style level.
Page	#FAVICON#	Enables support for the application User Interface attribute, Favicon. Developers can use the Favicon attribute for creating a favicon (or shortcut icon). To use this feature, your page template must include the #FAVICON# substitution string.
Page	#PAGE_URL#	Page URL.
JavaScript	#DIALOG_ATTRIBUTES#	Defines dialog attributes not declaratively supported.
JavaScript	#DIALOG_CSS_CLASSES#	Dialog CSS Classes.
JavaScript	#DIALOG_HEIGHT#	Dialog Height.
JavaScript	#DIALOG_MAX_WIDTH#	Dialog Maximum Width.
JavaScript	#DIALOG_WIDTH#	Dialog Width.

Table 11-11 (Cont.) Page Template Substitution Strings

Referenced From	Substitution String	Description
JavaScript	#IS_MODAL#	Dialog Page Mode (for example, <code>true</code> when modal and <code>false</code> when non-modal).
JavaScript	#SIDE_GLOBAL_NAVIGATION_LIST#	Navigation Menu (Side).
JavaScript	#TOP_GLOBAL_NAVIGATION_LIST#	Navigation Menu (Top).
JavaScript	#TRIGGERING_ELEMENT#	Triggering Element (for example, the current DOM element).

11.3.14.2 Required Dialog Page Template Attributes

To create a dialog page template, you must define the following Page Template attributes.

Table 11-12 Required Attributes for Dialog Page Templates

Attribute	Description
Name, Template Type	Must be defined as Dialog Page .
JavaScript, Dialog Initialization Code	Enter JavaScript code to initialize the page as a dialog. See field-level Help for function call syntax.
JavaScript, Dialog Closure Code	Enter JavaScript code to close the dialog page. See field-level Help for function call syntax.
JavaScript, Dialog Cancel Code	Enter JavaScript code to cancel the dialog page. See field-level Help for function call syntax.
Dialog, Width	Sets the default width for dialogs. The page template-level setting can be overwritten at page-level.
Dialog, Height	Sets the default height for dialogs. The page template-level setting can be overwritten at page-level.
Dialog, Maximum Width	Sets the maximum width for dialogs, in pixels. The page template-level setting can be overwritten at page-level.
Dialog, CSS Classes	Enter additional CSS classes you wish to be applied to dialogs. The page template-level setting can be overwritten at page-level.
Dialog, Allow Embed in Frame	Select the page mode to use this attribute to control if the browser is allowed to display your application's pages within a frame. Application Express embeds modal dialogs in iframes. If you set the application security attribute Browser Frame to Deny , checking Allow Embed In Frame for Modal Dialog will instead use Allow from same origin for dialog pages that use this template.



See Also:

["Creating Dialog Pages"](#)

11.3.15 Popup LOV Templates

Use Popup LOV templates control how popup lists display for all items defined as POPUP.

You can only specify one popup LOV template for each theme.

- [Popup List of Values Template Attributes](#)



See Also:

["Creating Lists of Values at the Application-Level"](#)

11.3.15.1 Popup List of Values Template Attributes

This section describes some sections of the Edit Popup List of Values Template page. For more information on an attribute, see field-level Help.

- [Search Field](#)
- [Buttons](#)
- [Window](#)
- [Pagination](#)
- [Result Set](#)
- [Page Attributes](#)

11.3.15.1.1 Search Field

Use these attributes to specify how a Search field displays. [Table 11-13](#) describes available Search Field attributes.

Table 11-13 Search Field Attributes

Attribute	Description
Before Field Text	Defines text to display before the popup list of values search field displays.
After Field Text	Displays this text after displaying the search field, the search button, and the close button.
Filter Width	Displays the HTML INPUT TYPE = TEXT widget using this width.
Filter Max Width	Displays the HTML INPUT TYPE = TEXT widget using this maximum width.
Filter Text Attribute	Displays the HTML INPUT TYPE = TEXT widget using these attributes. This is included within the HTML input tag.

11.3.15.1.2 Buttons

Use these attributes to define the button name and attributes for the Find, Close, Next, and Previous buttons.

11.3.15.1.3 Window

Popup lists of values are executed using JavaScript. Use these attribute to control the values of `scrollbars=`, `resizable=`, `width=`, and `height=`.

11.3.15.1.4 Pagination

Defines how row count results display.

11.3.15.1.5 Result Set

Use these attributes to define text or HTML to display before and after a result set.

11.3.15.1.6 Page Attributes

Use these attributes to define popup pages.

11.3.16 Region Templates

Region templates control the appearance and placement of region attributes.

You place region attributes using substitution strings such as `#BODY#` and `#EDIT#`. Template substitution strings must be in upper case and begin and end with a pound sign (`#`).

- [Region Template Attributes](#)

11.3.16.1 Region Template Attributes



See Also:

["Understanding Template Options"](#) and ["Managing Theme Subscriptions"](#)

This section describes some attributes on the Edit Region Template page. To learn more about a specific attribute, see field-level Help.

- [Name](#)
- [Definition](#)
- [Layout](#)
- [Sub Regions](#)
- [Substitution Strings](#)

11.3.16.1.1 Name

Theme indicates the theme to which the template is a member. **Name** identifies the name of the template.

Template Class identifies a specific use for the template. When you switch to a new theme, all templates in one theme are mapped to corresponding templates in another theme. App Builder accomplishes this template mapping through the assignment of a template class. Use the **Translatable** check box to indicate that the template contains text strings that require translation.

11.3.16.1.2 Definition

Region templates provide the appearance for a portion of a page called a region. Use substitution strings to indicate the existence and placement of a component within the region. `#BODY#` is the only required substitution string and identifies where the source of the region should be placed. All other substitution strings are optional. The following are valid substitution strings:

- `#TITLE#`
- `#PAGE_TITLE#`
- `#EXPAND#`
- `#CHANGE#`
- `#BODY#`
- `#SUB_REGION_HEADERS#`
- `#SUB_REGIONS#`
- `#FORM_OPEN#`
- `#FORM_CLOSE#`
- `#REGION_ID#`
- `#REGION_STATIC_ID#`
- `#REGION_CSS_CLASSES#`
- `#REGION_ATTRIBUTES#`
- `#REGION_HEADER#`
- `#REGION_FOOTER#`

When you create a button in a region position, the positions you define appear in a select list. Use the following substitution strings to define positions for the placement of buttons in a region:

- `#EDIT#`
- `#CLOSE#`
- `#CREATE#`
- `#CREATE2#`
- `#EXPAND#`
- `#HELP#`

- #DELETE#
- #COPY#
- #NEXT#
- #PREVIOUS#

**See Also:**

["Using Substitution Strings"](#)

11.3.16.1.3 Layout

Page items display within regions. If the layout in the page template is set to **Table**, each item is part of an HTML table. Use this attribute to set the attributes of this table.

11.3.16.1.4 Sub Regions

Use **Header Templates** and **Header Entry Templates** to generate a list of region titles of all the subregions of the current region. For either template, #ENTRIES# is the only required substitution string.

Use **Template** to wrap a subregion with additional HTML code. #SUB_REGION# is the only required substitution string. It identifies where the source of the subregion should be placed. All other substitution strings are optional.

11.3.16.1.5 Substitution Strings

Lists substitution string used within templates to reference component values.

11.3.17 Report Templates

Report column templates provide you with control over the results of a row from a SQL query. This type of template defines a cell, not an entire row.

Each report template identifies column names using the syntax #1#, #2#, #3#, and so on. You can also name columns using column name substitution syntax such as #ENAME# or #EMPNO#. You can reference any item from your application within your template. For example, to reference an item called *ABC*. in your template, you could include the exact substitution string `&ABC.`. The actual value of *ABC*. would be provided by an end user editing an item in your application named *ABC*.

- [Generic Column Templates and Named Column Templates](#)
- [Report Column Template Attributes for Generic Column Templates](#)
- [Report Column Template Attributes for Named Column Templates](#)
- [About Using JavaScript in Column Templates](#)

11.3.17.1 Generic Column Templates and Named Column Templates

Oracle Application Express includes two types of report templates:

- [Generic Column Templates](#)
- [Named Column Templates](#)

11.3.17.1.1 Generic Column Templates

A generic column template determines the appearance of a report by defining the look of the column once. This look is then repeated as many times as is necessary, based on the number of columns specified in the report's definition. This type of template is limited to reports that have a standard row and column structure. Additional style can be applied to a report using this type of template through the use of conditions.

The following example demonstrates how to have each column use a specific style:

```
<td class="tabledata" align="#ALIGN#">#COLUMN_VALUE#</td>
```

This example assumes your page template includes a CSS containing the class `tabledata`. This example also demonstrates the use of the substitution strings `#ALIGN#` and `#COLUMN_VALUE#`. If you actually ran this report, these substitution strings would be replaced with values generated by the results of a SQL query.

If your query uses an expression in the select list, it is a good idea to create an alias for the columns to avoid runtime errors. For example, suppose your query was as follows:

```
SELECT ename, (sal + comm) * 12 FROM emp
```

You could rewrite the query to alias the columns as follows:

```
SELECT ename, (sal + comm) * 12 yearly_comp FROM emp
```

11.3.17.1.2 Named Column Templates

Named column templates allow for more flexibility in report design. However, because they reference columns by name, they can only be used by reports that are based on those columns. For example:

```
<tr><td>#ENAME#</td><td>#SAL#</td></tr>
```

Although named column templates offer flexibility, you may need to create a new template for each query. You can also include a position notation. The following example demonstrates how to use following HTML and substitution strings:

```
<tr><td>#ENAME#</td><td>#SAL#</td></tr>
```

```
<tr><td>#1#</td><td>#2#</td></tr>
```

11.3.17.2 Report Column Template Attributes for Generic Column Templates

This section describes specific sections of the Edit Report Template page for Generic Column Templates. To learn more about a specific attribute, see field-level Help.

- [Report Template](#)
- [Before Rows](#)
- [Column Headings](#)
- [Before Each Row](#)
- [Column Templates](#)

- [After Each Row](#)
- [After Rows](#)
- [Row Highlighting](#)
- [Pagination Subtemplate](#)
- [Comments](#)

11.3.17.2.1 Report Template

Template Name identifies the name of the template. **Template Type** indicates the type of template. Named Column templates reference column names in the template. Generic Column Templates reference the #COLUMN_VALUE# substitution string in the template.

Theme indicates the theme to which the template is a member. **Template Class** identifies a specific use for the template. When you switch to a new theme, all templates in one theme are mapped to corresponding templates in another theme. App Builder accomplishes this template mapping through the assignment of a template class. Use the **Translatable** check box to indicate the template contains text strings that require translation.

11.3.17.2.2 Before Rows

In **Before Rows**, enter HTML that displays once at the beginning of a report template.

Opening an HTML table is a common use of this attribute as shown in the following example:

```
<table>
```

You can include pagination above a report by including the substitution string #TOP_PAGINATION#. This substitution string generates HTML that starts with an opening <tr> tag and ends with a closing </tr> tag. For example, to include an open table tag and the #TOP_PAGINATION# substitution string, you would enter the following:

```
<table>#TOP_PAGINATION#
```

You can also include the substitution string #CSV_LINK# to include support for exporting your report to comma-separated value (CSV) format, a format compatible with most spreadsheet programs.

You can also use the substitution string #REPORT_ATTRIBUTES#. This substitution string is set per report region on the report attributes page.

11.3.17.2.3 Column Headings

Use **Before Column Heading** to display text before report heading.

Use **Column Heading Template** to colorize each column header cell. The text of this attribute must include Help to indicate where the cell heading text should be colorized. For example:

```
<th >Item Help Text</th>
```

If you do not want any column headings, enter the following:

```
OMIT
```

If you do use this attribute, Application Express engine applies the default column heading template.

Use **After Column Heading** to display text after report headings.

11.3.17.2.4 Before Each Row

In **Before Each Row**, enter text to display before all columns in the report. Use this attribute to open a new HTML row. Before Each Row supports the following substitution strings:

- **#ROWNUM#**
Use this substitution string to specify the current row.
- **#COLCOUNT#**
Use this substitution string to specify the number of columns.
- **#HIGHLIGHT_ROW#**
Use this substitution string to specify the number of highlighted rows.

11.3.17.2.5 Column Templates

Column templates define the look of each column. You can define up to four column templates; each can be conditional. For example, you can have different background colors for even and odd rows, or highlight rows that meet a PL/SQL defined condition.

In each Column Template, you define the look of each column. Column Templates support the substitution strings described in [Table 11-14](#).

Table 11-14 Column Template Substitution Strings

Substitution String	Description
#ALIGNMENT#	Determines the column alignment. Specified by the user.
#COLCOUNT#	Defines the count of the number of columns.
#COLNUM#	Defines the current column number.
#COLUMN_HEADER#	Defines the column header.
#COLUMN_VALUE#	Replaced with the value of the column.
#ROWNUM#	Specifies the current row number.

Consider the following example:

```
<td> #ALIGNMENT#>#COLUMN_VALUE#</td>
```

If you actually ran this report, these substitution strings would be replaced with values generated by the results of a SQL query.

By creating conditions, you can create a report that displays columns differently depending on whether the specified condition is met. To specify a column template be used conditionally, select a condition type from the Column Template Condition list. Valid values include:

- **Use Based on PL/SQL Expression.** Conditionally formats columns based on data in that row.
- **Use for Even Numbered Rows.** Conditionally formats even numbered rows.
- **Use for Odd Numbered Rows.** Conditionally formats odd numbered rows.

If you select **Use Based on PL/SQL Expression**, the next step is to enter a PL/SQL expression in the Column Template Expression field. For example, the following expression displays a value in bold if the value is greater than 2000:

```
#SAL# > 2000
```

You could also use the substitution string #ROWNUM#. For example:

```
#ROWNUM# > 2000
```

11.3.17.2.6 After Each Row

In **After Each Row**, enter HTML that displays after all columns in the report display. This attribute is often used to close an HTML table row. For example:

```
</tr>
```

11.3.17.2.7 After Rows

Use **After Rows** to specify text that should display after the last row. A common use of this attribute is to close the HTML table tag. For example:

```
</table>
```

The After Rows attribute supports the following substitution strings:

- #PAGINATION#
Replaced with a pagination attribute.
- #COLCOUNT#
Substituted at runtime with the number of columns defined in the report.
- #CSV_LINK#
Substituted at runtime with CSV download link if CSV export is enabled. Otherwise the string is not shown.
- #EXTERNAL_LINK#
Substituted at runtime with the download link for exports using external processing engine for (for example, PDF export). If this feature is not enabled, the string is not shown.

11.3.17.2.8 Row Highlighting

Background color for checked row controls the background color of a report row when the row selector is checked. **Background color for current row** controls the background color of a report row when the user moves the mouse over the row.

11.3.17.2.9 Pagination Subtemplate

The Pagination Subtemplate section contains attributes for editing the Pagination Template, Next Page Template, Previous Page Template, Next Set Template, and Previous Template. Pagination Subtemplates support the substitution strings #PAGINATION_NEXT#, #PAGINATION_NEXT_SET#, #PAGINATION_PREVIOUS# and #PAGINATION_PREVIOUS_SET#. [Table 11-17](#) describes these templates.

Table 11-15 Pagination Subtemplate Attributes

Pagination Subtemplate Attribute	Description
Pagination Template	<p>Applies to the entire pagination subtemplate. For example:</p> <pre>#TEXT#</pre> <p>Use the substitution string #TEXT# to specify where you want the pagination subtemplate to display.</p> <p>Use the other Pagination Subtemplate attributes to modify individual items.</p>
Next Page Template	<p>Enter HTML to modify how the Next Page portion of the pagination subtemplate appears. For example:</p> <pre>next</pre>
Previous Page Template	<p>Enter HTML to modify how the Previous Page portion of the pagination subtemplate appears. For example:</p> <pre>previous</pre>
Next Set Template	<p>Enter HTML to modify how the Next Set portion of the pagination subtemplate appears. For example:</p> <pre>next set</pre>
Previous Set Template	<p>Enter HTML to modify how the Previous Set portion of the pagination subtemplate appears. For example:</p> <pre>previous set</pre>

11.3.17.2.10 Comments

Use this attribute to record comments about this component.

11.3.17.3 Report Column Template Attributes for Named Column Templates

This section describes specific sections of the Edit Report Template page for Named Column Templates. You can access the sections of the page by either scrolling down the page, or by clicking a navigation button at the top of the page. When you select a button at the top of the page, the selected section appears and all other sections are temporarily hidden. To view all sections of the page, click **Show All**.

- [Name](#)
- [Subscription](#)
- [Row Templates](#)
- [Column Headings](#)
- [Before first and after last row text](#)
- [Pagination](#)
- [Comments](#)

11.3.17.3.1 Name

Template Name identifies the name of the template. **Template Type** indicates the type of template. Named Column templates reference column names in the template. Generic Column Templates reference the #COLUMN_VALUE# substitution string in the template.

Theme indicates the theme to which the template is a member. Use the **Translatable** check box to indicate the template contains text strings that require translation. **Template Class** identifies a specific use for the template. When you switch to a new theme, all templates in one theme are mapped to corresponding templates in another theme. App Builder accomplishes this template mapping through the assignment of a template class.

11.3.17.3.2 Subscription

Use Subscription to apply an existing template to the current application. When you select an existing template, you become a subscriber to that template.

To load a new copy of a master template, click **Refresh**.

11.3.17.3.3 Row Templates

Row templates define the look of each column. You can define up to four row templates, each of which can be conditional.

In each Row Template, you define the look of each row. Row Templates support the substitution strings described in [Table 11-16](#).

Table 11-16 Row Template Substitution Strings

Substitution String	Description
#ALIGNMENT#	Determines the row alignment. Specified by the user.
#COLCOUNT#	Defines the count of the number of columns.
#COLNUM#	Defines the current column number.
#COLUMN_HEADER#	Defines the column header.
#COLUMN_VALUE#	Replaced with the value of the column.
#ROWNUM#	Specifies the current row number.

By creating conditions, you can create a report that displays rows differently depending on whether the specified condition is met. To specify a row template be used conditionally, select a condition type from the Column Template Condition list. Valid values include:

- **Use Based on PL/SQL Expression.** Conditionally formats columns based on data in that row.
- **Use for Even Numbered Rows.** Conditionally formats even numbered rows.
- **Use for Odd Numbered Rows.** Conditionally formats odd numbered rows.

If you select **Use Based on PL/SQL Expression**, the next step is to enter a PL/SQL expression in the Column Template Expression field. For example, the following expression displays a value in bold if the value is greater than 2000:

```
#SAL# > 2000
```

You could also use the substitution string `#ROWNUM#`. For example:

```
#ROWNUM# > 2000
```

11.3.17.3.4 Column Headings

Use this template to add color to each column header cell. The text of this attribute must include help to indicate where the cell heading text should be colored. If you do not enter a Column Heading Template, then a default column header template is applied. If you do not want any column headings, then enter `OMIT`. For example:

```
<th #ALIGNMENT#>#COLUMN_HEADER#</th>
```

11.3.17.3.5 Before first and after last row text

In **Before Rows**, enter HTML that displays once at the beginning of a report template. Opening an HTML table is a common use of this attribute, as shown in the following example:

```
<table>
```

You can identify column headers using the syntax `#1#`, `#2#`, `#3#`. For example:

```
<th>#1#</th><th>#2#</th><th>#3#</th>
```

You can include pagination above a report by including the substitution string `#TOP_PAGINATION#`. This substitution string generates HTML that starts with an opening `<tr>` tag and ends with a closing `</tr>` tag. For example, to include an open table tag and `#TOP_PAGINATION#` substitution string, you would enter the following:

```
<table>#TOP_PAGINATION#
```

You can also include the substitution string `#CSV_LINK#` to include support for exporting your report to CSV format, a format compatible with most spreadsheet programs.

Use **After Rows** to specify text that should display after the last row. A common use of this attribute is to close the HTML table tag. For example:

```
</table>
```

The After Rows attribute supports the following substitution strings:

- `#PAGINATION#`
Replaced with a pagination attribute.
- `#COLCOUNT#`
Substituted at runtime with the number of columns defined in the report.

11.3.17.3.6 Pagination

The Pagination section contains attributes for editing the Pagination Template, Next Page Template, Previous Page Template, Next Set Template, and Previous Template. Pagination Subtemplates support the substitution strings `#PAGINATION_NEXT#`, `#PAGINATION_NEXT_SET#`, `#PAGINATION_PREVIOUS#` and `#PAGINATION_PREVIOUS_SET#`. [Table 11-17](#) describes these templates.

Table 11-17 Pagination Subtemplate Attributes

Pagination Subtemplate Attribute	Description
Pagination Template	<p>Applies to the entire pagination subtemplate. For example:</p> <pre>#TEXT#</pre> <p>Use the substitution string #TEXT# to specify where you want the pagination subtemplate to display.</p> <p>Use the other Pagination Subtemplate attributes to modify individual items.</p>
Next Page Template	<p>Enter HTML to modify how the Next Page portion of the pagination subtemplate appears. For example:</p> <pre>next</pre>
Previous Page Template	<p>Enter HTML to modify how the Previous Page portion of the pagination subtemplate appears. For example:</p> <pre>previous</pre>
Next Set Template	<p>Enter HTML to modify how the Next Set portion of the pagination subtemplate appears. For example:</p> <pre>next set</pre>
Previous Set Template	<p>Enter HTML to modify how the Previous Set portion of the pagination subtemplate appears. For example:</p> <pre>previous set</pre>

11.3.17.3.7 Comments

Use this attribute to record comments about this component.

11.3.17.4 About Using JavaScript in Column Templates

You can conditionally display HTML depending upon values in the database using JavaScript. The following example displays an HTML row only if the `GROUP_DESC` query column is not null:

```
<script language="javascript">
IF ( "#GROUP_DESC#" != "" )
document.writeln( "<TR>;
<TD BGCOLOR=#336699>;</TD>
</TR>
</TR>
<TD>#GROUP_DESC#</TD>
      </TR>" );
</TR>" );
```



See Also:

["About Regions"](#)

11.4 Using Custom Cascading Style Sheets

Control the style of a web page by uploading and referencing a cascading style sheet.

- [About Cascading Style Sheets](#)
A cascading style sheet (CSS) enables a developer to control the style of a web page without changing its structure.
- [Referencing an Uploaded Cascading Style Sheet in the Page Template](#)
Reference an uploaded cascading style sheet within the Header section of the page template.

11.4.1 About Cascading Style Sheets

A cascading style sheet (CSS) enables a developer to control the style of a web page without changing its structure.

When used properly, a CSS separates visual attributes such as color, margins, and fonts from the structure of the HTML document. Oracle Application Express includes themes that contain templates that reference their own CSS. The style rules defined in each CSS for a particular theme also determine the way reports and regions display.



Tip:

If your application uses *Universal Theme - 42*, you can also take advantage of theme styles and update the appearance of your application using Theme Roller. See ["Using Theme Styles"](#) and ["Using the Theme Roller Dialog."](#)

About Uploading Cascading Style Sheets

You can upload files (including CSS files) for use by a specific application or all applications within a workspace. To learn more, see ["Managing Static Application Files"](#) and ["Managing Static Application Files."](#)

11.4.2 Referencing an Uploaded Cascading Style Sheet in the Page Template

Reference an uploaded cascading style sheet within the Header section of the page template.

Use the Header section to enter the HTML that makes up the <HEAD> section of the HTML document.

1. To reference an uploaded cascading style sheet:
1. Navigate to the Themes page:

- a. On the Workspace home page, click the **App Builder** icon.
- b. Select an application.
- c. Click **Shared Components**.
- d. Under User Interface, select **Themes**.

The Themes page appears.

2. Select a theme.
3. On the Tasks list, click **View Templates**.
4. Select the name of the page template you want to edit.
5. Use a `<link>` tag within the Header section to reference the appropriate style sheet.

To reference an uploaded file that is associated with a specific application, you would use the substitution string `#APP_IMAGES#`. For example:

```
<html>
<head>
  <title>#TITLE#</title>
  #HEAD#
  <link rel="stylesheet" href="#APP_IMAGES#sample2.css" type="text/css">
</head>
...
```

To reference an uploaded file that is associated with a specific workspace, you would use the substitution string `#WORKSPACE_IMAGES#`. For example:

```
<html>
<head>
  <title>#TITLE#</title>
  #HEAD#
  <link rel="stylesheet" href="#WORKSPACE_IMAGES#sample3.css" type="text/css">
</head>
...
```

See Also:

- ["About Cascading Style Sheets"](#)
- ["Creating a New Template"](#)
- ["Managing Templates"](#)
- ["Page Templates"](#)
- ["APP_IMAGES"](#)
- ["WORKSPACE_IMAGES"](#)

12

Controlling Page Layout

Developers can customize their database application's page layout by using a global page, customizing regions, and editing item attributes.

This section also describes how to manage images and static files as well as explains how to render HTML using custom PL/SQL.

- [About Page Layout in Oracle Application Express](#)
The Application Express engine renders pages by combining templates with application components defined by the developer and data in the database.
- [Optimizing a Page for Printing](#)
You can optimize a page for printing by creating a specific Printer Friendly template and selecting that template on the Create/Edit Theme page.
- [Creating a Global Page to Display Components on Every Page](#)
A global page functions as a master page.
- [Managing Regions](#)
Regions function as containers for content.
- [About Incorporating Content from Other Web Sites](#)
To incorporate content from other servers, you can create a region based on a URL to display content.
- [About Managing Images](#)
To reference an image within an application, you must upload it to the static file repository. During the upload process, you specify whether the file is available to all applications or just a specific application.
- [Rendering HTML Using Custom PL/SQL](#)
If you must generate specific HTML content not handled by Oracle Application Express forms, reports, and charts, you can use the PL/SQL region type.



See Also:

- ["Adding Navigation"](#)
- ["Editing User Interface Attributes"](#)
- ["Using Themes and Theme Styles"](#)

12.1 About Page Layout in Oracle Application Express

The Application Express engine renders pages by combining templates with application components defined by the developer and data in the database.

The overall framework (or structure of a page) is determined by the page template. For example, the page template controls if a page uses tabs and a navigation bar. It can also

define if a page includes a bar on the left side that serves as a placeholder for navigation or secondary content. Finally, a page template can include definitions of region positions, which enable precise control over placement of regions using HTML tables or style sheet definitions. The page template itself is composed of HTML combined with substitution strings, which are substituted with the appropriate components at runtime.

As a developer, you add content to a page by creating a region. A **region** is an area of a page that serves as a container for content. Each region contains a different type of content such as HTML, a report, a form, a chart, a list, a breadcrumb, PL/SQL, a tree, a URL, or a calendar. You position a region either relative to other regions (that is, based on its sequence number and column), or by using a region position defined in the page template. The style of the region is also controlled by the region template. Like the page template, the region template defines the structure of the area that the region takes up on a page. It defines if the region title is displayed and where it is displayed relative to the main content or the body. A region can also define absolute positions for buttons.

 **See Also:**
["Using Themes and Theme Styles"](#)

12.2 Optimizing a Page for Printing

You can optimize a page for printing by creating a specific Printer Friendly template and selecting that template on the Create/Edit Theme page.

Generally, a Printer Friendly template optimizes a page for printing. For example, a Printer Friendly template might:

- Not display tabs or navigation bars
- Display items as text instead of as form elements

If the theme you select does not include a printer friendly template, you can create a Printer Friendly template by creating a new page template.

- [Selecting a Printer Friendly Template for an Application](#)
- [Using f?p Syntax to Toggle to Printer Friendly Mode](#)

 **See Also:**
["Editing Themes"](#) and ["Accessing New Themes"](#)

12.2.1 Selecting a Printer Friendly Template for an Application

To select a Printer Friendly template:

1. Navigate to the Themes page:

- a. On the Workspace home page, click the **App Builder** icon.
- b. Select an application.
- c. Click **Shared Components**.
- d. Under User Interface, select **Themes**.

The Themes page appears.

2. Select a theme.
3. Scroll down to **Component Defaults**.
4. Make a selection from the **Printer Friendly Page** list.
5. Confirm your changes and click **Apply Changes**.



See Also:

["Editing Themes"](#)

12.2.2 Using f?p Syntax to Toggle to Printer Friendly Mode

Once you create a Printer Friendly template and select it, you can use f?p syntax to toggle to Printer Friendly mode. Including the ninth f?p syntax argument (`PrinterFriendly`) renders the page in printer friendly mode (optimizing printed output). For example, you could include this argument when coding a link or creating a navigation bar icon.



See Also:

["About Using f?p Syntax to Link Pages"](#)

12.3 Creating a Global Page to Display Components on Every Page

A global page functions as a master page.

A global page (previously referred to as Page 0) functions as a master page. Developers can create a separate Global page for each user interface. The Application Express engine renders all components you add to a Global page on every page within your application. You can further control whether the Application Express engine renders a component or runs a computation, validation, or process by defining conditions.

- [Creating a Global Page](#)
- [Navigating to the Global Page](#)

 **See Also:**

- ["Managing Pages in a Database Application"](#)
- ["Understanding Conditional Rendering and Processing"](#)
- ["Available Conditions"](#)

12.3.1 Creating a Global Page

To create a Global page:

1. On the Workspace home page, click **App Builder**.
2. Select an application.
The Application home page appears.
3. Click the **Create Page** button.
4. For Create a Page:
 - a. User Interface - Select a user interface for the page.
 - b. Select a page type - Select **Global Page**.

Note that the Global Page option only appears if the application does not have a Global page for the specified user interface.

5. For Page Number, enter an integer value that identifies a page within the application.
6. Click **Finish**.

 **See Also:**

["Editing User Interface Attributes"](#)

12.3.2 Navigating to the Global Page

To navigate to the Global page:

1. On the Workspace home page, click the **App Builder** icon.
The App Builder home page appears.
2. Select an application.
The Application home page appears.
3. Select **Global Page** (or **Page Zero** if this is an older application).

12.4 Managing Regions

Regions function as containers for content.

- [About Regions](#)
Learn about regions.
- [Creating a Region](#)
Create regions by selecting it from the Gallery in the central pane in Page Designer.
- [Editing Regions](#)
Alter the appearance of a page by editing Region attributes.
- [Copying a Region](#)
Copy a region in Page Designer.
- [Deleting Regions](#)
Delete regions on Page Designer.

12.4.1 About Regions

Learn about regions.

Each page in an Oracle Application Express application contains one or more regions. A region is a area on a page that serves as a container for content. Each page can have any number of regions. You control the appearance of a region through a specific region template. The region template controls the look of the region, the size, determines whether there is a border or a background color, and what type of fonts display. A region template also determines the standard placement for any buttons placed in region positions.

You can use regions to group page controls (such as items or buttons). You can create simple regions that do not generate additional HTML, or create elaborate regions that frame content within HTML tables or images.

Regions display in sequence in the page template body or can be placed explicitly into region positions. The page structure can be defined using HTML tables or more commonly today using `DIV` tags.



See Also:

- ["Managing Regions "](#)
- ["Accessing Page Specific Utilities"](#)

12.4.2 Creating a Region

Create regions by selecting it from the Gallery in the central pane in Page Designer.

1. To create a region in Page Designer:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
Page Designer appears.
 2. In the Gallery at the bottom of the central pane:

- a. Click the **Region** tab and locate the type of region you want to create. Pass the cursor over a control or component to view a tooltip that describes it.
- b. Right-click a region to view a context menu.
- c. Select **Add To** and then the location where you want to add the component.

Page Designer indicates what actions are required next. If there is an error, a **Messages** icon displays next to the **Save** button. Click the **Messages** icon to view a dialog listing all the errors. Select an error to highlight the associated attribute in the Property Editor.

3. Edit the appropriate attributes in the Property Editor.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

4. Click **Save** or **Save and Run Page**.

 **Tip:**

You can also drag and drop components from the Gallery. Click and hold the mouse on the region to be created and drag it the desired location in the Layout tab. When the mouse is over the appropriate location, the Layout tab displays as a darkened yellow tile. Release the mouse to drop the component. You can only drop components into appropriate drop positions, as determined by the component type.

12.4.3 Editing Regions

Alter the appearance of a page by editing Region attributes.

- [Editing Region Attributes](#)
Edit Region attributes in Page Designer.
- [Controlling Region Positioning](#)
Use the Layout, Position attribute to select the template position used to display this region
- [Specifying a Region Header and Footer](#)
Edit the Header and Footer attributes to specify additional HTML to be placed above and below a region.
- [Utilizing Region Caching in Page Designer](#)
Enable region caching to improve the performance of static regions such as regions containing lists that do not use conditions or regions containing static HTML.
- [Enabling Users to Customize a Page](#)
Use the Customizable attribute to control whether display attributes in a region can be customized by users.

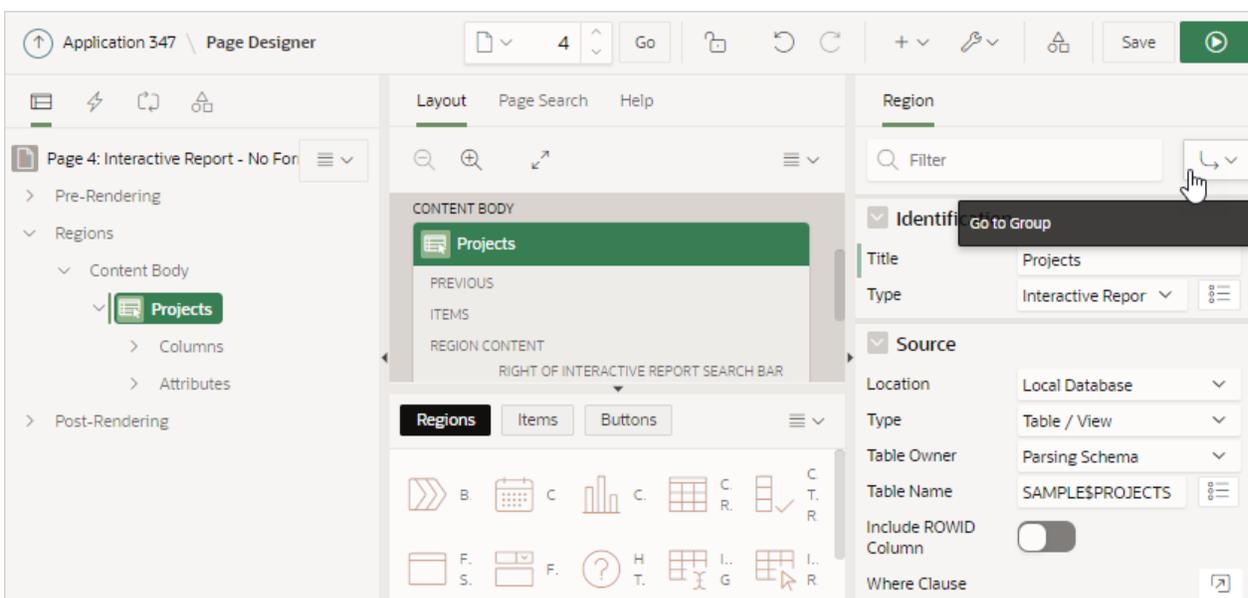
- [Specifying a Static Region ID](#)
Specifying a static region ID is useful when creating custom JavaScript or cascading style sheets.
- [Adding a Region Image](#)
Use Region Image and Image Tag Attributes to add an image to the upper left side of a region.
- [Creating a Region Display Selector](#)
Create a Region Display Selector region to include show and hide controls for each region on a page. to include the current region in the Region Display Selector.

12.4.3.1 Editing Region Attributes

Edit Region attributes in Page Designer.

1. To edit region attributes:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
 Page Designer appears.
 2. In the Rendering tab, select the region.

The Property Editor displays attributes in the **Region** tab in the right pane.



To find a group or attribute:

- **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.

- **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
3. Edit the Region attributes in the Property Editor.
To learn more about an attribute, see field-level Help.
 4. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.



See Also:

"Right Pane of Page Designer (Property Editor)"

12.4.3.2 Controlling Region Positioning

Use the Layout, Position attribute to select the template position used to display this region

The template positions defined within the current theme for the page's user interface determine the available selections.

12.4.3.3 Specifying a Region Header and Footer

Edit the Header and Footer attributes to specify additional HTML to be placed above and below a region.

For all report regions, the substitution string `#TIMING#` shows the elapsed time in seconds used when rendering a region. You can use this substitution string for debugging purposes.

For classic report regions, the region footer supports the following substitution strings:

- `#ROWS_FETCHED#` shows the number of rows fetched by the Oracle Application Express reporting engine (the page size). You can use these substitution strings to display customized messages to the user. For example:

```
Fetches #ROWS_FETCHED# rows in #TIMING# seconds.
```

- `#TOTAL_ROWS#` displays the total number of rows that satisfy a SQL query used for a report.

- `#FIRST_ROW_FETCHED#` and `#LAST_ROW_FETCHED#` display the range of rows displayed. For example:

```
Row(s) #FIRST_ROW_FETCHED# through #LAST_ROW_FETCHED# of #ROWS_FETCHED# displayed
```

12.4.3.4 Utilizing Region Caching in Page Designer

Enable region caching to improve the performance of static regions such as regions containing lists that do not use conditions or regions containing static HTML.

**Tip:**

Region caching is not available for interactive report regions.

- [About Region Caching](#)
- [Enabling Region Caching](#)

**See Also:**

"Managing Page and Region Caching" in *Oracle Application Express Administration Guide*

12.4.3.4.1 About Region Caching

When you enable region caching, the Application Express engine renders a region from a cached (or stored) repository instead of rendering it dynamically. Keep in mind that the actual session identifiers are not cached. Instead, the Application Express engine caches a `&SESSION.` substitution string and the current session rendering the cached region is substituted on display. For example, if a region contains a link and the link includes a session, the exact session is not cached to ensure that the links works for all sessions.

The Application Express engine only renders a region from cache if it meets the defined condition. Additionally, regions can be cached specific to a user or cached independent of a user.

12.4.3.4.2 Enabling Region Caching

1. To enable region caching:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In the Rendering tab, select the region.
The Property Editor displays attributes in the **Region** tab in the right pane.
 3. Under **Server Cache, Caching**, select one of the following:
 - **Disabled** - Content is not cached and computed for each request.
 - **Enabled** - Content is cached and utilized by all users.
 - **Cached by User** - Content is cached specifically for each user.
 - **Cache by Session** - Content is cached specifically for each session.
 4. Click **Save**.

12.4.3.5 Enabling Users to Customize a Page

Use the Customizable attribute to control whether display attributes in a region can be customized by users.

To use this feature, you must include the #CUSTOMIZE# substitution string in the Header, Body, or Footer section of the page template.

If at least one region supports end-user customization, a **Customize** link appears wherever you include the #CUSTOMIZE# substitution string in the page template. When users click this link, a window appears, enabling them to display or hide regions on the page.

1. To enable end user customization:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. Select the region in the Rendering tab or the Layout tab.
The Property Editor displays attributes in the **Region** tab in the right pane.
 3. Find **Customization** edit the Customizable attribute. Select one of the following:
 - **Not Customizable By End Users**
 - **Customizable and Not Shown By Default**
 - **Customizable and Shown By Default**
 4. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.



See Also:

["Creating Custom Themes"](#)

12.4.3.6 Specifying a Static Region ID

Specifying a static region ID is useful when creating custom JavaScript or cascading style sheets.

You can use the Static ID attribute on the Edit Region page to uniquely identify a region. You can then reference the region using the #REGION_STATIC_ID# substitution string in a region templates, the header, the footer, or the body.

A static region ID is included by assigning it as an HTML element ID to the region container object (that is, the table or DIV). The ID of an HTML element must be unique for the entire page. For example, to keep the page HTML valid you cannot have a button and region with the same ID.

1. To specify a static region ID:
1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. Select the region in the Rendering tab or the Layout tab.

The Property Editor displays attributes in the **Region** tab in the right pane.
3. Edit the **Static ID** attribute:
 - a. Find **Advanced** and then **Static ID**.
 - b. **Static ID** - Enter the static ID for this region. If defined, this is used as the ID for the region, using the substitution string `#REGION_STATIC_ID#`, which can be useful if developing custom JavaScript behavior for the region. If this is not defined, the region generates an internal ID.

 **Tip:**

The template must include the `#REGION_STATIC_ID#` substitution string, in order for the region to utilize the static ID entered.

4. Click **Save**.

12.4.3.7 Adding a Region Image

Use Region Image and Image Tag Attributes to add an image to the upper left side of a region.

Use the Region Image and Image Tag Attributes to add an image to the upper left side of a region.

1. To add a region image:
1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. Select the region in the Rendering tab or the Layout tab.

The Property Editor displays attributes in the **Region** tab in the right pane.
3. Find **Advanced**. Edit the following attributes:
 - **Region Image** - Enter a reference to an image that displays in the upper left of the region. There is no control over the table tag used to display this image.
 - **Image Tag Attributes** - Enter image tag attributes included in the image HTML. This can be used for attributes such as height, width or image ALT text (if the image is non-decorative).

If no ALT is defined in the image tag attributes, Application Express defaults to rendering the image as a decorative image, for example with an empty ALT tag.

4. Click **Save**.

12.4.3.8 Creating a Region Display Selector

Create a Region Display Selector region to include show and hide controls for each region on a page. To include the current region in the Region Display Selector.

When a user clicks on a region name included in the Region Display Selector, only the selected region shows and all other listed regions are hidden. The first entry within the Region Display Selector is Show All, which enables the user to show all of the available regions rather than only the previously selected region.

1. To create a Region Display Selector:
 1. Create the page and regions to be included in the Region Page Selector.
 2. For each region to be included in the selector, set the Region Display Selector attribute to **On**.
 3. In the Gallery, right-click **Region Display Selector** region, select **Add To**, and select the appropriate location.

 **Tip:**

You can also drag and drop from the Gallery. From the Gallery select the **Region Display Selector** region and drag it to the appropriate location in the Layout tab.

4. Edit the Region attributes in the Property Editor:
 - a. In the Rendering tab (left pane), select the region.

The Property Editor displays attributes in the **Region** tab. Attributes are organized in groups.
 - b. **Identification, Title** - Enter a region title. The region title only displays when it is defined in the region template.
 - c. **Advanced, Region Display Selector** - Select **On** if you want this region included in the Region Display Selector. This attribute is only utilized if a region type of Region Display Selector is defined and viewable on the page.
 - d. Edit additional attributes as needed.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. Edit Attributes in the Property Editor:
 - a. In the Rendering tab (left pane), select the region.
 - b. In the Property Editor, select the **Attributes** tab.

- c. **Settings, Mode** - Select how Region Display Selector regions display on the page. Options include:
 - **View Single Region** - Show regions as tabs. Selecting a tab will make the corresponding region visible and hide the other selections.
 - **Scroll Window** - Always display all the regions on the page. Selecting a tab will scroll your window to the corresponding region.
 - d. **Settings, Include 'Show All'** - Prepend a "Show All" tab which, when selected, displays all regions on the page.
 - e. **Settings, Remember Last Selection** - On page load, the region that you last selected will be displayed.
6. Click **Save**.

12.4.4 Copying a Region

Copy a region in Page Designer.

Tip:

You cannot copy a Tree region since this type of region encompasses more than one region.

To copy a region:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. Right-click the region in Layout tab, select **Copy To**, and select a destination from the submenu.

Tip:

To copy a region to another page, select the region in the Rendering tab, right-click, and select **Copy to Other Page**. Follow the on-screen instructions.

12.4.5 Deleting Regions

Delete regions on Page Designer.

To delete regions:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.

- b. Select an application.
 - c. Select a page.Page Designer appears.
2. Select one or more regions in the Rendering tab.
3. Right-click and select **Delete**.
4. Click **Save**.

12.5 About Incorporating Content from Other Web Sites

To incorporate content from other servers, you can create a region based on a URL to display content.

Typically, pages in an application are based on data stored in an Oracle database. For example, suppose you wanted to reference the current Oracle stock price. You could create a region of type URL based on a URL. For example:

```
http://quote.yahoo.com/q?d=b&s=ORCL
```

You could then create an item called STOCK_SYMBOL and base your region on a stock price entered by the user. For example:

```
http://quote.yahoo.com/q?d=b&s=&STOCK_SYMBOL.
```

Sometimes (as is the case with the previous example) the HTML returned to the region is more than is needed. To restrict the HTML displayed, you can use the following region attributes:

- URL (discard until but not including this text)
- URL (discard after and including this text)

Tip:

The previous example may require that you set the Proxy Server application attribute. If you do not set the Proxy Server application attribute, you get an error message. Oracle Application Express uses the Oracle `utl_http.request_pieces` function to obtain the HTML generated from the given URL. See "[Editing the Application Definition](#)."

Developers can also use the Region attribute **Inclusion Mode** to control how Oracle Application Express retrieves and displays the content. Options include:

- **IFrame** - The browser displays the remote content in an HTML iframe. Oracle Application Express does not have to fetch this content into the database for display.
- **Inline (escape special characters)** - Causes the database to load the remote content at page rendering time. It then displays the fetched data inline, at the position of the region. Special HTML characters in the content are escaped, to prevent cross site scripting.

- **Inline (no escaping)** - This mode is similar to **Inline (escape special characters)** except the HTML characters are not escaped. Developers should only use this mode if the remote content is always safe.

**See Also:**

["Editing Region Attributes "](#)

Working with SSL-Enabled URLs

If you call a SSL-enabled URL (for example, by invoking a Web service), or create a region of type URL that is SSL-enabled, you must create a wallet. A wallet is a password-protected container that stores authentication and signing credentials (including private keys, certificates, and trusted certificates) needed by SSL.

**Tip:**

See "Configuring Wallet Information" in *Oracle Application Express Administration Guide*

12.6 About Managing Images

To reference an image within an application, you must upload it to the static file repository. During the upload process, you specify whether the file is available to all applications or just a specific application.

**See Also:**

["Managing Static Application Files"](#) and ["Managing Static Workspace Files"](#)

12.7 Rendering HTML Using Custom PL/SQL

If you must generate specific HTML content not handled by Oracle Application Express forms, reports, and charts, you can use the PL/SQL region type.

To generate HTML in this type of region, you need to use the PL/SQL Web Toolkit. You can reference session state using bind variable syntax. Keep in mind that when you generate HTML in this way, you do not get the same consistency and control provided with templates.

To give you more control over HTML dynamically generated within a region, you can use PL/SQL. For example, to print the current date, you could create a region with the following source:

```
http.p(TO_CHAR(SYSDATE, 'Day Month DD, YYYY'));
```

This next example accesses tables:

```
DECLARE
    l_max_sal NUMBER;
BEGIN
    SELECT max(sal) INTO l_max_sal FROM emp;
    http.p('The maximum salary is: '||TO_CHAR(l_max_sal,'999,999.00'));
END;
```



See Also:

Oracle Database Development Guide

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Managing Database Application Controls

Developers can create and manage a variety of database application page controls, including page-level items, dynamic actions, buttons, and trees.

- [Managing Page-Level Items](#)
View existing page-level items, create new page-level items, and edit an item to change its appearance or behavior.
- [Managing Dynamic Actions](#)
Dynamic actions enable developers to define complex client-side behavior declaratively without the need for JavaScript.
- [Managing Buttons](#)
You can use buttons to direct users to a specific page or URL, or to post or process information (for example, by creating Create, Cancel, Next, Previous, or Delete buttons). You can also configure buttons to display conditionally or warn users of unsaved changes.
- [Managing Trees](#)
Trees to display hierarchical information in a clear, easy-to-use format. You can create a tree control using a SQL query.
- [About Incorporating JavaScript into an Application](#)
Oracle Application Express includes multiple built-in interfaces especially designed for adding JavaScript.



See Also:

- ["Controlling Page Layout"](#)
- ["Adding Navigation"](#)
- ["Manually Refreshing Oracle Application Express Components"](#)

13.1 Managing Page-Level Items

View existing page-level items, create new page-level items, and edit an item to change its appearance or behavior.

- [Understanding Page-Level Items](#)
An item is part of an HTML form such as a check box, date picker, file browse field, popup list of values (LOV), select list, shuttle, flip toggle switch, text field, text area, and so on.
- [Viewing Page-Level Items](#)
Configure page-level items to control how items display.

- [Creating Page-Level Items](#)
Create page-level items in Page Designer in either the Rendering tab or by adding an item from the Gallery.
- [Editing Page-Level Items](#)
Edit item attributes to control how an item displays on a page.



See Also:

["About Item Types"](#)

13.1.1 Understanding Page-Level Items

An item is part of an HTML form such as a check box, date picker, file browse field, popup list of values (LOV), select list, shuttle, flip toggle switch, text field, text area, and so on.

When defining an item, developers must follow defined naming conventions and follow specific rules when referencing item values stored in session state.

- [About the Differences Between Page Items and Application Items](#)
Page items are placed on a page and have associated user interface properties and Application items are not associated with a page.
- [About Item Naming Conventions](#)
When creating an item name, developers must follow very specific item naming conventions.
- [Referencing Item Values](#)
You can reference item values stored in session state in regions, computations, processes, validation, and branches.
- [About Referencing Items Using JavaScript](#)
When you reference an item, the best approach is to reference by ID.
- [Working with Multiple Select List Item](#)
Learn how to handle values returned from a multiple select list item.



See Also:

["About Item Types"](#)

13.1.1.1 About the Differences Between Page Items and Application Items

Page items are placed on a page and have associated user interface properties and Application items are not associated with a page.

There are two types of items: page items and application items. **Page items** are placed on a page and have associated user interface properties, such as Display Only, Label and Label Template. Examples of page-level items include a check box, date picker, display as text, file browse field, popup list of values, select list, or a text area.

In contrast **Application items** are not associated with a page and therefore have no user interface properties. You can use an application item as a global variable.



See Also:

["Managing Application-Level Items"](#)

13.1.1.2 About Item Naming Conventions

When creating an item name, developers must follow very specific item naming conventions.

When specifying an item name, remember the following rules. Item names must:

- Be unique within an application.
- Not include quotation marks.
- Begin with a letter or a number, and subsequent characters can be letters, numbers, or underscore characters.
- Be case-insensitive.
- Should not exceed 30 characters. Items longer than 30 characters cannot be referenced using bind variable syntax. See ["Referencing Session State Using Bind Variable Syntax."](#)
- Cannot contain letters outside the base ASCII character set.

As a best practice Oracle recommends including the page number when naming items. By default, wizards prefix page item names with `P<page no>_<item name>` (for example, `P1_NAME`).

13.1.1.3 Referencing Item Values

You can reference item values stored in session state in regions, computations, processes, validation, and branches.

[Table 13-1](#) describes the supported syntax for referencing item values.

Table 13-1 Syntax for Referencing Item Values

Type	Syntax	Description
SQL	<code>:MY_ITEM</code>	Standard bind variable syntax for items whose names are no longer than 30 bytes. Use this syntax for references within a SQL query and within PL/SQL code.
PL/SQL	<code>V('MY_ITEM')</code>	PL/SQL syntax referencing the item value using the <code>V</code> function. Use this syntax in PL/SQL code of packages or stored procedures and functions. Avoid this syntax in SQL statements. It may result in performance problems.
PL/SQL	<code>NV('MY_NUMERIC_ITEM')</code>	Standard PL/SQL syntax referencing the numeric item value using the <code>NV</code> function. Use this syntax in PL/SQL code of packages or stored procedures and functions. Avoid this syntax in SQL statements. It may result in performance problems.

Table 13-1 (Cont.) Syntax for Referencing Item Values

Type	Syntax	Description
Static Text (exact)	&MY_ITEM.	Static text. Exact Substitution. Note: Exact substitution syntax should be avoided in SQL or PL/SQL code because it can result in SQL Injection vulnerabilities.

You can set the value of an item in your application using any of the following methods:

- For page-level items, use the Source Attribute to set the item value.
From the page, select the item name to view the Edit Page Item page. Scroll down to Source and edit the appropriate fields.

You can also set the value of an item in any region based on PL/SQL or a process using the following syntax:

```
BEGIN
  :MY_ITEM := 'new value';
END;
```

- Pass the value on a URL reference using `f?p` syntax. For example:
`f?p=100:101:10636547268728380919::NO::MY_ITEM:ABC`
- Set the value using a computation. Computations are designed to set item values. For example:

```
TO_CHAR(SYSDATE, 'Day DD Month, YYYY');
```

- Use the PL/SQL API to set an item value within a PL/SQL context. For example:

```
APEX_UTIL.SET_SESSION_STATE('MY_ITEM', SYSDATE);
```

See Also:

- ["Clearing Session State"](#)
- ["Understanding Cross-Site Scripting Protection"](#)
- ["Managing Session State Values"](#)

13.1.1.4 About Referencing Items Using JavaScript

When you reference an item, the best approach is to reference by ID.

If you view the HTML source of an Oracle Application Express page in a web browser, you would notice that all items have an id attribute. This ID corresponds to the name of the item, not the item label. For example, if you create an item with the name `P1_FIRST_NAME` and a label of `First Name`, the ID is `P1_FIRST_NAME`.

You can get and set item attributes and values using the JavaScript functions `$('P1_FIRST_NAME')` and `$('P1_FIRST_NAME', 'Joe');`. Consider the following example:

```
function showFirstName(){
    alert('First Name is ' +$v('P1_FIRST_NAME'))
};
function setFirstName(pFirstName){
    $s('P1_FIRST_NAME', pFirstName);
};
```

These functions can be called by other JavaScript functions or with the Execute JavaScript code dynamic action.



See Also:

"APEX_JAVASCRIPT" in *Oracle Application Express API Reference*

13.1.1.5 Working with Multiple Select List Item

Learn how to handle values returned from a multiple select list item.

- [About Handling Values Returned from a Multiple Select List Item](#)
- [Using APEX_UTIL.STRING_TO_TABLE to Convert Selected Values](#)

13.1.1.5.1 About Handling Values Returned from a Multiple Select List Item

A multiple select item renders as a multiple select list form element which can be either a Multiselect List or Shuttle item type. When submitted, selected values are returned in a single colon-delimited string. You can handle values in this format in three ways:

- Using the `INSTR` function
- Using the `APEX_STRING.SPLIT` function
- Creating a shuttle

13.1.1.5.2 Using APEX_UTIL.STRING_TO_TABLE to Convert Selected Values

Suppose you had a report on the `EMP` and `DEPT` tables that is limited by the departments selected from a Department multiple select list. First, you create the multiple select item, `P1_DEPTNO`, using the following query:

```
SELECT dname, deptno
FROM dept
```

Second, you return only those employees within the selected departments as follows:

```
SELECT ename, job, sal, comm, dname
FROM emp e, dept d
WHERE d.deptno = e.deptno
AND instr(':'||:P1_DEPTNO||':','|'||e.deptno||'|') > 0
```

Next, assume you want to programmatically step through the values selected in the multiple select item, `P1_DEPTNO`. To accomplish this task, convert the colon-delimited string into a PL/SQL array using the `apex_string.split` function. The following example demonstrates how to insert the selected departments into an audit table containing the date of the query.

```
DECLARE
  l_selected apex_t_varchar2;
BEGIN
  --
  -- Convert the colon separated string of values into
  -- a PL/SQL array
  l_selected := apex_string.split(
    p_str => :P1_DEPTNO,
    p_sep => ':' );

  --
  -- Loop over array to insert department numbers and sysdate
  --

  FOR i IN 1..l_selected.count
  LOOP
    INSERT INTO report_audit_table (report_date, selected_department)
      VALUES (sysdate, l_selected(i));
  END LOOP;
END;
```

**See Also:**

"STRING_TO_TABLE Function" in *Oracle Application Express API Reference*

13.1.2 Viewing Page-Level Items

Configure page-level items to control how items display.

1. To view page-level attributes in Page Designer:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. In either the Rendering tab or the Layout tab, select the item to edit.

The Property Editor changes to display the attributes. Attributes are organized in groups.

 **Tip:**

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

3. Edit the appropriate attributes in the Property Editor.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.

4. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

13.1.3 Creating Page-Level Items

Create page-level items in Page Designer in either the Rendering tab or by adding an item from the Gallery.

- [Creating a Page-Level Item from the Rendering Tab](#)
- [Adding a Page-Level Item from the Gallery](#)
- [Creating a Static List of Values](#)
- [Creating a Cascading List of Values](#)
- [Creating a Shuttle Item on the Form Page in Page Designer](#)

13.1.3.1 Creating a Page-Level Item from the Rendering Tab

1. To create a page-level item from the Rendering tab:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. If necessary, create a region to contain the item.
 3. In the Rendering tab, right-click the region to contain the item and select **Create Page Item**.

The Property Editor displays attributes for the item. Attributes are organized in groups.

 **Tip:**

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

4. Edit the appropriate attributes in the Property Editor.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.



See Also:

- ["About Regions"](#)
- ["About Item Types"](#)

13.1.3.2 Adding a Page-Level Item from the Gallery

1. To create a page-level item by adding it from the Gallery:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. If necessary, create a region to contain the item.
 3. In the central pane, click **Layout** and then the **Items** tab in the Gallery. Passing the cursor over an item displays a tooltip that describes it.
 4. Select an item and drag it to the appropriate location in the Layout tab.



Tip:

You also right-click the item, click **Add To**, and select the appropriate location.

The Property Editor displays Page Item attributes.

5. Page Designer indicates what to do next. If there is an error, the Show Messages icon displays in the Page Developer toolbar.
 - a. Click the **Show Messages** icon on the Page Designer toolbar. The Messages dialog displays errors that must be addressed.
 - b. Select an error to highlight the associated attribute in the Property Editor.
6. Edit the appropriate attributes in the Property Editor.



Tip:

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

7. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

**See Also:**

- ["About Regions"](#)
- ["About Item Types"](#)

13.1.3.3 Creating a Static List of Values

One way to create a static list of values is to edit an item's List of Values definition. Note that this type of list of values is not reusable. As a best practice, create a list of values as a shared component whenever possible.

1. To create a static list of values:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. Create a new item from the Rendering tab or by adding it from the Gallery.

The Property Editor displays the Page Item attributes. Attributes are organized in groups.

 **Tip:**

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

3. Edit the appropriate attributes in the Property Editor.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.

4. Under **Identification**:
 - a. **Name** - Enter the name of this item. Item names must be valid Oracle identifiers. Oracle recommends that item names be no longer than 30 bytes so they can be used as bind variables in SQL Queries.
 - b. **Type** - Select **Select List**.
5. Under **List of Values**:
 - a. **Type** - Select **Static Values**.
 - b. **Static Values** - Click the **Display1, Display2** button.
In the Static Values dialog:

- **Display Value** - Enter the Display Value for each entry.
- **Return Value** - Enter the Return Value for each entry. If you do not include a Return Value, the return value equals the Display Value
- **Move Up** and **Move Down** - Click the **Move Up** and **Move Down** arrow buttons to change the order.
- **Sort** - To sort the list at alphabetically at runtime, expand the Sort region and enable **Sort at Runtime**.

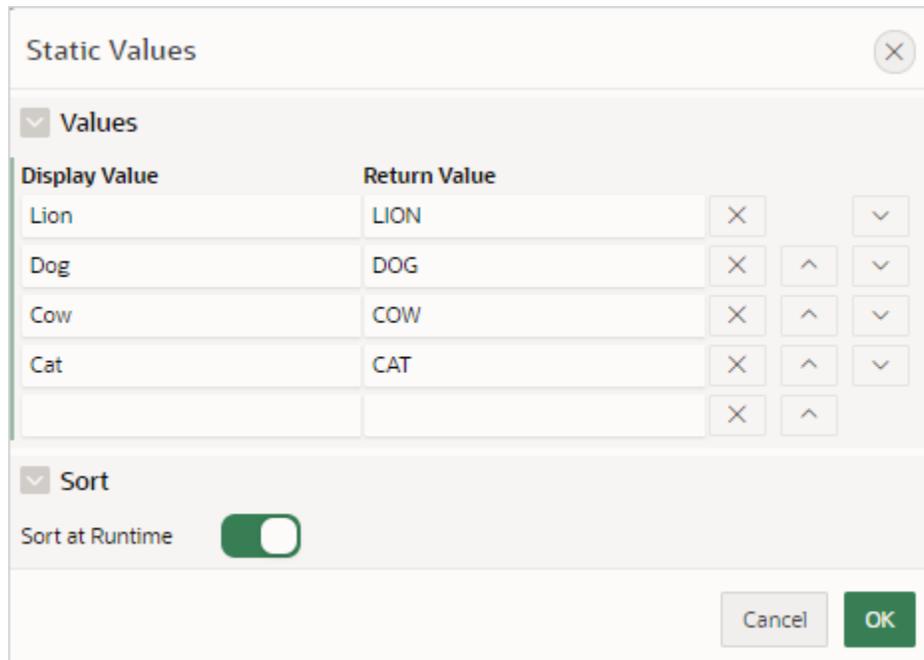
 **Tip:**

See the sections that follow to view examples.

- Click **OK**.
- Edit the remaining List of Values attributes as appropriate. To learn more about an attribute, select the attribute and click the **Help** tab in the central pane.
 - To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

Example 13-1 Four Values Displayed in Alphabetical Order

This example shows the Static Values dialog with four values defined: Lion, Dog, Cow, and Cat. The return value of each entry is capitalized. **Sort at Runtime** is set to **On** so that the list displays alphabetical order.

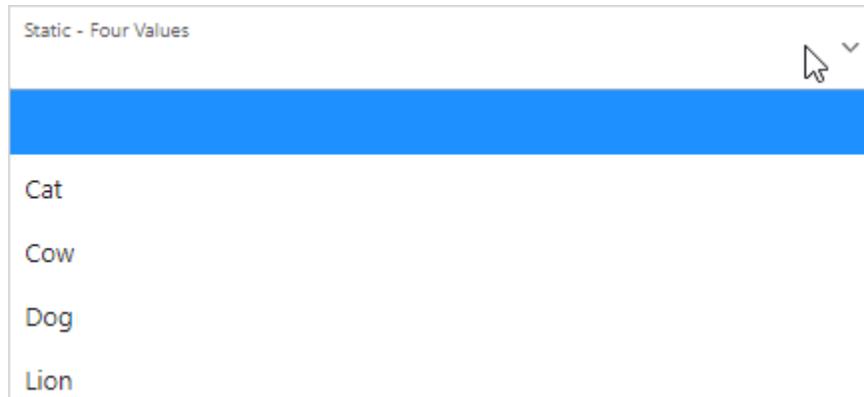


Display Value	Return Value		
Lion	LION	X	▼
Dog	DOG	X	▲ ▼
Cow	COW	X	▲ ▼
Cat	CAT	X	▲ ▼
		X	▲

Sort at Runtime

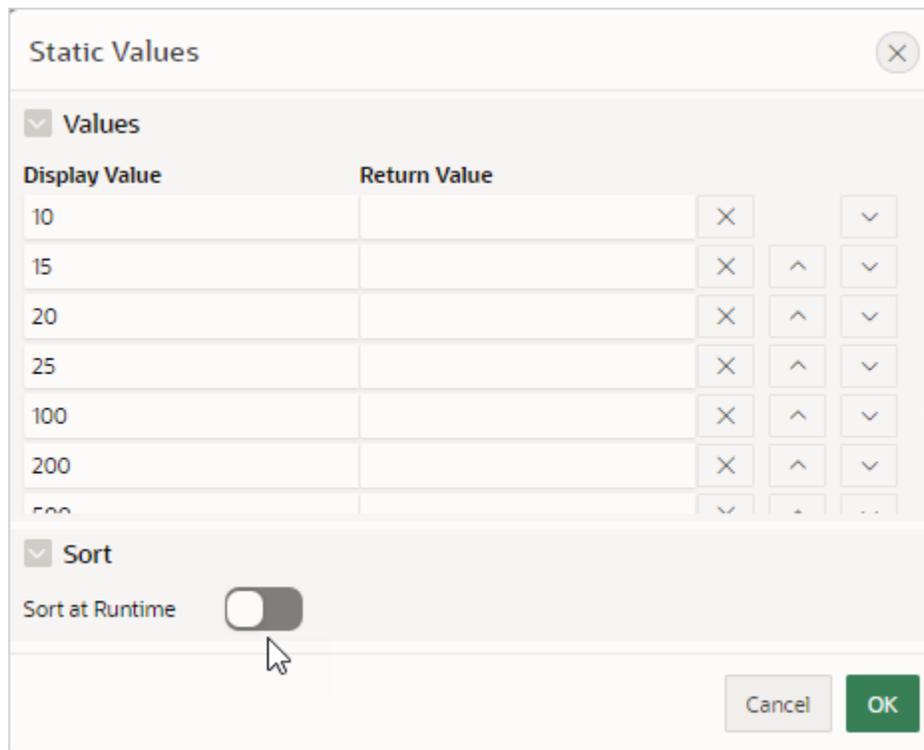
Cancel OK

In a running application this select list would look similar to the following illustration.



Example 13-2 Values Displayed in the Order Listed

This example shows the Static Values dialog with ten values defined: 10, 15, 20, 25, 50, 100, 200, 500, 1000, and 10000 which display in the order listed. The return value of each entry equals the display value.

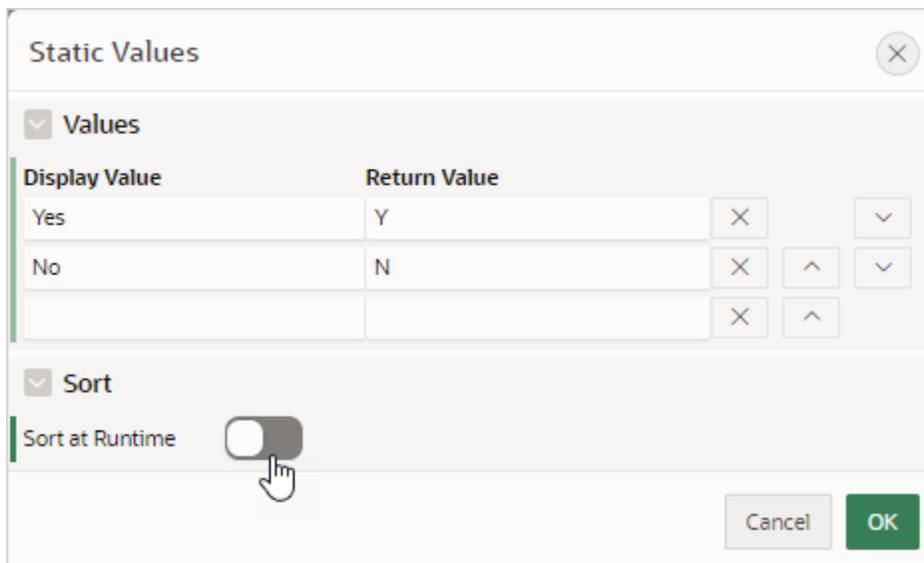


In a running application this select list would look similar to the following illustration.



Example 13-3 A List of Values with Having Both a Return and Display Value

This example shows the Static Values dialog with two values defined. The first value has a **Display Value** of Yes and a **Return Value** of Y. The second value has a **Display Value** of No and a **Return Value** of N. **Sort at Runtime** is set to **Off** to make sure Yes always displays first.



In a running application this select list would look similar to the following illustration.



See Also:

"Creating Lists of Values at the Application-Level" and "About Item Naming Conventions"

13.1.3.4 Creating a Cascading List of Values

By creating a cascading list of values (LOV), one item on a page determines the list of values for another item. App Builder includes cascading LOV support for the following item types: Select List, Shuttle, Checkbox, Radio Group, Popup LOV, and List Manager.

You create a cascading LOV by creating two items. To populate the second item, you specify a Cascading LOV Parent Item when running the Create Item Wizard or by editing the item's attributes.

The following example demonstrates how to create two related select lists where the value of the first list populates the second.

1. To create a cascading list of values:
 1. Create the first item, P1_DEPTNO:
 - a. Create a select list item.
 - b. In the Property Editor, edit the attributes:
 - Identification: Name - Enter `P1_DEPTNO`
 - Identification: Type - Select **Select List**.
 - Label: Label - Enter `Department`
 - c. In the Property Editor, edit the List of Values attributes:
 - List of Values: Type - Select **SQL Query**.
 - List of Values: SQL Query, enter:


```
SELECT dname as d,
       deptno as r
FROM dept
ORDER BY dname
```
 - List of Values: Display Null Value - Select **On**.
 - List of Values: Null Display Value - Enter:


```
- Select Department -
```
 - Accept the remaining defaults.

- Click **Save**.
2. Create the second item, P1_EMPNO:
 - a. Create a select list item.
 - b. In the Property Editor, edit the attributes:
 - Identification: Name - Enter `P1_EMPNO`
 - Identification: Type - Select **Select List**.
 - Label: Label - Enter `Employee`
 - c. In the Property Editor, edit the List of Values attributes:
 - List of Values: Type - Select **SQL Query**.
 - List of Values: SQL Query, enter:


```
SELECT ename as d,
       empno as r
FROM emp
WHERE deptno = :P1_DEPTNO
```
 - List of Values: Display Null Value - Select **On**.
 - List of Values: Null Display Value - Enter:


```
- Select Employee -
```
 - Accept the remaining defaults.
 - Click **Save**.
 3. To save and run the page, click **Save and Run Page**.

Two select lists appear. Making a selection in the Department select list, determines which individuals display in the Employees select list.

13.1.3.5 Creating a Shuttle Item on the Form Page in Page Designer

This section demonstrates how to create shuttle item type. In this example, you first create a report and form on the `DEPT` table that shows which employees are assigned to a given department. Then, you create a shuttle item that lists employees alphabetically to make it easier to assign employees to a department.

1. To create a shuttle item on a form:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
 Page Designer appears.
 2. In Page Rendering, right-click region containing the form and select **Create Page Item**.
 3. In the Property Editor, edit the following attributes:
 - a. Identification: Name - Enter the name of this item (for example, `PX_EMP_LIST`).
Where `PX` in the item name (for example `P2_EMP_LIST`) indicates the page on which the item resides.

The Property Editor displays the item attributes.

 **Tip:**

Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field, or click **Go to Group** and select the group.

3. Edit the appropriate attributes.

Edited attributes display a green marker to the left of the attribute name until the page is saved.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.

4. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

13.1.4.2 Defining Default Values for Page Items

You define default values for an item using the Default attribute. The default value is used when the item's value is not derived from session state and when the source value is `NULL`.

1. To define a default value for an item:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In either the Rendering tab or the Layout tab, select the item to edit.
The Property Editor displays attributes for the item.

 **Tip:**

Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field, or click **Go to Group** and select the group.

3. In the Property Editor, find the **Default** group.
4. Under **Default**, select a **Type**. Options include:
 - **Static** - Set to the value entered in **Static Value**.
 - **Item** - Set to the value returned from the session state for the selected Item.
 - **SQL Query** - Set to the value returned from the entered SQL Query.

- **SQL Query returning Colon Delimited List** - Set to the colon delimited list of values returned from the entered SQL Query . Colon delimited lists are required when the column is displayed as a check box, radio group, or shuttle.
 - **PL/SQL Expression** - Set to the value returned from the entered PL/SQL Expression.
 - **PL/SQL Function Body** - Set to the value returned from the PL/SQL Function Body entered.
 - **Sequence** - Set to the value returned from the Sequence entered.
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

13.1.4.3 Configuring Page Item Security

1. To configure page item security:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
 Page Designer appears.
 2. In either the Rendering tab or the Layout tab, select the item to edit.
The Property Editor displays the item attributes.

 **Tip:**

Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field, or click **Go to Group** and select the group.

3. Find **Security**. Configure the following Security attributes.

Table 13-2 Property Editor - Page Item, Security

Attribute	Description
Authorization Scheme	Select an authorization scheme which must evaluate to TRUE in order for this component to be rendered or otherwise processed. See Also: " Providing Security Through Authorization "

Table 13-2 (Cont.) Property Editor - Page Item, Security

Attribute	Description
Session State Protection	<p>Select a Session State Protection level. Options include:</p> <ul style="list-style-type: none"> • Unrestricted - The item can be set by passing the item in a URL or in a form. No checksum is required in the URL. • Checksum Required - Application Level - The item can be set by passing the item in a URL that includes a checksum specific to the the workspace and application. • Checksum Required - User Level - The item can be set by passing the item in a URL that includes a checksum specific to the workspace, application and user. • Checksum Required - Session Level - The item can be set by passing the item in a URL that includes a checksum specific to the the session. • Restricted - May not be set from browser - The item cannot be altered using the URL or POSTDATA. Select this option to restrict what can set the item value to internal processes, computations, and so on. This attribute only applies to items that are not used as data entry items and is always observed, even if Session State Protection is disabled. Use this attribute for page or application items that have the following Display As types <ul style="list-style-type: none"> – Display Only (Save State=No) – Text Field (Disabled, does not save state) <p>See Also: "Preventing URL Tampering"</p>
Store value encrypted in session state	<p>Specify whether to encrypt this item when stored in session state. If the contents of an item contain sensitive data, then you should encrypt the value when it is stored in the Application Express session state management tables. Otherwise, anyone with rights to read the Application Express meta data tables could potentially write a query to extract this sensitive data.</p> <p>Values up to 4000 bytes in length can be encrypted. Attempts to encrypt values longer than 4000 bytes produce an error message.</p>
Escape Special Characters	<p>This attribute only displays with some item types. Select On to prevent Cross-Site Scripting (XSS) attacks. Select Off if you want that HTML tags which are stored in the page item or in the entries of a list of value are actually rendered.</p> <p>See Also: "Understanding Cross-Site Scripting Protection"</p>

Table 13-2 (Cont.) Property Editor - Page Item, Security

Attribute	Description
Restricted Characters	<p>Select how to restrict the characters that can be saved in session state. Application Express displays an error message if a user tries to save data that does not conform to the selected character restriction. Restricting the characters hardens application security and is a possible counter measure to cross-site scripting (XSS) attacks.</p> <p>Available options include:</p> <ul style="list-style-type: none"> • All characters can be saved - No restriction applies. • Whitelist for a-Z, 0-9 and space - Only allow characters a-z, A-Z, 0-9, and space. • Blacklist HTML command characters (<>) - Reserved HTML characters <i>cannot</i> be saved. • Blacklist &<>"/;,* =% and -- - The following characters <i>cannot</i> be saved: &, <, >, ", /, ;, ", *, , =, %, "--" (PL/SQL comment) • Blacklist &<>"/;,* =% or -- and new line - The following characters <i>cannot</i> be saved: &, <, >, ", /, ;, ", *, , =, %, "--", and new line characters <p>See Also: "Understanding Cross-Site Scripting Protection"</p>

13.1.4.4 Changing an Existing Item to Use Quick Picks

Quick picks enable users to select predefined values with just one click, rather than typing in text or selecting from a list of available options. If the item type supports quick pick selection, use the Quick Picks attributes to define up to ten selections that display under a give item. Clicking on a quick pick sets the value of item. The following example shows quick picks for 5%, 10%, 15%, and 20%.

- To create a quick pick:
 - View the page in Page Designer:
 - On the Workspace home page, click the **App Builder** icon.
 - Select an application.
 - Select a page.

Page Designer appears.
 - In either the Rendering tab or the Layout tab, select the item to edit.
The Property Editor displays the item attributes.

Tip:

Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field, or click **Go to Group** and select the group.

- Under **Quick Picks**:
 - Show Quick Picks** - Select **On** .
 - Link Attributes** - Enter HTML attributes that are associated with the display of each Quick Pick link

 **Tip:**

Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field, or click **Go to Group** and select the group.

3. Under **Read Only** , select a **Type**, and enter appropriate information in the field provided.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

4. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

13.1.4.7 Applying a Format Mask to an Item

You can apply a format mask to an item by selecting the item in Page Designer and editing the **Format Mask** attribute. Developers commonly select a format mask to determine how numbers and dates display.

1. To apply a format mask to an item:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In either the Rendering tab or the Layout tab, select the item to edit.
The Property Editor displays the item attributes.

 **Tip:**

Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field, or click **Go to Group** and select the group.

3. Under **Appearance, Format Mask** - Select a format mask.

 **Tip:**

Only apply number format masks to items that contain numbers and only apply date format masks to items that contain dates. Otherwise, an error is raised since the component contains a value that can not be converted using the specified format mask.

4. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

13.1.4.8 Configuring Item Attributes to Warn Users of Unsaved Changes

Developers can use the **Warn on Unsaved Changes** item attribute to specify if the page item should be included in the unsaved changes check. This check warns the user when they try to navigate away from a page and when the page contains unsaved changes. Items not based on a database column (for example, a search item) may not need to be checked. For those items, set Warn on Unsaved Changes to Do Not Check.

1. To configure the Warn on Unsaved Changes attribute:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
 2. In either the Rendering tab or the Layout tab, select the item to edit.
The Property Editor displays the item attributes.

 **Tip:**

Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field, or click **Go to Group** and select the group.

3. Find **Advanced**.
4. For **Warn on Unsaved Changes**, select one of the following:
 - **Page Default** - Check for unsaved changes when the button is clicked if **Warn on Unsaved Changes** is enabled at the page-level.
 - **Ignore** - Changes to the item are ignored by the unsaved changes check. Select this option for items not based on a database column (for example, a search item).
5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

 **Tip:**

The **Warn on Unsaved Changes** attribute is implemented using the `apex.page.warnOnUnsavedChanges` API.

**See Also:**

"Configuring Pages to Warn Users of Unsaved Changes" and "warnOnUnsavedChanges" in *Oracle Application Express JavaScript API Reference*

13.1.4.9 Controlling How Page Items Write Session State

You can control whether a page item writes its session state into persistent (disk) session state or just into memory by configuring the item attribute, **Maintain Session State**.

1. To configure how a page item writes session state:
 1. View the page containing the item to be configured in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. In either the Rendering tab or the Layout tab, select the item to edit.

The Property Editor displays the item attributes.

**Tip:**

Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field, or click **Go to Group** and select the group.

3. In the Property Editor, find the **Source** group.
4. Under **Source**, **Maintain Session State**, select one of the following options:
 - **Per Request (Memory Only)** - Do not save state in the database. State is only available when processing the current request. When AJAX requests need to use an item, make sure to pass the item name using the Page Items To Submit attribute..
 - **Per Session (Disk)**- Maintain for each session by storing the value in the database, to access it across
 - **Per User (Disk)** - Value is saved in a user attribute repository and it is also available for later Oracle Application Express sessions.

**Note:**

When creating database items that work with a Form region (for example as part of a wizard), **Per Request (Memory Only)** is the default. **Per User (Disk)** is not available for these items.

5. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

**See Also:**

["About Setting Session State"](#)

13.1.4.10 Viewing Item Utilities

The Utilities page includes Grid Edit pages and reports that enable you to edit items on multiple pages within a selected application.

1. To access the Utilities page:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. Click **Utilities**.
 4. From Page Specific Utilities region, click **Item Utilities**.
 5. Select one of the following reports:
 - **Grid Edit of all Item Labels** - Edit all item labels for all pages in your application.
 - **Grid Edit of all Item Help Text** - Edit item help text to ensure consistency accross your application.
 - **Item Help Subscriptions** - Edit item help subscriptions in your application.
 - **All Page Items** - Edit all page items in your application.
 - **Password Items** - Edit password items in your application. Oracle recommends password items not save session state. To learn more, see the **Password Items** region on the right side of the page.
 - **Conditional Items** - Edit conditional items in your application.

13.2 Managing Dynamic Actions

Dynamic actions enable developers to define complex client-side behavior declaratively without the need for JavaScript.

- [About Dynamic Actions](#)

Dynamic actions provide a way to define complex client-side behavior declaratively without the need for JavaScript. Using the Dynamic Action Create wizard, you specify an action that is performed when a defined set of conditions occur. You can also specify which elements are affected by the action, and when and how they are affected.
- [About Dynamic Action Events](#)

You can define dynamic actions to fire based on events that happen on the page. Oracle Application Express includes four different categories of events: Browser events, Framework events, Component events, and Custom events. This section describes all supported events, including the internal JavaScript event name in brackets.
- [Creating a Dynamic Action](#)

Creating a dynamic action involves specifying when the action happens (with optional conditions), what action or actions are performed, and what elements are

affected by the action. To learn more about any Property Editor attribute, select the attribute and click the **Help** tab in the central pane.

- [Editing Dynamic Actions](#)
Once you create a dynamic action, you can modify attributes defined during the creation process, specify attributes not available during the process (such as specifying an Authorization Scheme) and add additional true actions.
- [Defining Dynamic Action Event Scope](#)
After creating the dynamic action, the scope of the action can be modified to trigger only once, for the lifetime of the current page, or until triggering elements are updated by a Partial Page Refresh (PPR).
- [Deleting a Dynamic Action](#)
Delete a dynamic action by selecting it in Page Designer and selecting Delete from the context menu.
- [About Calling JavaScript Using a Dynamic Action](#)
You can execute JavaScript code by creating a dynamic action.
- [Debugging Dynamic Actions](#)
Learn how to debug dynamic actions in Oracle Application Express.

**See Also:**

"[Accessing Page Specific Utilities](#)"

13.2.1 About Dynamic Actions

Dynamic actions provide a way to define complex client-side behavior declaratively without the need for JavaScript. Using the Dynamic Action Create wizard, you specify an action that is performed when a defined set of conditions occur. You can also specify which elements are affected by the action, and when and how they are affected.

When working with dynamic actions, you should be mindful of the fact that the more dynamic actions you add to a page, the greater your overall page size. This is because the dynamic action framework emits additional code to the client for each dynamic action defined, which then also must be downloaded and executed by the framework in the client.

The process of implementing a dynamic action involves the following steps:

1. Create (or use an existing) page component such as an item, button or region. This component is referenced within the dynamic action, in defining when it fires.
2. Create a dynamic action from the application page that invokes the action.
3. Run your application to test the dynamic action.

**Tip:**

See "[Debugging Dynamic Actions](#)" for information on how to debug problems.

**Tip:**

To view dynamic action examples, install the sample app, *Sample Dynamic Actions*. To learn more, see [Sample Apps](#).

13.2.2 About Dynamic Action Events

You can define dynamic actions to fire based on events that happen on the page. Oracle Application Express includes four different categories of events: Browser events, Framework events, Component events, and Custom events. This section describes all supported events, including the internal JavaScript event name in brackets.

Browser Events

**Note:**

The events displayed differ according to the page's current User Interface type. If you want to select an event that corresponds to a different type, then you have the option of selecting Show unsupported, which displays all events including those that do not correspond to the current type.

- Change (`change`) - Fires when a control loses the input focus and its value has been modified since gaining focus.
- Click (`click`) - Fires when the pointing device button is clicked over the triggering element.
- Double Click (`dblclick`) - Fires when the pointing device button is double clicked over the triggering element.
- Double Tap (`apexdoubletap`) - Fires when the pointer is doing a double tap/click.
- Get Focus (`focusing`) - Fires when the triggering element receives focus by either a pointing device or by tabbing into the element.
- Key Down (`keydown`) - Fires when a key on the keyboard is pressed. Use this event when you want to capture special keystrokes such as arrow keys, after a key has been pressed.
- Key Press (`keypress`) - Fires when a key on the keyboard is pressed resulting in text being entered. Use this event when you want to capture actual text entry.
- Key Release (`keyup`) - Fires when a key on the keyboard is released. Use this event when you want to capture special keystrokes such as arrow keys, after a key has been released.
- Lose Focus (`focusout`) - Fires when the triggering element loses focus either by the pointing device or by tabbing out of the element.
- Mouse Button Press (`mousedown`) - Fires when the pointing device button is pressed over the triggering element.

- Mouse Button Release (`mouseup`) - Fires when the pointing device button is released over the triggering element.
- Mouse Enter (`mouseenter`) - Fires once when the pointing device is moved into the triggering element.
- Mouse Leave (`mouseleave`) - Fires once when the pointing device is moved away from the triggering element.
- Mouse Move (`mousemove`) - Fires when the pointing device is moved while it is over the triggering element.
- Pan (`apexpan`) - Fires when the pointer is down, then moved in a horizontal direction.
- Page Load `ready` – Fires when the page loads.
- Page Unload (`unload`) - Fires when a page is unloaded.
- Press (`apexpres`) - Fires when the pointer is down for greater than 250ms.
- Resize (`resize`) - Fires when the browser window is resized.
- Resource Load (`load`) - When the triggering element is the window element (using a JavaScript Expression value of `window` in the When attributes), the event fires when the browser finishes loading all content within a document, including window, frames, objects and images. For other elements, this event can only be used for elements associated with a URL: images, scripts, frames, iframes.
- Scroll (`scroll`) - Fires when a scrollable triggering element is scrolled. This could be the browser window (using a JavaScript Expression value of `window` in the When attributes), scrollable frames or elements with the `overflow` CSS property set to `scroll` (or `auto` when the element's explicit height is less than the height of its contents).
- Select (`select`) - Fires when a user selects some text in a text field.
- Swipe (`apexswipe`) - Fires when the pointer is moving fast in a horizontal direction.
- Tap (`apextap`) - Fires when the pointer is doing a small tap click.

Framework Events

- After Refresh (`apexafterrefresh`) - Fires after the triggering element has been refreshed. The event is only valid for triggering elements that perform Partial Page Refresh and fire this event. The native components that support this are Interactive Reports, Classic Reports, Charts, List View and all item types with cascading LOV support. Plug-ins might support this event as well. This event can be sent by the `apex.server.plugin` and `apex.server.process` APIs when the `refreshObject` option is provided. See "[apex.server](#)" in *Oracle Application Express JavaScript API Reference*
- Before Page Submit (`apexbeforepagesubmit`) - Fires before a page being submitted.
- Before Refresh (`apexbeforerefresh`) - Fires before the triggering element has been refreshed. The event is only valid for triggering elements that perform Partial Page Refresh and fire this event. The native components that support this are Interactive Reports, Classic Reports, Charts, List View and all item types with cascading LOV support. Plug-ins might support this event as well. This event can be sent by the `apex.server.plugin` and `apex.server.process` APIs when the `refreshObject` option is provided. See "[apex.server](#)" in *Oracle Application Express JavaScript API Reference*.
- Dialog Closed (`apexafterclosedialog`) - Fires when an Application Express dialog is closed. This event only fires when the dialog is closed using the 'Close Dialog' page process, or the 'Close Dialog' dynamic action.

Component Events

These events are available when there is a component (either an item, region, or dynamic action) available to your application that triggers a custom event. These events appear in the following format Event name [Component Name], for example the Change Order event triggered by the Shuttle native item type appears as Change Order [Shuttle]. Component events are either triggered from native components shipped with Oracle Application Express, or from plug-in components you have installed into your application.

- Events triggered by native components:

These will be in the format Event name [Component Name]. For help related to events raised by our native components, see `interactiveGrid` and `treeView`. See "`interactiveGrid`" and "`treeView`" in *Oracle Application Express JavaScript API Reference*.

- Events triggered by plug-in components:

These will be available when added to your current application and will be in the format Event name [Component Name]. For help related to events raised by plug-ins, refer to Help text on the plug-in configuration page, by navigating to Shared Components, Plug-ins, *plug-in name*, Help Text, where the plug-in author may have included documentation.

Custom Events

- Custom Events:

By selecting Custom an additional field displays enabling you to define of a custom event. This is useful when the native or plug-in provided events are insufficient.

13.2.3 Creating a Dynamic Action

Creating a dynamic action involves specifying when the action happens (with optional conditions), what action or actions are performed, and what elements are affected by the action. To learn more about any Property Editor attribute, select the attribute and click the **Help** tab in the central pane.

To create a dynamic action in Page Designer:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. Click the **Dynamic Actions** tab in the left pane.
3. Under Dynamic Actions, right-click **Events** and select **Create Dynamic Action**.

Tip:

You can also select an event type and then right-click to select **Create Dynamic Action**.

The Property Editor displays Dynamic Action attributes.

Page Designer indicates what actions are required next. If there is an error, a **Messages** icon displays next to the **Save** button. Click the **Messages** icon to view a dialog listing all the errors. Select an error to highlight the associated attribute in the Property Editor.

4. In the Property Editor, edit the following Dynamic Action attributes:

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

- a. **Identification, Name** - Enter the name of the dynamic action.
- b. **Execution Options, Sequence** - Enter the sequence for this computation. The sequence determines the order of execution.
- c. **When, Event** - Specify the event that causes the dynamic action to fire.
- d. **When, Selection** - Select the type of page element or construct to be used to trigger the event.

 **Note:**

Only available if the event selected supports definition of a page element. Selecting any of the following events hides this attribute: Page Load, Page Unload, Resize, Before Page Submit, Orientation Change. All other event types show this field.

- e. **Client-side Condition, Type** - Optionally select the type of condition you want to control the true and false action processing of the dynamic action. If no client-side condition is defined, only true actions will fire. If a client-side condition is defined, the true action will fire when the condition is met, and the false action will fire when it is not.

 **Note:**

Other properties will display conditionally based on the type, to declaratively allow you to define the condition. For example for the condition type `Item = Value`, you will see an `Item` and `Value` property, which will be checked in evaluating the condition.

Next, define the action that to be performed if the event evaluates to True or False.

5. To edit an existing action:
 - a. Expand the Dynamic Action tree and select an existing action (that is, select either **True** or **False**).
 - b. In Property Editor, edit the following **Action** attributes:
 - **Action** - Specify which action you want to perform.

- **Affected Elements** - Select the page components to be affected when this action is executed. Additional options display depending upon the type of element selected.
- **Execution Options, Fire When Event Result Is** - Specify whether this action fires when the triggering element condition is met by selecting True (True Action), or when it is not met by selecting False (False Action). If no condition is specified, only True actions fire.
- **Fire on Initialization** - Specify if the action fires on initialization.

Initialization has a slightly different meaning depending on how the dynamic action is defined. For dynamic actions defined to fire on interactive grid columns, this specifies if the action fires when the interactive grid row is activated for editing. For all other dynamic actions, this specifies if the action fires when the page loads.

6. To add a new action:
 - a. Expand the Dynamic Action tree.
 - b. Right-click the dynamic action and select either **Create TRUE Action** or **Create FALSE Action**.
 - c. Edit the action in the Property Editor as described in the previous step.
7. Click **Save**.



See Also:

["About Dynamic Action Events"](#)

13.2.4 Editing Dynamic Actions

Once you create a dynamic action, you can modify attributes defined during the creation process, specify attributes not available during the process (such as specifying an Authorization Scheme) and add additional true actions.

To edit a dynamic action:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. Click the **Dynamic Actions** tab in the left pane. Dynamic actions are organized by events.
3. Expand the appropriate event and select the dynamic action.
Attributes for the dynamic action display in the Property Editor.
4. In Property Editor, edit the appropriate Dynamic Action attributes.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. To edit an existing action:
 - a. Expand the Dynamic Action tree to view the True or False nodes.
 - b. Under True or False, select the action.
 - c. Edit the action in the Property Editor.
6. To add a new action:
 - a. Expand the Dynamic Action tree.
 - b. Right-click the dynamic action and select either **Create TRUE Action** or **Create FALSE Action**.
 - c. Edit the action in the Property Editor.
7. Click **Save**.

13.2.5 Defining Dynamic Action Event Scope

After creating the dynamic action, the scope of the action can be modified to trigger only once, for the lifetime of the current page, or until triggering elements are updated by a Partial Page Refresh (PPR).

To specify scope:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. Click the **Dynamic Actions** tab in the left pane.
3. Under Dynamic Actions, select the dynamic action.

The Property Editor displays attributes for the dynamic action. Attributes are organized in groups.
4. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
 - **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
5. Under **Advanced**, select **Event Scope**. The scope of the event determines when the event is evaluated a second or successive time. Options include:
 - **Static** - Binds the event handler to the triggering element(s) for the lifetime of the current page, but is no longer bound if a triggering element is updated via Partial Page Refresh (PPR).

- **Dynamic** - Binds the event handler to the triggering element(s) for the lifetime of the current page, irrespective of any triggering elements being recreated via Partial Page Refresh (PPR).
 - **Once** - Binds the event handler to the triggering element(s) only once. The dynamic action is not triggered again until after the page has been fully refreshed.
6. Click **Save**.

13.2.6 Deleting a Dynamic Action

Delete a dynamic action by selecting it in Page Designer and selecting Delete from the context menu.

To delete a dynamic action:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. Click the **Dynamic Actions** tab in the left pane.
3. Expand the appropriate event and locate the dynamic action to be deleted.
4. Right-click the dynamic action and select **Delete**.
5. Click **Save**.

13.2.7 About Calling JavaScript Using a Dynamic Action

You can execute JavaScript code by creating a dynamic action.

You can also execute JavaScript code by creating a dynamic action with the **ActionExecute** and **Set Value**. You can also use JavaScript code for the condition of a dynamic action by setting the Client-side Condition type to **JavaScript Expression**.



See Also:

["Managing Dynamic Actions"](#)

13.2.8 Debugging Dynamic Actions

Learn how to debug dynamic actions in Oracle Application Express.

- [About Debugging Dynamic Actions](#)
- [Debugging Dynamic Actions](#)

13.2.8.1 About Debugging Dynamic Actions

Debugging dynamic actions in Oracle Application Express is slightly different than other debugging, because much of the processing done with the dynamic action framework is done on the client, not on the server. To debug dynamic actions, Oracle Application Express outputs debug information to the browser's JavaScript console if your browser supports it (for example Firefox with Firebug installed shows the debug information in its Console pane). The debug information tells you when an action of a dynamic action fires, along with some additional information about the dynamic action, in the following format:

```
Dynamic Action Fired: [Dynamic Action name] ([Action name]) {JavaScript  
object containing all Dynamic Action information}
```

This format enables you to identify the dynamic action name, the action name which indicates which action is triggered, and the JavaScript object which contains a lot of information about the dynamic action, including the when element, the affected elements, the event object and any data that may be associated with the dynamic action.

13.2.8.2 Debugging Dynamic Actions

To debug a dynamic action:

1. Ensure the application containing the dynamic action has Debugging enabled. See ["Utilizing Debug Mode."](#)
2. Run the page containing the dynamic action.
3. Open the browser's JavaScript console.
4. From the Developer toolbar, click **Debug**.

The page refreshes. If you have any dynamic actions that are set to fire on page load, you will see the debug output in the browser console.

Since debug information is only output when running in Debug mode, leaving Debug mode switched on enables you to further test if dynamic actions are firing when you expect them to. For example if you have defined a dynamic action that fires when a certain item's value changes, change that item's value and the console shows the debug output if the dynamic action fires.

13.3 Managing Buttons

You can use buttons to direct users to a specific page or URL, or to post or process information (for example, by creating Create, Cancel, Next, Previous, or Delete buttons). You can also configure buttons to display conditionally or warn users of unsaved changes.

- [What Actions Can a Button Perform?](#)
Use buttons to submit a page or redirect to a different page.
- [Creating a Button](#)
Create buttons in Page Designer.
- [Editing a Button](#)
Edit buttons in Page Designer.

- [Displaying a Button Conditionally](#)
You can choose to have a button display conditionally by editing the Server-side Condition attribute in Page Designer.
- [Configuring Button Attributes to Warn Users of Unsaved Changes](#)
Use the Warn on Unsaved Changes attribute to warn users of unsaved changes when they attempt to navigate away from a page.
- [About Calling JavaScript from a Button](#)
Call JavaScript from a button to confirm a request. Oracle Application Express uses this technique for the delete operation of most objects.
- [About the Relationship Between Button Names and REQUEST](#)
The name you give a Submit button (that is, a button with an Action of Submit Page) determines the value of the built-in attribute `REQUEST` when the page is submitted.
- [About Branching with Buttons](#)
Learn about branching with buttons.

**See Also:**

"[Calling a Page from a Button URL](#)" and "[Accessing Page Specific Utilities](#)"

13.3.1 What Actions Can a Button Perform?

Use buttons to submit a page or redirect to a different page.

Buttons can perform different types of actions. A button can:

- Submit a page (for example to save changes to a form page).
- Redirect to either a different page or a custom URL.
- Do nothing (for example if the button's behavior is defined in a Dynamic Action).

13.3.2 Creating a Button

Create buttons in Page Designer.

To create a button in Page Designer:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. If necessary, create a region to contain the item.
3. In the Gallery, click the **Buttons** tab.
Passing the cursor over a button displays a tooltip that describes it.
4. Right-click the button, select **Add To**, and select the appropriate location.

 **Tip:**

You also select the button with the mouse and drag it to the appropriate location in the Layout tab.

The Property Editor displays Button attributes. Attributes are organized in groups.

5. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
 - **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
6. Edit the appropriate attributes in the Property Editor.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

7. Click **Save**.

 **See Also:**

["About Regions"](#)

13.3.3 Editing a Button

Edit buttons in Page Designer.

To create a region button in Page Designer:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In either the Rendering tab or the Layout tab, select the button to edit.

The Property Editor displays the button attributes in the right pane.
3. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.

- **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
4. Edit the button attributes.

 **Note:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. Click **Save**.

13.3.4 Displaying a Button Conditionally

You can choose to have a button display conditionally by editing the Server-side Condition attribute in Page Designer.

To have a button display conditionally:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. In either the Rendering tab or the Layout tab, select the button to edit.

The Property Editor changes to display Button attributes. Attributes are organized in groups.

3. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
 - **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
4. Find **Server-side Condition**. Select a Type and enter appropriate information in the field provided.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. Click **Save**.

**See Also:**

"Referencing Session State Using Bind Variable Syntax"

13.3.5 Configuring Button Attributes to Warn Users of Unsaved Changes

Use the Warn on Unsaved Changes attribute to warn users of unsaved changes when they attempt to navigate away from a page.

To configure the Warn on Unsaved Changes attribute:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In either the Rendering tab or the Layout tab, select the button to edit.

The Property Editor changes to display button attributes. Attributes are organized in groups.
3. To find a group or attribute:
 - **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
 - **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.
4. Find **Behavior**.
5. For **Warn on Unsaved Changes**, select one of the following:
 - **Page Default** - Check for unsaved changes when the button is clicked if **Warn on Unsaved Changes** is enabled at page level.
 - **Do Not Check** - The unsaved changes check will not be performed when the button is clicked. Use this setting for Cancel, Delete, and Apply Changes buttons.
6. Click **Save**.

**Tip:**

The **Warn on Unsaved Changes** attribute is implemented using the `apex.page.warnOnUnsavedChanges` API.

 **See Also:**

"[Configuring Pages to Warn Users of Unsaved Changes](#)" and "[warnOnUnsavedChanges](#)" in *Oracle Application Express JavaScript API Reference*

13.3.6 About Calling JavaScript from a Button

Call JavaScript from a button to confirm a request. Oracle Application Express uses this technique for the delete operation of most objects.

For example, when you delete a button, a JavaScript message appears asking you to confirm your request. Consider the following example:

```
function deleteConfirm(msg)
{
var confDel = msg;
if(confDel ==null)
    confDel= confirm("Would you like to perform this delete action?");
else
    confDel= confirm(msg);

if (confDel== true)
    doSubmit('Delete');
}
```

This example creates a function to confirm a delete action and then calls that function from a button. Note that the function optionally submits the page and sets the value of the internal variable :REQUEST to `Delete`, thus performing the deletion using a process that conditionally executes based on the value of the request.

When you create the button, you must select **Redirect to URL**. Then, you would specify a URL target such as the following:

```
javascript:confirmDelete('Would you like to perform this delete action?');
```

Oracle recommends using dynamic actions as the preferred way of executing JavaScript code. Consider the following example:

1. Create a button with action of **Defined by Dynamic Action**.

Create a dynamic action and using the action type **Execute JavaScript Code** to execute the previous code, for example:

```
if (confirm("Would you like to perform this delete action?")) {
    apex.submit('Delete');
}
```

This example uses JavaScript, but you could also easily implement this example without having to use JavaScript. Instead, you can use the declarative actions `Confirm` and `Submit Page` which are also translatable.

**See Also:**

["Creating a Button"](#) and ["Managing Dynamic Actions."](#)

13.3.7 About the Relationship Between Button Names and REQUEST

The name you give a Submit button (that is, a button with an Action of Submit Page) determines the value of the built-in attribute `REQUEST` when the page is submitted.

You can reference the value of `REQUEST` from within PL/SQL using the bind variable `:REQUEST`. By using this bind variable, you can conditionally process, validate, or branch based on which button the user clicks. You can also create processes that execute when the user clicks a button. And you can use a more complex condition as demonstrated in the following examples:

```
If :REQUEST in ('EDIT','DELETE') then ...  
If :REQUEST != 'DELETE' then ...
```

These examples assume the existence of buttons named `EDIT` and `DELETE`. You can also use this syntax in PL/SQL Expression conditions. Be aware, however, that the button name capitalization (case) is preserved. In other words, if you name a button `LOGIN`, then a request looking for the name `Login` fails. For example:

```
<input type="BUTTON" value="Finish" onclick="apex.submit('Finish');">
```

In this example `Finish` is the name of the `REQUEST` and this example is case-sensitive.

13.3.8 About Branching with Buttons

Learn about branching with buttons.

Each page can include any number of branches. A branch links to another page in your application or to a URL. The Application Express engine considers branching at different times during page processing. You can choose to branch before processing, before computation, before validation, and after processing. Like any other control in App Builder, branching can be conditional. For example, you can branch when a user clicks a button. When you create a branch, you associate it with a specific button. The branch is only be considered if a user clicks the button.

**See Also:**

["Controlling Navigation Using Branches"](#)

13.4 Managing Trees

Trees to display hierarchical information in a clear, easy-to-use format. You can create a tree control using a SQL query.

- [About Trees](#)
Tree controls in Oracle Application Express use APEX Tree.

- [Creating a Tree on New Page](#)
Create a tree on a new page by running the Create Page Wizard.
- [Creating a Tree in Page Designer](#)
Create a tree control by providing a SQL query that specifies a hierarchical relationship by identifying an ID and parent ID column in a table or view.
- [Editing Tree Attributes](#)
Control tree behavior by editing region attributes and report Attributes.

13.4.1 About Trees

Tree controls in Oracle Application Express use APEX Tree.

App Builder includes a built-in wizard for generating a tree hierarchical navigation mechanism. Trees are implemented using a single hierarchical query that identifies the row to be used as the start of your query and the relationship between parent rows and child rows of the hierarchy. Trees use the APEX Tree implementation. This is a JavaScript-based, cross browser tree component that features optional keyboard navigation, and optional state saving.

When you implement a tree control, the SQL query specifies a hierarchical relationship by identifying an ID and parent ID column in a table or view. The tree query must utilize a `START WITH ... CONNECT BY` clause to generate the hierarchical query.



Tip:

The creation of APEX Tree regions is only supported on pages using a Desktop user interface.

About Desupported jsTrees

Prior to release 5.2, Oracle Application Express supported the rendering of jsTree tree regions. Oracle Application Express no longer supports jsTree tree regions. Oracle Application Express now supports the generation of an APEX Tree tree region. APEX Tree is a JavaScript based, cross browser tree component. jsTree regions are automatically upgraded to APEX Tree regions when upgrading from a previous release or when importing to release 18.1.



Tip:

To view tree examples, install the sample app, *Sample Trees*. To learn more, see [Sample Apps](#).

13.4.2 Creating a Tree on New Page

Create a tree on a new page by running the Create Page Wizard.

A tree is based on a query and returns data that can be represented in a hierarchy. When you create a tree using the Create Page Wizard, the wizard generates the hierarchical query for you based on the options you select.

To create a tree on a new page:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click **Create Page**.
4. For Create a Page:
 - a. User Interface - Select a user interface for the page (optional).

This attribute only displays for applications using older themes and for which Desktop and Mobile User Interfaces have been defined.
 - b. Select a page type - Select **Tree**.
5. For Page Attributes, specify the following:
 - a. Page Number - Specify the page on which the tree should be created.
 - b. Page Name - If the tree will be created on a new page, enter the page name.
 - c. Page Mode - Select a page mode.
 - d. Page Group - Select the name of the page group you would like to associate with this page. This option will only be visible when the application contains groups.
 - e. Region Template - Select a region template for the tree region.
 - f. Region Name - Enter a name for the region to contain the tree.
 - g. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page, and which breadcrumb navigation control you want to use. If you select Breadcrumb, enter the following:
 - Entry Name - Enter a name for the breadcrumb entry.
 - Select Parent Entry - Select a parent entry.
 - h. Click **Next**.
6. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
7. For Table/View Owner and Name:
 - a. Table/View Owner - Select the owner of the table from which the tree will be based.
 - b. Table / View Name - Select the table or view which contains the columns to be included in the master page.
 - c. Click **Next**.
8. For Query, identify the column you want to use as the ID, the Parent ID, and text that should appear on the nodes:
 - a. ID - Select the column to use as the ID.
 - b. Parent ID - Select the column to use as the parent ID.
 - c. Node Text - Select the text to appear on the tree nodes.
 - d. Start With - Select the column to be used to specify the root of the hierarchical tree query.

- e. Start Tree - Choose how to start your query. Options include:
 - Based on Existing Item - Select an existing application or page item.
 - Based on a SQL Query - Enter a SQL query that returns a single row or single column.
 - Based on a Static Value - Enter a static value.
 - Value is NULL.
 - f. Click **Next**.
9. For Where and Order by, specify the following:
- a. Where Clause - Enter a `WHERE` clause. To learn more, expand **Current Query**.
 - b. Order Siblings By - Select the order siblings by column, such as `ENAME`. The default value is based on the Node Text column selected.
 - c. Click **Next**.
10. For Tree Attributes, specify the following:
- a. Include Buttons - Select the buttons to include.
 - b. Selected Node Page Item - Select the page or application item to hold the selected node value. This item can be used to save the tree state, by holding the value of the last selected node. The value of the selected node can be saved to the selected item using the node link attribute or a page process. When the tree is reloaded, the tree opens to the last selected tree node.
 - c. Tooltip - Displays a tooltip when the mouse hovers over a leaf node. Options include:
 - Static Assignment - Specifies a static value to be used as the tooltip text. Substitution strings can be used in the static text, to incorporate information from the SQL query in the tooltip text. The following substitution strings can be used:
 - #VALUE# - refers to the value of ID column.
 - #TITLE# - refers to the value of Node Text column.
 - #LINK# - refers to the value of Link option.
 - Database Column - Select the column to use as the tooltip text.
 - d. Link Option - To make leaf node text a link, choose **Existing applications item** and click **Next**.

Existing Application Item makes the leaf node text a link. If you select this option, you must specify a page to link to and an existing application item to link leaf node text.
11. Confirm your selections and click **Create**.

 **Tip:**

The creation of APEX Tree regions is supported on pages using a Desktop user interface.

13.4.3 Creating a Tree in Page Designer

Create a tree control by providing a SQL query that specifies a hierarchical relationship by identifying an ID and parent ID column in a table or view.

The tree query you provide must utilize a `START WITH . . . CONNECT BY` clause to generate the hierarchical query.

To create a tree in Page Designer

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
Page Designer appears.
2. Click the **Layout** tab in the central pane.
3. In the Gallery, click the **Regions** tab. Right-click **Tree** and select **Add To**, and select the appropriate location.

 **Tip:**

You can also select the Tree region in the Gallery and drag it to the appropriate location in the Layout tab.

4. Page Designer indicates what to do next. If there are errors, the **Show Messages** icon displays in the Page Developer toolbar.
 - a. Click the **Show Messages** icon on the Page Designer toolbar.
The Messages dialog displays errors that must be addressed.
 - b. Select an error to highlight the associated attribute in the Property Editor.
5. Edit the **Region** attributes:
 - a. In the Property Editor, select the **Region** tab (if not already selected).
To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.
 - b. **Identification, Title** - Enter a region title. The region title only displays when it is defined in the region template.
 - c. Under **Source** -
 - **Location** - Select the location of the data.
 - **Type** - Select how the data is queried.
 - **Table Name** - Enter the case-sensitive table or view name. You can type in the name or pick from the list.Depending upon your selections, additional attributes may appear.
 - d. Under **Layout** -

- **Sequence** - Enter the display sequence for this item. The sequence and other layout settings determine where this item is displayed in relation to other items within the region.
 - **Parent Region** - Select the parent region to which this region belongs. If a parent region is selected then this region is rendered completely inside the parent region.
 - **Position** - Select the template position used to display this region. The selections available are derived from the appropriate template positions defined within the current theme, for the page's user interface.
 - e. **Appearance, Template** - Specify the template. Select a region template to define the appearance and layout of this region.
6. Edit the tree **Attributes**:
- a. In the Rendering tab, select the region and click **Attributes** tab.
Tree Attributes display in the Property Editor.
To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.
 - b. Under **Settings**:
 - **Node Label Column** - Select the data source column containing the value for the node label. The value cannot contain markup.
 - **Node Value Column** - Select the data source column containing the value for the node value. This value is not displayed but added to the tree adapter node id property that can be accessed using JavaScript.
 - **Hierarchy** - Indicate whether Application Express should compute the tree hierarchy from the data or whether the data already contains all hierarchy information. The user interface changes depending upon your selection.
 - **Computed With SQL:**
 - * **Node ID Column** – Select the data source column containing the ID for a node. This is required when the hierarchy is being computed by Application Express. Typically, a primary key column is chosen here.
 - * **Parent Key Column** – Select the data source column containing the value for the parent key of a node. Required when Application Express computes the hierarchy.
 - **Not Computed:**
 - * **Node Status Column** – Select the data source column containing the value for the node status. Required when the **Hierarchy** attribute is set to **Not Computed**. The column must contain **0** for leaf nodes and **1** for nodes with children.
 - * **Hierarchy Level Column** – Select the data source column containing the value for the hierarchy level of the node. Required when the **Hierarchy** attribute is set to **Not Computed**.
 - **Tooltip** - Select whether tooltips are displayed, and the source for the tooltip.
 - **Link** - Specify the link to be executed when a node is clicked.

- **Link Column** - Select the data source column containing the value for the link to be executed when a node is clicked.
- **Icon CSS Class Column** - Select the data source column containing the value for the icon CSS class to be applied to the node.

7. Click **Save**.

13.4.4 Editing Tree Attributes

Control tree behavior by editing region attributes and report Attributes.

By default, a tree does not have focus and node links are activated with a single click action.

1. To access the Tree attributes:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. Select the tree region in the Rendering tab or the Layout tab.

The Property Editor displays attributes in the right pane. Attributes are organized in groups.

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

3. Edit Region attributes:
 - a. In the Property Editor (right pane), select the **Region** tab.
 - b. Edit attributes as needed.
4. Edit tree Attributes
 - a. In the Property Editor (right pane), select the **Attributes** tab.
 - b. Edit attributes as needed.
5. Click **Save**.

13.5 About Incorporating JavaScript into an Application

Oracle Application Express includes multiple built-in interfaces especially designed for adding JavaScript.

Adding JavaScript to a web application is a great way to add features that mimic those found in client/server applications without sacrificing all the benefits of web deployment.

Remember that JavaScript is not appropriate for data intensive validations. For example, to verify that a name is contained within a large database table, you must pull down every record to the client, creating a huge HTML document. In general, complex operations are much better suited for server-side Application Express validations instead of JavaScript. To learn more, see the JavaScript discussion for the appropriate control or component.

 **See Also:**

- "[Supported Shortcut Types](#)" for information about referencing a shortcut inside of a JavaScript literal string
- "[Understanding Validations](#)"

14

Adding Navigation

Add navigation to an application by creating breadcrumbs, branches, tabs, or classic navigation bars.



Tip:

You can also add navigation by creating a list (or a shared collection of links). Newer themes support the creation of lists that render as a navigation menu or navigation bar. See "[Managing Navigation Menus](#)" and "[Managing Navigation Bar Lists](#)."

- [About Using Lists as Navigation](#)
Add navigation to your application by creating a list (or a shared collection of links). Newer themes, such as *Universal Theme - 42*, support the creation of navigation menus and navigation bars.
- [Creating Breadcrumbs](#)
Breadcrumbs provide hierarchical navigation and can be displayed as a list of links or as a breadcrumb path.
- [Controlling Navigation Using Branches](#)
Add navigation to application pages by creating branches. A branch is an instruction to link to a specific page, procedure, or URL after a given page is submitted.
- [Managing Tabs](#)
If your application uses an older theme, add navigation by creating tabs.
- [Managing a Classic Navigation Bar](#)
If your application uses an older theme, add navigation by creating classic navigation bar entries.



See Also:

["Managing Trees"](#)

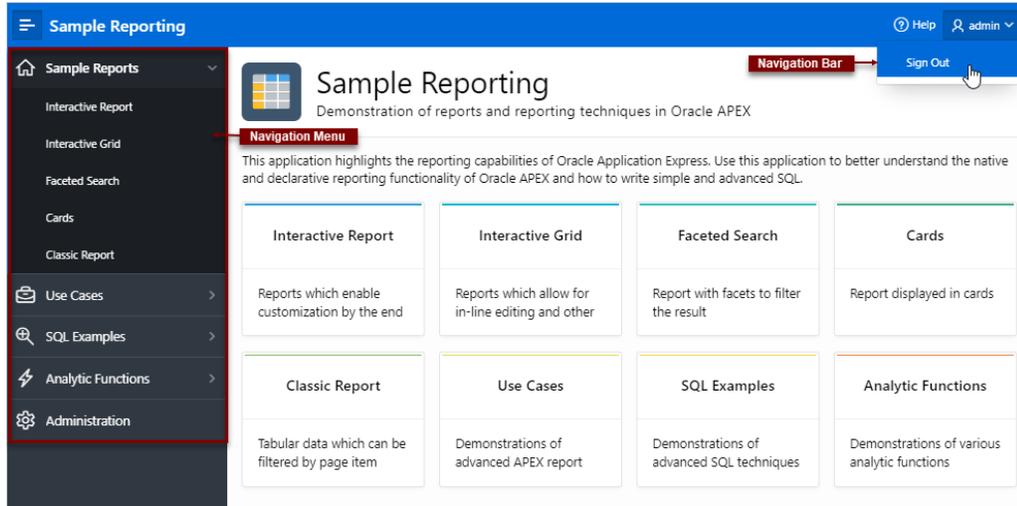
14.1 About Using Lists as Navigation

Add navigation to your application by creating a list (or a shared collection of links). Newer themes, such as *Universal Theme - 42*, support the creation of navigation menus and navigation bars.

You add a list to a page by creating a region and specifying the region type as List. You control the appearance of a list through list templates. For example, you can create static list that functions as navigation using the template **Vertical Unordered List with Bullets**.

Navigation menus are lists that render at the top of the page (similar to tabs) or display as a side bar. A **navigation bar** displays with a list template in the #NAVIGATION_BAR# position on your page template.

The *Sample Reporting* sample app, shown below, includes both a navigation menu and a navigation bar.



Tip:

To install the sample app, *Sample Reporting*, see [Sample Apps](#).



See Also:

- ["Creating Lists"](#)
- ["Managing Navigation Menus"](#)
- ["Managing Navigation Bar Lists"](#)

14.2 Creating Breadcrumbs

Breadcrumbs provide hierarchical navigation and can be displayed as a list of links or as a breadcrumb path.

- [About Breadcrumbs](#)
Use breadcrumbs as a second level of navigation at the top of each page, complementing other user interface elements such as tabs and lists.
- [Creating a Breadcrumb While Creating a Page](#)
Create a breadcrumb when creating a new page.

- [Creating a Breadcrumb Manually](#)
Create a breadcrumb while creating a new page, as a Shared Component, using the Create Breadcrumb Wizard, adding a breadcrumb region in Page Designer. Add breadcrumb entries from Shared Components.
- [Editing Breadcrumbs](#)
Edit breadcrumbs and breadcrumb entries in Shared Components and edit breadcrumb attributes in Page Designer.
- [Accessing Breadcrumb Reports](#)
Access the following reports by clicking the tabs at the top of the Breadcrumbs page: Hierarchy, Grid Edit, Exceptions, Utilization, and History.

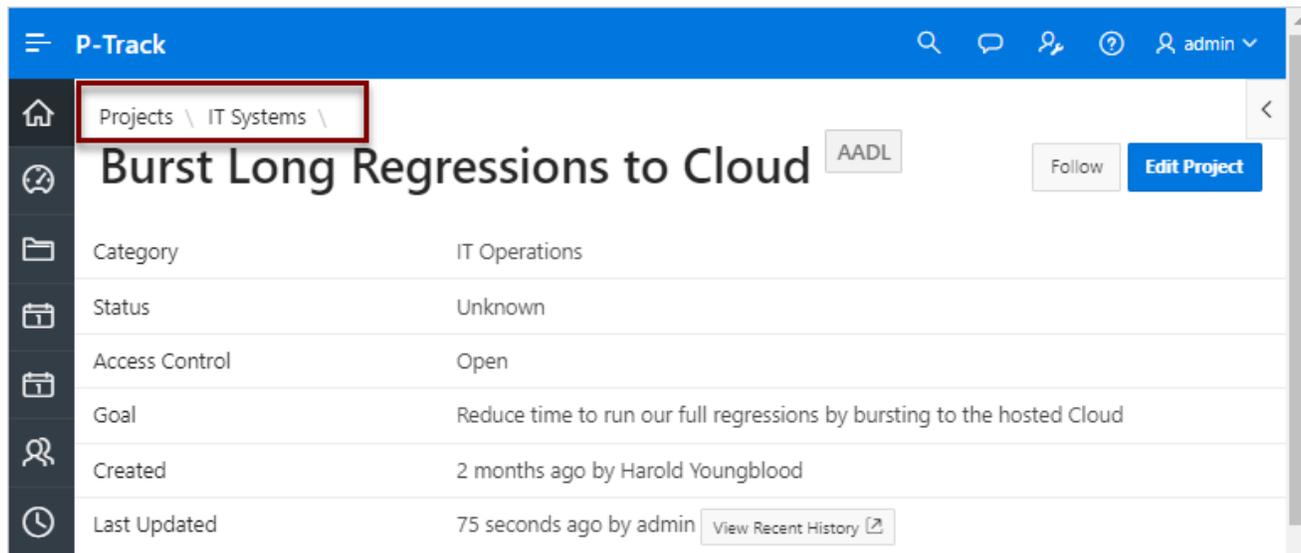
 **See Also:**

- ["Accessing New Themes"](#)
- ["Breadcrumb Templates"](#)

14.2.1 About Breadcrumbs

Use breadcrumbs as a second level of navigation at the top of each page, complementing other user interface elements such as tabs and lists.

A breadcrumb is a hierarchical list of links that indicates where the user is within the application from a hierarchical perspective. Users can click a specific breadcrumb link to instantly view the page.



The screenshot shows a web application interface with a blue header bar labeled "P-Track". Below the header, a breadcrumb trail "Projects \ IT Systems \ " is highlighted with a red box. The main content area displays a project titled "Burst Long Regressions to Cloud" with a status of "AADL". The project details are as follows:

Category	IT Operations
Status	Unknown
Access Control	Open
Goal	Reduce time to run our full regressions by bursting to the hosted Cloud
Created	2 months ago by Harold Youngblood
Last Updated	75 seconds ago by admin View Recent History

14.2.2 Creating a Breadcrumb While Creating a Page

Create a breadcrumb when creating a new page.

1. To create a breadcrumb while running the Create Page Wizard:
1. Run the Create Page Wizard to add a new page.
During the wizard, a Breadcrumb option appears. The actual page on which this list displays depends upon the type of page you are creating.
2. From the Breadcrumb list, select **Breadcrumb** or select an existing breadcrumb (if applicable).
3. If you select Breadcrumb:
 - a. Parent Entry - Select a parent page (if applicable) or select **No parent entry**.
 - b. Entry Name - Enter a name for the breadcrumb.
4. Follow the on-screen instructions.

**See Also:**

["Managing Pages in a Database Application"](#)

14.2.3 Creating a Breadcrumb Manually

Create a breadcrumb while creating a new page, as a Shared Component, using the Create Breadcrumb Wizard, adding a breadcrumb region in Page Designer. Add breadcrumb entries from Shared Components.

- [About Creating a Breadcrumb Manually](#)
Create a breadcrumb manually by creating the breadcrumb, adding breadcrumb entries, and then adding the breadcrumb to a page by creating a region.
- [Creating Breadcrumbs from Shared Components](#)
Create a breadcrumb on the Breadcrumbs page accessible from Shared Components.
- [Creating a Breadcrumb Region in Page Designer](#)
Creating a breadcrumb region manually in Page Designer by running the Create Breadcrumb Wizard.
- [Add a Breadcrumb to a Page by Creating a Region](#)
After you create a breadcrumb, you add it to a page by creating a breadcrumb region.
- [Adding Entries to a Breadcrumb](#)
Add breadcrumb entries from Shared Components.
- [About Creating Dynamic Breadcrumbs](#)

14.2.3.1 About Creating a Breadcrumb Manually

Create a breadcrumb manually by creating the breadcrumb, adding breadcrumb entries, and then adding the breadcrumb to a page by creating a region.

1. To create breadcrumbs manually, you add a breadcrumb to each page in your application as follows:
1. Create the breadcrumb by running the Create Breadcrumb Wizard. You can access this wizard in two ways:

- Go to the Shared Component page and select **Create Breadcrumb**.
 - In Page Designer, select the **Create** menu and then **Breadcrumb Region**.
2. Add entries to the breadcrumb.
 3. Add the breadcrumb to a page by creating a region.

14.2.3.2 Creating Breadcrumbs from Shared Components

Create a breadcrumb on the Breadcrumbs page accessible from Shared Components.

1. To create breadcrumbs from the Shared Components page:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. On the Application home page, click **Shared Components**.
 4. Under Navigation, click **Breadcrumbs**.
The Breadcrumbs page appears.
 5. Click **Create Breadcrumb**.
 6. Enter a name and click **Create**.
 7. Add breadcrumb entries.



See Also:

["Adding Entries to a Breadcrumb."](#)

14.2.3.3 Creating a Breadcrumb Region in Page Designer

Creating a breadcrumb region manually in Page Designer by running the Create Breadcrumb Wizard.

The Create Breadcrumb Wizard creates the breadcrumb region and breadcrumb entry.

1. To create a breadcrumb region in Page Designer:
 1. View the page in Page Designer.
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
Page Designer appears.
 2. On Page Designer Toolbar at the top of the page, click the **Create** menu and select **Breadcrumb Region**.
The Create Breadcrumb Wizard appears.
 3. For Region Attributes:
 - a. Region Title - Enter a title for the region.
 - b. Region Template - Select a region template.

- c. Display Point - Identify the display point.
 - d. Sequence - Specify the sequence for this component. The sequence determines the order of evaluation.
 - e. Click **Next**.
 4. For Breadcrumb:
 - a. Breadcrumb - Select the Breadcrumb to be associated with this region.
 - b. Breadcrumb Template - Identify breadcrumb template.
 - c. Click **Next**.
 5. For Breadcrumb Entry:
 - a. Breadcrumb Entry Label - Specify the label for this breadcrumb entry.
 - b. Parent Entry - Select this breadcrumb entry's hierarchical parent..
 - c. Click **Next**.
 6. Confirm your selections and click **Finish**.

14.2.3.4 Add a Breadcrumb to a Page by Creating a Region

After you create a breadcrumb, you add it to a page by creating a breadcrumb region.

1. To add a breadcrumb region to a page:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

 **Note:**

Note the Gallery at the bottom of the page. Pass the cursor over a control or component to view a tooltip that describes it.

2. Create breadcrumb region from the Gallery:
 - a. In the Gallery, click the **Regions** tab.
 - b. Right-click **Breadcrumb**.
 - c. Select **Add To** and then select the appropriate location such as **Breadcrumb Bar**.

 **Tip:**

You can also select the Breadcrumb region in the Gallery and drag it to the appropriate location in the Layout tab.

Page Designer indicates what actions are required next. If there is an error, a **Messages** icon displays next to the **Save** button. Click the **Messages** icon to view

a dialog listing all the errors. Select an error to highlight the associated attribute in the Property Editor.

3. In the Property Editor, edit the following Region attributes:

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.

- a. Identification, Title - Enter a region title. The region title only displays when it is defined in the region template.
 - b. Source, Breadcrumb - Select the breadcrumb list associated with this page.
 - c. Layout, Sequence - Enter the display sequence for this item. The sequence and other layout settings determine where this item is displayed in relation to other items within the region.
 - d. Layout, Position - Select the template position used to display this region. The selections available are derived from the appropriate template positions defined within the current theme, for the page's user interface.
 - e. Appearance, Template - Select a region template to define the appearance and layout of this region. To learn more, click the **Help** tab in the central pane.
 - f. Appearance, Item Display Position - Specify where page items display in relation to the main region content.
4. Click **Save**.

Repeat these procedures for each page where you would like to add breadcrumb navigation.

14.2.3.5 Adding Entries to a Breadcrumb

Add breadcrumb entries from Shared Components.

1. To add entries to a breadcrumb:
1. Navigate to the Breadcrumbs page:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. Click **Shared Components**.
 - e. Under Navigation, click **Breadcrumbs**.
The Breadcrumbs page appears.
2. Select a breadcrumb to which to add entries.
3. Click **Create Breadcrumb Entry**.
4. Under Breadcrumb, select the page where this breadcrumb entry displays.
5. Under Entry:
 - a. Sequence - Indicate the order in which breadcrumb entries appear. The sequence determines the order of evaluation.

Home > Orders > Orders for ACME Inc

In this example, `ACME Inc` not only indicates the page a user is on but also the navigation path. The Application Express engine stores the value of `ACME Inc` in session state.

To create this type of dynamic menu, you must include a reference to a session state item in the breadcrumb's short name or long name. For example:

```
&COMPANY_NAME.
```

14.2.4 Editing Breadcrumbs

Edit breadcrumbs and breadcrumb entries in Shared Components and edit breadcrumb attributes in Page Designer.

- [Editing Breadcrumbs in Shared Components](#)
Once you create a breadcrumb, you can edit it on the Breadcrumbs page in Shared Components.
- [Reparenting Breadcrumb Entries](#)
Select a new parent for selected breadcrumb entries on the Reparent Entries page.
- [Deleting Unused Breadcrumb Entries](#)
Delete unused breadcrumb entries.
- [Editing Breadcrumb Attributes](#)
Edit Region attributes and Breadcrumb attributes in Page Designer.

14.2.4.1 Editing Breadcrumbs in Shared Components

Once you create a breadcrumb, you can edit it on the Breadcrumbs page in Shared Components.

1. To edit a breadcrumb:
 1. Navigate to the Breadcrumbs page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
 - d. Under Navigation, select **Breadcrumbs**.
The Breadcrumbs page appears.
 2. To edit the breadcrumb name or delete a breadcrumb:
 - a. Click the **Edit** icon.
The Create/Edit Breadcrumb dialog appears.
 - b. To edit the name, update Breadcrumb Name and click **Apply Changes**.
 - c. To delete the breadcrumb, click **Delete**.
3. To edit breadcrumb entries:
 - a. Click the breadcrumb name.
The Entries page appears.
 - b. Click an entry.

- c. On Create/Edit page, edit the appropriate attributes.
To learn more about a specific attribute, see field-level Help.
- d. (Optional) Synchronize the corresponding Page Name and Title with the Breadcrumb Short Name.
In the right region under **Breadcrumb Entry**, **Synchronize Breadcrumb**, select **Page Name and Title**
Selecting this option makes changing the name of a page and breadcrumb a one-step process. The information you provide for breadcrumb names is used to update the referenced page name and title.
- e. Click **Apply Changes**.

14.2.4.2 Reparenting Breadcrumb Entries

Select a new parent for selected breadcrumb entries on the Reparent Entries page.

1. To reparent breadcrumb entries:
 1. Navigate to the Breadcrumbs page:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, select **Breadcrumbs**.
The Breadcrumbs page appears.
 2. Click the breadcrumb name.
The Entries page appears.
 3. From the Tasks list, click **Reparent Entries within this Breadcrumb**.
The Reparent Entries page appears.
 4. Use the navigation bar to edit or filter the view:
 - Breadcrumb - Identify the breadcrumb you want to edit and click **Go**.
 - Start With - Make a selection to restrict your view to a subset of the breadcrumb hierarchy and click **Go**.
 5. From Reparent to, select the new parent.
 6. Select the breadcrumbs entries you want to move and click **Reparent Checked Entries**.

14.2.4.3 Deleting Unused Breadcrumb Entries

Delete unused breadcrumb entries.

1. Navigate to the Breadcrumbs page:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.

- d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, select **Breadcrumbs**.
The Breadcrumbs page appears.
 2. Click the breadcrumb name.
The Entries page appears.
 3. From the Tasks list, click **Delete Unused Breadcrumb Entries**.
The Delete page appears.
 4. Select the entries to remove and click **Delete Checked**.

14.2.4.4 Editing Breadcrumb Attributes

Edit Region attributes and Breadcrumb attributes in Page Designer.

Region attributes define the area of the page which functions as a container for the breadcrumb. Edit **breadcrumb Attributes** to change the Breadcrumb Template, Template Options, and CSS Classes.

1. To edit region attributes:
 1. View the page in Page Designer.
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.
Page Designer appears.
 2. To edit Region attributes:
 - a. In the Rendering tab, select the region containing the breadcrumb.
 - b. The Property Editor displays the region attributes in the **Region** tab.
 - c. Edit the appropriate attributes.
To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.
 3. To edit breadcrumb Attributes:
 - a. In the Rendering tab, select the region containing the breadcrumb.
The Property Editor displays the region attributes in the **Attributes** tab.
 - b. Edit the appropriate attributes.
To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.
 4. Click **Save**.

14.2.5 Accessing Breadcrumb Reports

Access the following reports by clicking the tabs at the top of the Breadcrumbs page: Hierarchy, Grid Edit, Exceptions, Utilization, and History.



Note:

Breadcrumb reports only appear after you create a breadcrumb.

1. To view Breadcrumb reports:
1. Navigate to the Breadcrumbs page:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, select **Breadcrumbs**.
The Breadcrumbs page appears.
2. Click the appropriate tab:
 - **Hierarchy** - View breadcrumbs by page and hierarchy. Click the page number to link to a page.
 - **Grid Edit** - Edit all breadcrumb names at once. Click the page number to link to a page.
 - **Exceptions** - View the Exceptions page.
 - **Utilization** - View the Breadcrumb Utilization report. This report lists breadcrumbs by page. Click the page number to go to a specific page.
 - **History** - View the Breadcrumb History report. This report lists recent changes to breadcrumbs.

14.3 Controlling Navigation Using Branches

Add navigation to application pages by creating branches. A branch is an instruction to link to a specific page, procedure, or URL after a given page is submitted.

- [Creating a Branch](#)
Create a branch in Page Designer.
- [About Branching Conditionally](#)
Make a branch conditional by editing Server-side Condition attributes in Page Designer.

**See Also:**

"Accessing Page Specific Utilities"

14.3.1 Creating a Branch

Create a branch in Page Designer.

1. To create a branch:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. Create a branch in the left pane:
 - **Rendering** tab - Right-click and select **Create Branch**
 - **Processing** tab - Right-click and select **Create Branch**.

The Property Editor displays the Branch attributes.

3. Page Designer indicates what to do next. If there is an error, the Show Messages icon displays in the Page Developer toolbar.
 - a. Click the **Show Messages** icon on the Page Designer toolbar.

The Messages dialog displays errors that must be addressed.
 - b. Select an error to highlight the associated attribute in the Property Editor.
4. In the Property Editor, edit the attributes:

**Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

- a. **Identification, Name** - Specify the name of the branch for easy identification by developers.
- b. **Execution Options:**
 - i. **Sequence** - Specify the sequence for this component. The sequence determines the order of execution.
 - ii. **Point** - Select the point in the processing at which this branch action is considered. Options include:
 - **After Submit** (previously named **Before Computation**)
 - **Validating** (previously named **Before Validation**)
 - **Processing** (previously named **Before Processing**)

- **After Processing** (previously named **After Processing**)
 - **Before Header** (previously named **Before Header**)
- c. **Behavior, Type** - Select a page branch type. To learn more, click the **Help** tab in the central pane.
- The attributes that display in the Property Editor depend on the branch type you select.
- If Type is **Page or URL (Redirect)**, click **Target** and edit the attributes in the Link Builder Target dialog.
- d. **Server-Side Condition:**
- i. **When Button Pressed** - If you want this page processing component to execute only when the specified button is clicked, select a button from the list. You can incorporate this button condition with other conditions to further refine when this page processing component executes.
 - ii. **Condition Type** - Select a condition type from the list that must be met in order for this component to be rendered or processed. To learn more, click the **Help** tab in the central pane.
5. Click **Save**.

**See Also:**

- ["About the When Button Pressed Attribute"](#)
- ["Creating Pre-Rendering Branches, Computations, and Processes"](#)
- ["Creating Page Submission Branches, Validations, Computations, and Processes"](#)

14.3.2 About Branching Conditionally

Make a branch conditional by editing Server-side Condition attributes in Page Designer.

To make a branch conditional, view the branch attributes in the Property Editor. Under **Server-side Condition**, edit the appropriate attributes.

14.4 Managing Tabs

If your application uses an older theme, add navigation by creating tabs.

**Tip:**

Tabs only appear in applications using an older theme. Applications using the *Universal Theme - 42* theme provide navigation support through the creation of navigation menus.

- [About Tabs](#)
For applications that use an older theme, tabs are an effective way to navigate users between pages.
- [About the Tabs Page](#)
The Tabs page describes the tabs defined in your application.
- [Checking for Tab Template Support](#)
Prior to creating parent and standard tabs, check that your default template has positions defined for both standard and parent tabs using the appropriate substitution strings.
- [Creating a Tab](#)
Create tabs on the Tabs page.
- [Editing Tabs](#)
Edit tabs on the Tabs page.
- [Accessing Tab Reports](#)
Access the following reports by clicking the tabs at the top of the Tabs page: Conditional Display, Utilization, and History.

 **See Also:**

- ["Creating Lists"](#)
- ["Managing Navigation Menus"](#)
- ["Creating Database Applications"](#)

14.4.1 About Tabs

For applications that use an older theme, tabs are an effective way to navigate users between pages.

The ability to include tabs in your application depends upon your application theme. Older themes, such as such as *Theme 26 - Productivity Applications*, include tab-based navigation. Newer themes, such a *Universal Theme - 42*, include list-based navigation menus.

An application can have pages with no tabs, one level of tabs, and two levels of tabs. Standard tabs enable you to display only one level of tabs. To display two levels of tabs, you define both Parent tabs and Standard tabs.

 **Tip:**

As an alternative to tabs, you can use lists to display tab controls. List templates provide greater control over HTML generation.

App Builder includes two different types of tabs:

- **Standard tabs**
An application having only one level of tabs uses a standard tab set. A standard tab can have a one-to-one relationship with a page and is associated with a specific page and page number. You can use standard tabs to link users to a specific page.

- **Parent tabs**

Parent tabs can control the display of standard tab sets and can be current for many pages. Clicking a parent tab displays the corresponding standard tab, with the default page as the current page. Parent tabs give users another level of navigation and a context (or sense of place) within the application. You can use parent tabs to link users to a specific URL associated with a specific page.

You can group tabs into collections called a tab set. Each tab must be part of a tab set.

14.4.2 About the Tabs Page

The Tabs page describes the tabs defined in your application.

1. To access the Tabs page:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Navigation, click **Tabs**.

The Tabs page appears.

This application has 4 tabs organized into 1 tab sets, and has defined 0 parent tabs.

Tab Set: TS1

- Tab: Home**
Page 1. Home - Default Page (1)
- Tab: Projects**
Page 3. Projects - Default Page (1)
- Tab: Employees**
Page 2. Employees - Default Page (1)
- Tab: Tasks**
Page 5. Tasks - Default Page (1)

The Tab Display section provides additional information about how the current tabs or tab set are configured to display.

The Page Templates region at the bottom of the page displays a report of page templates associated with the current application. This region is hidden by default. To view it, click the greater than (>) icon to the left of Page Templates.

**See Also:**

["Checking for Tab Template Support"](#)

14.4.3 Checking for Tab Template Support

Prior to creating parent and standard tabs, check that your default template has positions defined for both standard and parent tabs using the appropriate substitution strings.

You also must make sure you do not override this template at the page-level.

1. To view page templates:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
 2. Under Navigation, click **Tabs**.
The Tabs page appears.
3. Locate **Page Templates** at the bottom of the page. If needed, expand the Page Templates region.

Page Templates			
Page Template Name	Supports Standard Tabs	Supports Parent Tabs	Template Class
Login	No	No	Login
No Tabs - Left Sidebar (fixed-width / DIV based)	No	No	No Tabs with Sidebar
No Tabs - Left and Right Sidebar (fixed-width / DIV left and optional table-based right)	No	No	No Tabs with Sidebar
No Tabs - Right Sidebar (fixed-width / DIV based)	No	No	No Tabs
No Tabs - Right Sidebar (optional / table-based)	No	No	No Tabs
One Level Tabs - Left Sidebar (fixed-width / DIV based)	Yes	No	One Level Tabs with Sidebar
One Level Tabs - Left and Right Sidebar (fixed-width / DIV left and optional table-based right)	Yes	No	One Level Tabs with Sidebar

See Also:

- ["Page Templates"](#)
- ["Using Themes"](#) for information about setting a default page template at the application level

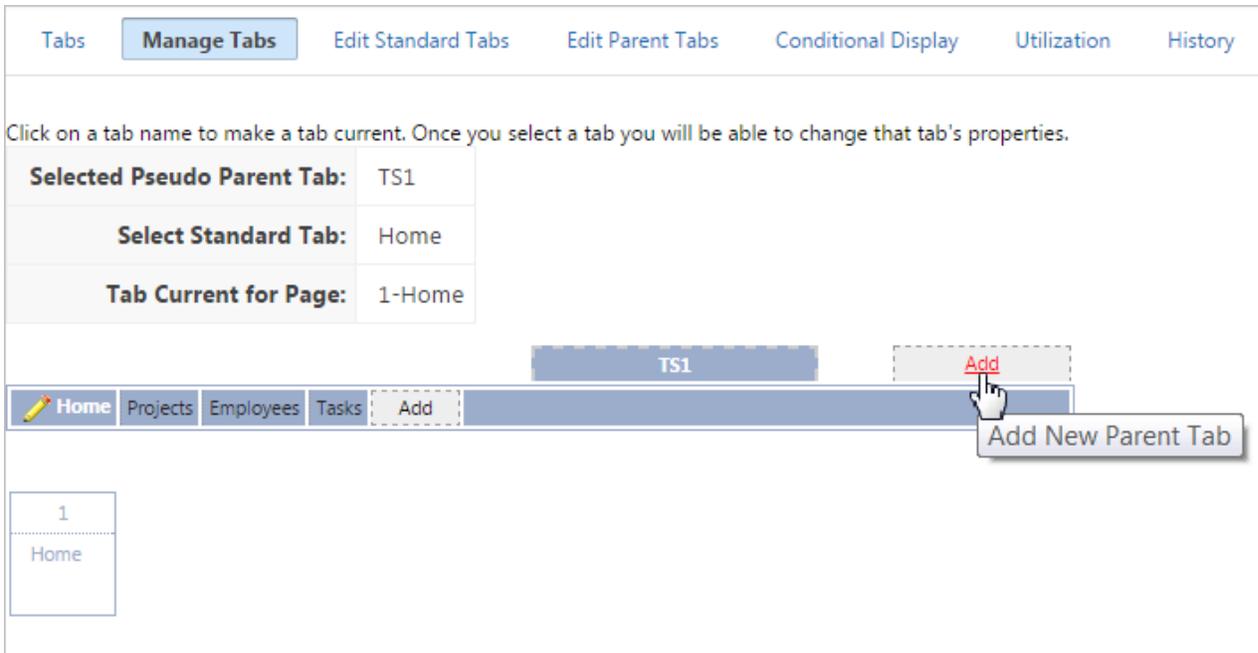
14.4.4 Creating a Tab

Create tabs on the Tabs page.

An application can have pages with no tabs, one level of tabs, and two levels of tabs. Standard tabs enable you to display only one level of tabs. To display two levels of tabs, you must define both Parent tabs and Standard tabs.

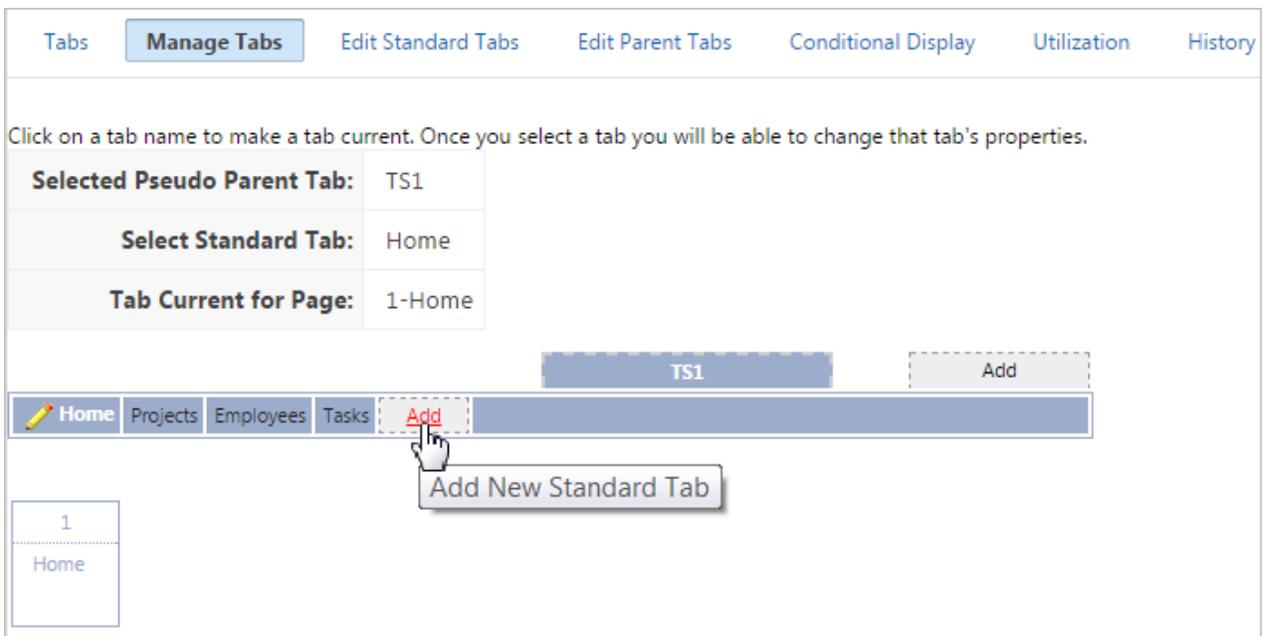
1. To create a tab:
 1. Access the Tabs page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
 - d. Under Navigation, click **Tabs**.
 2. Click **Manage Tabs**.
 3. To add a Parent tab, click the **Add** button in the upper row.

A graphical representation of the tabs defined in your application displays.



Parent tabs can control the display of standard tab sets. Clicking a parent tab displays the corresponding standard tab, with the default page as the current page.

4. To create a Standard tab, click the **Add** button in the lower row.



The Create Parent Tab or Create Standard Tab Wizard appears.

5. Follow the on-screen instructions.

**See Also:**

["About Tabs"](#)

14.4.5 Editing Tabs

Edit tabs on the Tabs page.

- [Editing Multiple Tabs Simultaneously](#)
- [Managing Standard Tabs](#)

14.4.5.1 Editing Multiple Tabs Simultaneously

To edit multiple tabs simultaneously:

1. Navigate to the Tabs page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Navigation, click **Tabs**.
2. Click one of the following tabs at the top of the page:
 - **Edit Standard Tabs**
 - **Edit Parent Tabs**A report appears.
3. To edit a specific tab, click the **Edit** icon.
4. Edit the appropriate attributes and click **Apply Changes**.

14.4.5.2 Managing Standard Tabs

The Standard Tab Task list displays on the right side of the Tabs page. You can access the links on this list to move a standard tab to different parent tab, rename a standard tab set, resequence the display order, associate pages with a tab set, create a new standard tab, or create a new standard tab set.

To access the Standard Tab Task list:

1. Navigate to the Tabs page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Navigation, click **Tabs**.
2. Click **Manage Tabs**.
3. Make a selection from the Standard Tab Task list on the right side of the page:
 - **Move Highlighted Standard Tab to a Different Parent Tab**

- **Rename Standard Tab Set**
- **Resequence Display Order**
- **Associate Page(s) with Selected Standard Tab**
- **Create New Standard Tab**
- **Create New Standard Tab Set**

14.4.6 Accessing Tab Reports

Access the following reports by clicking the tabs at the top of the Tabs page: Conditional Display, Utilization, and History.

This section describes the Conditional Display, Utilization, and History reports.

To view the Conditional Display report:

1. Navigate to the Tabs page:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Tabs**.The Tabs page appears.
2. Click the appropriate tab:
 - **Conditional Display** - The Conditional Display report displays Standard Tabs and Parent tabs that are configured to display conditionally. To filter the display, select tab type and click **Go**.
 - **Utilization** - The Utilization report lists the standard tabs used in the current application.
 - **History** - History report displays a history of changes to tab attributes for the current application.

14.5 Managing a Classic Navigation Bar

If your application uses an older theme, add navigation by creating classic navigation bar entries.



Tip:

Applications using the *Universal Theme - 42* theme provide navigation support through the creation of navigation menus.

- [About Classic Navigation Bar Entries](#)
For applications using older themes, navigation bar entries offer an easy way to move users between application pages.

- [Creating a Classic Navigation Bar Entry](#)
Before adding a navigation bar, you must create entries for the navigation bar.
- [Copying a Classic Navigation Bar Entry](#)
Copy a classic navigation bar entry by selecting **As a Copy of an Existing Navigation Bar** in the Create Navigation Bar Entry Wizard.
- [Editing a Classic Navigation Bar Entry](#)
Edit an existing navigation bar entry on the Navigation Bar Entries page accessible from Shared Components..
- [Editing Multiple Classic Navigation Bar Entries Simultaneously](#)
Edit multiple navigation bar entries simultaneously.
- [Accessing Classic Navigation Bar Entry Reports](#)
Access the Subscription and History reports by clicking the tabs at the top of the Navigation Bar Entries page.



See Also:

- ["Creating Custom Themes"](#)
- ["Managing Navigation Menu"](#)

14.5.1 About Classic Navigation Bar Entries

For applications using older themes, navigation bar entries offer an easy way to move users between application pages.

The associated page template determines the location of a navigation bar. A navigation bar entry can be an image, text, or an image with text beneath it. You must supply the images and text to use in the navigation bar entries.

Navigation bars are different from other shared components in that you do not need to reference them on a page-by-page basis. If your page template includes the #NAVIGATION_BAR# substitution string, the Application Express engine automatically includes any defined navigation bars when it renders the page.

14.5.2 Creating a Classic Navigation Bar Entry

Before adding a navigation bar, you must create entries for the navigation bar.

You can create a navigation bar entry from scratch or by copying an existing entry.

- [Creating a Classic Navigation Bar Entry from Scratch](#)
- [Creating a Classic Navigation Bar Entry for Feedback](#)

14.5.2.1 Creating a Classic Navigation Bar Entry from Scratch

To create a navigation bar entry from scratch:

1. Navigate to the Navigation Bar Entries page:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.

- c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Classic Navigation Bar Entries**.
2. Click **Create**.

The Create Navigation Bar Entry Wizard appears.

3. For Method, select **From Scratch**.
4. For Type, select **Navigation to URL**.
5. For Attributes, specify the following:
 - a. Sequence - Specify the order of evaluation for this component.

 **Tip:**

To review the existing entries, click the **Existing Navigation Bar Entries** link at the bottom of the page.

- b. Entry Label - Enter display text for this navigation bar entry.
 - c. Icon Image Name - Enter an image name. For naming conventions, see field-level Help.
 - d. Image ALT - Enter ALT text for navigation icons that are images. If you do not specify an image name, then this text displays.
 - e. Image Height - Define the height of the image in pixels.
 - f. Width - Defines the width of the image.
 - g. Click **Next**.
6. For Target, specify the following
- a. If the target location is a URL, specify:
 - Target is a - Select **URL**.
 - URL Target - Enter a URL. For example:
`http://www.yahoo.com`
 - b. If the target location is a page, specify:
 - Target is a - Select **Page in this Application**.
 - Page - Specify the target page number.

To reset pagination, select **reset pagination for this page**.

Select **Printer Friendly** to display the target page using the application's Printer Friendly template. Printer friendly templates optimize a page for printing.
 - Request - Enter text that defines the built-in application item called `REQUEST`.
 - Clear Cache - Enter the page numbers where you would like to clear the user's session state. Separate multiple entries with commas.
 - c. To set session state (that is, give a listed item a value):

- Set these items - Enter the list of application item names for which you would like to set session state. Separate multiple items with commas. Setting the session state gives the listed item a value.
- With these values - Enter a comma-delimited list of values for the items your specified.

You can specify static values or substitution syntax (for example, `&APP_ITEM_NAME.`). Note that item values passed to `f?p=` in the URL cannot contain a colon. Additionally, item values cannot contain commas unless you enclose the entire value in backslashes (for example, `\1234,56\`).

- d. Click **Next**.
7. To set a condition for displaying the navigation bar entry, select a condition type.
 8. Click **Create**.

 **Tip:**

In order for a navigation bar to appear, your page template must include the `#NAVIGATION_BAR#` substitution string. To learn more, see "[Page Templates](#)."

 **See Also:**

- "[Creating a Classic Navigation Bar Entry for Feedback](#)"
- "[Viewing Help](#)"
- "[Editing Themes](#)"
- "[Optimizing a Page for Printing](#)"

14.5.2.2 Creating a Classic Navigation Bar Entry for Feedback

Feedback is the process of gathering real-time comments, enhancement requests, and bugs from your application users. To add a feedback page to an application, you add a Feedback page.

To create a navigation bar entry for feedback:

1. Navigate to the Navigation Bar Entries page:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Classic Navigation Bar Entries**.
2. Click **Create**.

The Create Navigation Bar Entry Wizard appears. Each wizard page displays a series of blocks on the left, representing the sequence of steps. The highlighted block indicates the step you are performing.

3. For Method, select **From Scratch**.
4. For Type, select **Feedback**.
5. For Feedback:
 - a. Feedback Page - Select your feedback page.
 - b. Entry Label - Enter the label of the new navigation bar entry.
 - c. Display Sequence - The sequence for the new navigation bar entry. The sequence determines the order of evaluation.
6. Click **Create**.

 **Tip:**

In order for a navigation bar to appear, your page template must include the #NAVIGATION_BAR# substitution string. See "[Page Templates](#)."

 **See Also:**

"[Managing Feedback](#)"

14.5.3 Copying a Classic Navigation Bar Entry

Copy a classic navigation bar entry by selecting **As a Copy of an Existing Navigation Bar** in the Create Navigation Bar Entry Wizard.

1. To copy a navigation bar entry:
 1. Navigate to the Navigation Bar Entries page:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Classic Navigation Bar Entries**.
 2. Click **Create**.

The Create Navigation Bar Entry Wizard appears.
 3. For Method, select **As a Copy of an Existing Navigation Bar** and click **Next**.
 4. For Copy From Application, select an application and click **Next**.
 5. For New Names, enter the name on the new entry, and select whether to copy and subscribe.

6. Click **Copy Navigation Bar Entries**.

14.5.4 Editing a Classic Navigation Bar Entry

Edit an existing navigation bar entry on the Navigation Bar Entries page accessible from Shared Components..

1. To edit a navigation bar entry:
 1. Navigate to the Navigation Bar Entries page:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Classic Navigation Bar Entries**.
 2. Select a navigation bar entry.
The Edit page appears.
 3. Edit the appropriate attributes.
 4. To learn more about a specific item on a page, see field-level Help.
 5. Click **Apply Changes**.



See Also:

["Viewing Help"](#)

14.5.5 Editing Multiple Classic Navigation Bar Entries Simultaneously

Edit multiple navigation bar entries simultaneously.

1. To edit multiple navigation bar entries simultaneously:
 1. Navigate to the Lists page:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder**.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Classic Navigation Bar Entries**.
 2. Select a list.
 3. Click **Grid Edit** at the top of the page.
 4. Edit the appropriate attributes and click **Apply Changes**.

14.5.6 Accessing Classic Navigation Bar Entry Reports

Access the Subscription and History reports by clicking the tabs at the top of the Navigation Bar Entries page.



Note:

The Subscription and History buttons only appear after you create a navigation bar.

1. To view Classic Navigation Bar Entry reports:
1. Navigate to the Navigation Bar Entries page:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Classic Navigation Bar Entries**.
2. Click the appropriate tab:
 - **Subscription** - Click **Subscription** to access the Subscribed NavBars report. This report displays subscribed navigation bar entries in your application.
 - **History** - Click **History** to view the Navigation Bar History report. This report lists recent changes to navigation bars.

15

Managing Computations, Validations, and Processes

Enhance your application by including computations, validations, and processes.

Computations enable you to assign values to items. **Validations** are edit checks on specific items, pages, or columns. A **page process** performs an action at a specified point during the rendering or submission of the page. **Application processes** are blocks of PL/SQL logic that are set to run at specific points using processes from multiple pages of an application.

- [Understanding Page Computations](#)
Use computations to assign a value to an identified item when a page is submitted or displayed.
- [Understanding Validations](#)
Use validations to create edit checks on specific items, pages, or columns.
- [Understanding Page Processes](#)
Create **page processes** to perform an action at a specified point during the rendering or submission of the page.
- [Understanding Application Processes](#)
Create an application process to run a block of PL/SQL logic at a specific point from multiple pages of an application.
- [About Branches](#)
A branch is an instruction to go to a specific page, procedure, or URL. For example, you can branch from page 1 to page 2 after page 1 is submitted. When you create a branch, you specify a Branch Point and Branch Type.
- [Understanding Application Computations](#)
Create an application computation to set the value of a single page or application-level item. Application computations run at the same point across multiple pages in an application.
- [Using the Attribute Dictionary](#)
Use the Manage Attribute Dictionary page to update values on the current page with those in the Attribute Dictionary, or to update the Attribute Dictionary with the values on the current page.

15.1 Understanding Page Computations

Use computations to assign a value to an identified item when a page is submitted or displayed.

- [About Page Computations](#)
A page computation assigns a value to an identified item when a page is displayed or submitted (rendered and processed).
- [Creating a Page Computation](#)
Create a Page Computation in Page Designer.

- [Editing Page Computation Attributes](#)
Edit a page computation in Page Designer.
- [Editing the Computation Point and Source](#)
Control when a computation executes by editing the Sequence and Point attributes.
- [Example: Computation Points and Computation Syntax](#)
View computation points and computation syntax example.



See Also:

["Understanding Application Computations"](#)

15.1.1 About Page Computations

A page computation assigns a value to an identified item when a page is displayed or submitted (rendered and processed).

You create a page computation by running the Create Page Computation Wizard. For each computation, specify the item for which you are creating the computation and a computation type.

You can also use application-level computations to assign values to items. Most page-level computations populate page items. In contrast, most application-level computations populate application items.

15.1.2 Creating a Page Computation

Create a Page Computation in Page Designer.

1. To create a page computation:
 1. Navigate to the appropriate page in Page Designer.
 2. In the Rendering tab, expand the **Pre-Rendering** or **Post-Rendering** node and locate where the computation should be.
 3. Right-click the location and select **Create Computation**.

Page Designer appears.

In the Property Editor, attributes are organized into groups. To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.



Tip:

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

4. Edit the following attributes:
 - a. Identification, Item Name - Enter the page or application item populated by this computation.

- b. Execution Options, Sequence - Specify the sequence for this computation. The sequence determines the order of execution.
 - c. Execution Options, Point - Select at what point in page rendering or processing this computation is executed. The most typical computation point is **After Submit**.
 - d. Computation, Type - Select a computation type. To view a list of options, see Help.
5. Click **Save**.



See Also:

- ["Viewing a Page in Page Designer"](#)
- ["Creating Pre-Rendering Branches, Computations, and Processes"](#)
- ["Creating Page Submission Branches, Validations, Computations, and Processes"](#)

15.1.3 Editing Page Computation Attributes

Edit a page computation in Page Designer.

1. To edit a page computation:
 1. View the page in Page Designer.
 2. In the Rendering tab, expand the Pre-Rendering or Post-Rendering node and select the computation.

Page Designer appears.

In the Property Editor, attributes are organized into groups. To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

3. In the Property Editor, edit the appropriate attributes.

Tip:

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.

4. Click **Save**.



See Also:

- ["Viewing a Page in Page Designer."](#)

15.1.4 Editing the Computation Point and Source

Control when a computation executes by editing the Sequence and Point attributes.

You control when a computation executes by editing the **Sequence** and **Point** attributes. The **Sequence** attribute determines the order of evaluation. The **Point** attribute determines the point in page rendering or processing at which the computation executes. The most typical computation point is After Submit.

1. To edit a computation point and source:
 1. View the page in Page Designer.
 2. In the Rendering tab, expand the Pre-Rendering or Post-Rendering node and select the computation.

Page Designer appears.

In the Property Editor, attributes are organized into groups. To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

3. In the Property Editor, edit the following attributes.
 - a. Execution Options, Sequence - Specify the sequence for this component. The sequence determines the order of execution. If two components have the same sequence value, then they may be executed in a different order when the application is exported and imported into another environment.
 - b. Execution Options, Point - Select at what point in page rendering or processing this computation is executed.

For example, selecting **On New Instance** executes the computation when a new session (or instance) is generated. The most typical computation point is **After Submit**.

- c. Computation - Define expression or query to compute an item's value.
- d. Error, Error Message - Enter an error message that displays if this computation fails.

Tip:

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.

4. Click **Save**.

See Also:

["Viewing a Page in Page Designer"](#)

15.1.5 Example: Computation Points and Computation Syntax

View computation points and computation syntax example.

A good example of using computations can be illustrated by a page containing form fields for entering phone numbers. In this example, the phone number is stored in one database column; however, the data entry form breaks the phone number into three components: area code, prefix, and line number. In this example, the page items are called `P10_AREA_CODE`, `P10_PREFIX`, and `P10_LINE_NUMBER`.

Next, suppose you need to combine the values stored in these items into a single string. You could accomplish this by using an After Submit computation and store the combined values in an item called `P10_PHONE_NUMBER`.

To create a computation to store the combined values of `P10_AREA_CODE`, `P10_PREFIX`, and `P10_LINE_NUMBER` in new items:

1. Navigate to the appropriate page.
2. Create an item named `P10_PHONE_NUMBER` to store the combined values of `P10_AREA_CODE`, `P10_PREFIX`, and `P10_LINE_NUMBER`.
3. Create the computation:
 - a. In the Rendering tab, expand the **Pre-Rendering**.
 - b. Select a location, and then right-click and select **Create Computation**.

Page Designer appears.

In the Property Editor, attributes are organized into groups. To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

4. In the Property Editor, edit the following attributes:
 - a. Identification, Item Name - Select `P10_PHONE_NUMBER`.
 - b. Execution Options, Sequence - Specify the sequence for this computation. The sequence determines the order of execution.
 - c. Execution Options, Point - Select at what point in page rendering or processing this computation is executed. The most typical computation point is **After Submit**.
5. For Computation Type, you can create the following computation types:
 - a. Static Value:
 - Computation, Type - Select **Static Value** .
 - Computation, Static Value - Enter the following computation:

```
(&P10_AREA_CODE.) &P10_PREFIX.-&P10_LINE_NUMBER.
```

b. PL/SQL Function Body:

- Computation, Type - Select **PL/SQL Function Body** .
- Computation, PL/SQL Function Body - Enter the computation:

```
DECLARE
l_return_value VARCHAR2(300) DEFAULT NULL;
BEGIN
    l_return_value :=
    '(' || :P10_AREA_CODE || ') ' || :P10_PREFIX || '-' || :P10_LINE_NUMBER;
RETURN l_return_value;
END;
```

c. SQL Query (return colon separated value):

- Computation, Type - Select **SQL Query (return colon separated value)** .
- Computation Type, SQL Query - Enter the computation:

```
SELECT
    '(' || :P10_AREA_CODE || ') ' || :P10_PREFIX || '-' || :P10_LINE_NUMBER
FROM DUAL
```

d. PLSQL Expression:

- Computation, Type - Select **PLSQL Expression** .
- Computation Type, PLSQL Expression - Enter the computation:

```
'(' || :P10_AREA_CODE || ') ' || :P10_PREFIX || '-' || :P10_LINE_NUMBER
```

6. Click Save.**See Also:**

["About the Differences Between Page Items and Application Items"](#)

15.2 Understanding Validations

Use validations to create edit checks on specific items, pages, or columns.

- [About Validations](#)
Learn about validations.
- [What Happens When a Validation Fails?](#)
Learn what happens when a validation fails.
- [Creating a Validation](#)
Create validations in Page Designer.
- [Editing a Validation](#)
Edit validations in Page Designer.
- [About Determining When Validations Execute](#)
Determine when a validation executes by editing the Always Execute attribute.

- [About Defining How Validation Error Messages Display](#)
Control how validation messages display by editing the Error Message and Error Message attributes.
- [Processing Validations Conditionally](#)
Control when and if a validation executes by configuring the Server-side Condition attributes.
- [About Altering the Go to Error Link](#)
Alter the Go to Error text to change the default text or to translate it into a language that is not translated by default.

15.2.1 About Validations

Learn about validations.

A validation is an edit check. Validations specific to a single item are **page item validations**. Validations that apply to an entire page are **page validations**. Validations for tabular forms specific to a single column are **column level validations**. Validations for tabular forms that do not apply to a single column are **tabular form row validations**.

You can define a validation declaratively by selecting a validation method. You enter the actual validation edit check in the Validation Messages field. Be aware that if a validation fails, subsequent page processes or computations do not occur. Also remember that the validation you enter must be consistent with the validation type you selected.

15.2.2 What Happens When a Validation Fails?

Learn what happens when a validation fails.

If a page is submitted and some of the validations fail, Oracle Application Express redisplay the existing page with all inline validation errors. While displaying inline errors, Application Express does not execute computations, application processes, or page processes (for example, Automated Row Fetch) which are defined to execute during Page Rendering (in other words, all "On Load %" display points). The one exception is if the computations and processes use the condition type Inline Validation Errors Displayed.

The reason for skipping these computations and processes is that any of them could potentially alter the data entered by the user. For example, an Automated Row Fetch process would fetch and overwrite the modified data with the values from the database when the user actually wants to get the entered data in order to fix the validation error.

If a computation is skipped, the following displays in the debug output:

```
Do not perform computation because inline validation errors found.
```

If an application or page process is skipped, the following displays in the debug output:

```
Skip because inline validation errors found.
```

15.2.3 Creating a Validation

Create validations in Page Designer.



Note:

Text entered for validations may not exceed 3,950 characters.

1. To create a validation in Page Designer:
1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. Click the **Processing** tab in the left pane.
3. Right-click **Validations** and select **Create Validation**.

Validation attributes display in the Property Editor. Attributes are organized in groups.



Note:

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

4. **Identification, Name** - Enter the name of the validation. Make this name should be descriptive so that developers can easily identify conditions being checked.
5. **Execution Options, Sequence** - Enter the sequence for this validation. The sequence determines the order of execution.
6. Edit the following **Validation** attributes:
 - a. **Validation, Editable Region** - Select the associated region.
 - b. **Validation, Type** - Select the type of equality to be tested for this validation. Depending on your selection, one or more additional attributes are required to fully define this validation.

If the validation passes the equality test, or evaluates to TRUE, then the validation error message does not display. Validation error messages display when the validation fails the equality test, or evaluates to FALSE, or a non-empty text string is returned.

- c. **Validation, Always Execute** - Specify whether this validation always executes.

If set to **On**, this validation is always evaluated, irrespective of the Execute Validations setting defined against the button that submitted the page. If set

to **Off**, this validation is only evaluated if the triggering button has an Execute Validations setting of **On**.

7. Edit the following **Error** attributes:
 - a. **Error, Error Message** - Enter text for the error message.
 - b. **Error, Display Location** - Select where the error message displays for this validation.

Validation error messages display on a separate error page, or inline with the existing page. Inline error messages display underneath the Associated Item label and/or in a Notification area, defined as part of the page template.

- c. **Error, Associated Item** - Select the item where this validation error message displays.

If you select an item and the Error message display location includes **Inline with Field**, the error message displays underneath the label of the specified item. If the Error message display location does not include **Inline with Field**, this attribute has no impact on the display of the error message.

8. Click **Save**.



See Also:

- ["Creating Pre-Rendering Branches, Computations, and Processes"](#)
- ["Creating Page Submission Branches, Validations, Computations, and Processes"](#)

15.2.4 Editing a Validation

Edit validations in Page Designer.

1. To edit a validation in Page Designer:
1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.
2. Click the **Processing** tab in the left pane.
3. Expand **Validating** and then **Validations** and select the validation.

Validation attributes display in the Property Editor. Attributes are organized in groups.



Note:

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

4. In the Property Editor, edit the appropriate attributes.

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the center pane.

5. Click **Save**.

15.2.5 About Determining When Validations Execute

Determine when a validation executes by editing the Always Execute attribute.

The **Always Execute** attribute determines if validations execute when a page is submitted. Use this attribute for buttons or certain page items that submit a page. The **Always Execute** attribute has two options:

- **On** - The validation always executes independent of validation settings for buttons or items on a page.

For example, select **On** if your validation is a security check which determines if the current user is allowed to modify or delete the current record. This ensures the validation executes for any operation and prevents unprivileged users from modifying data.

- **Off** - The validation only executes if the button or item used to submit the page has the **Execute Validations** attributes set to **On**.

For example, it is not useful to verify that an item be numeric and display an error message if the user is simply deleting a record. In that scenario, the validations should only execute when the user clicks the Create or Apply Changes buttons.

To accomplish this behavior:

- For the validation, set **Always Execute** to **On**
- For the Create and Apply Changes buttons, set **Execute Validations** to **On**.
- For the Delete button, set **Execute Validations** to **Off** to avoid unnecessary validations.

 **See Also:**

["Editing a Validation"](#)

15.2.6 About Defining How Validation Error Messages Display

Control how validation messages display by editing the Error Message and Error Message attributes.

You can choose to have validation error messages display inline (that is, on the page where the validation is performed) or on a separate error page.

You define how a validation error message displays by configuring the following validation attributes:

1. **Error, Error Message** - Enter the error message text in this field. You can use #LABEL# as placeholder for the label of the associated page item or #COLUMN_HEADER# for the heading of the associated editable region column. The placeholders are not supported if error display location is set to On Error Page.
2. **Error, c** - Select where the error message displays for this validation. Validation error messages display on a separate error page, or inline with the existing page. Inline error messages display underneath the Associated Item label and/or in a Notification area, defined as part of the page template.

Options include:

- **Inline with Field and in Notification** - Error displays inline within the field label and within a notification area (defined as part of the page template).
 - **Inline with Field** - Error displays inline within the field label.
 - **Inline in Notification** - Error displays inline within a notification area (defined as part of the page template).
 - **On Error Page** - Displays the error on a separate error page. To create a hard error that stops all processing (including validations), you must display the error on an error page.
3. **Error, Associated Item** (or Column) - Select the item (or column) where this validation error message displays.

If you select an item and the Error message display location includes **Inline with Field**, the error message displays underneath the label of the specified item. If the Error message display location does not include **Inline with Field**, this attribute has no impact on the display of the error message.



See Also:

["Editing a Validation"](#)

15.2.7 Processing Validations Conditionally

Control when and if a validation executes by configuring the Server-side Condition attributes.

You can control when and if a validation executes by configuring the following **Server-side Condition** attributes:

1. **Server-side Condition, When Button Pressed** - If you want this page processing component to execute only when the specified button is clicked, select a button from the list. You can incorporate this button condition with other conditions to further refine when this page processing component executes.

If no button is pressed, other conditions are evaluated before performing the validation.

2. **Server-side Condition, Type** - Select a condition type from the list that must be met in order for this component to be rendered or processed.

To view a list of options, select the **Type** attribute in the Property Editor and click the **Help** tab in the central pane.

 **See Also:**

- ["Editing a Validation"](#)
- ["Understanding Conditional Rendering and Processing"](#)

15.2.8 About Altering the Go to Error Link

Alter the Go to Error text to change the default text or to translate it into a language that is not translated by default.

If you define an associated item, Oracle Application Express renders a **Go to Error** link in the Notification display location next to the corresponding error message. When clicked, the user's focus is set to the associated item.

You can alter the **Go to Error** text to change the default text or to translate it into a language that is not translated by default with Oracle Application Express. In either case, define a text message called `APEX.GO_TO_ERROR` with the text and language of your choice. Additionally, you can disable this functionality and remove the **Go to Error** link by setting the text of the `APEX.GO_TO_ERROR` text message to just a single space.

 **See Also:**

- ["Translating Messages Used Internally by Oracle Application Express"](#)

15.3 Understanding Page Processes

Create **page processes** to perform an action at a specified point during the rendering or submission of the page.

- [About Page Processes](#)
A page process performs an action at a specified point during the rendering or submission of the page.
- [Creating Page Processes](#)
Create a page process in Page Designer.
- [Editing Page Process Attributes](#)
Edit a page process in Page Designer.
- [Controlling When a Page Process Executes](#)
Control when a process executes by editing the Sequence and Point attributes.
- [Creating Page Process Success and Error Messages](#)
Define both success and error messages that display when a process runs.
- [Making a Page Process Conditional](#)
Create a conditional page process by editing Server-side Condition attributes.

15.3.1 About Page Processes

A page process performs an action at a specified point during the rendering or submission of the page.

For example, you can create a page process to execute logic or to make a call to the Application Express engine. A page process is a unit of logic that runs when a specific event occurs, such as loading or submitting a page.

From a functional perspective, there is no difference between page-level and application-level processes. The difference between these two process types is where the process is defined, that is at the page-level or at the application level.

See Also:

- ["Understanding Application Processes"](#)
- ["Accessing Page Specific Utilities"](#)

15.3.2 Creating Page Processes

Create a page process in Page Designer.

1. To create a page process:
 1. View the page in Page Designer.
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.
 2. In either the Rendering or Processing tab, locate the node where the process will occur. Right-click and select **Create Process**.
 3. Page Designer indicates what to do next. If there is an error, the Show Messages icon displays in the Page Developer toolbar.
 - a. Click the **Show Messages** icon on the Page Designer toolbar.

The Messages dialog displays errors that must be addressed.
 - b. Select an error to highlight the associated attribute in the Property Editor.
 4. Under **Identification**:
 - a. **Name** - Enter the name of the process.
 - b. **Type** - Specify which process type to execute. The Type you select determines what Setting attributes display.
 5. Under **Settings**, edit the appropriate attributes.
 6. Under **Execution Options**:
 - a. **Sequence** - Specify the sequence for this computation. The sequence determines the order of execution.

If two components have the same sequence value, then they may be executed in a different order when the application is exported and imported into another environment.

- b. Point** - Select the point at which this process is executed.
 - c. Run Process** - Select the frequency that this process is executed.
7. Under **Success Message**:
 - **Error Message** - Enter the success message for this process.

If the process runs and does not generate an error, then this process success message displays in the notification section of the resulting page displayed.
8. Under **Error**:
 - a. Error Message** - Enter the error message for this process.

This message displays if an unhandled exception is raised. After any error processing stops, a rollback is issued and an error message displays.
 - b. Display Location** - Select where this process error message displays, when the process fails to complete successfully.
9. Click **Save**.



See Also:

- ["Creating Pre-Rendering Branches, Computations, and Processes"](#)
- ["Creating Page Submission Branches, Validations, Computations, and Processes"](#)

15.3.3 Editing Page Process Attributes

Edit a page process in Page Designer.

1. To edit an existing page process:
 1. View the page in Page Designer.
 - a.** On the Workspace home page, click the **App Builder** icon.
 - b.** Select an application.
 - c.** Select a page.

Page Designer appears.
 2. Click the **Processing** tab in the left pane.
 3. In either the Rendering or Processing tab, expand the nodes to locate and select the process.

Process attributes display in the Property Editor. Attributes are organized in groups.

To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

4. Edit the appropriate attributes:

 **Tip:**

To learn more about an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

5. Click **Save**.

15.3.4 Controlling When a Page Process Executes

Control when a process executes by editing the Sequence and Point attributes.

1. To control when a process executes, edit the Sequence and Point attributes:

1. View the page in Page Designer:

- a. On the Workspace home page, click the **App Builder** icon.
- b. Select an application.
- c. Select a page.

Page Designer appears.

2. Click the **Processing** tab in the left pane.
3. In either the Rendering or Processing tab, expand the nodes to locate and select the process.

Process attributes display in the Property Editor. Attributes are organized in groups.

4. Edit the following attributes:

- a. **Execution Options, Sequence** - Specify the sequence for this component. The sequence determines the order of execution.
- b. **Execution Options, Point** - Select the point in the processing at which this branch action is considered.

5. Click **Save**.

 **See Also:**

["Editing Page Process Attributes"](#)

15.3.5 Creating Page Process Success and Error Messages

Define both success and error messages that display when a process runs.

You can define both success and error messages that display when a process runs. How an error message displays depends upon the processing point. For processes with a processing point of `On Submit - Before Computation and Validations` or `On Submit - After Computations and Validations`, you can specify whether the error message displays inline on the current page (the default) or on a separate page. For all other page processes, error messages display on a separate error page.

1. To create a page process error or success message:
1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. Click the **Processing** tab in the left pane.
3. In either the Rendering or Processing tab, expand the nodes to locate and select the process.

Process attributes display in the Property Editor. Attributes are organized in groups.
4. Edit the following attributes:
 - a. **Success Message, Success Message** - Enter the success message for this process. If the process runs and does not generate an error, then this process success message displays in the notification section of the resulting page displayed. If you are branching to another page via a URL redirect, you may need to check the preserve success message attribute.
 - b. **Error, Error Message** - Enter the error message for this process. This message displays if an unhandled exception is raised. After any error processing stops, a rollback is issued and an error message displays.
 - c. **Error, Display Location** - Select where this process error message displays, when the process fails to complete successfully.

Option include:

 - **Inline in Notification** - The process error message displays in the Notification area (defined as part of the page template).
 - **On Error Page** - Error displays on a separate error page.
5. Click **Save**.



See Also:

- ["Editing Page Process Attributes"](#)
- ["Page Templates"](#)

15.3.6 Making a Page Process Conditional

Create a conditional page process by editing Server-side Condition attributes.

1. To create a conditional page process:
1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.

- c. Select a page.
Page Designer appears.
2. Click the **Processing** tab in the left pane.
3. In either the Rendering or Processing tab, expand the nodes to locate and select the process.
Process attributes display in the Property Editor. Attributes are organized in groups.
4. Edit the following attributes:
 - a. **Server-side Condition, When Button Pressed** - If you want this page processing component to execute only when the specified button is clicked, select a button from the list. You can incorporate this button condition with other conditions to further refine when this page processing component executes.
 - b. **Server-side Condition, Execution Scope** - Applicable only to editable interactive grids. Specify the execution scope:
 - **For Created and Modified Rows** - The validation executes only for created and modified rows in your tabular form.
 - **All Submitted Rows** - The validation executes for every submitted row.
 - c. **Server-side Condition, Condition Type** - Select a condition type from the list that must be met in order for this component to be rendered or processed.
5. Click **Save**.

**See Also:**

["Editing Page Process Attributes"](#)

15.4 Understanding Application Processes

Create an application process to run a block of PL/SQL logic at a specific point from multiple pages of an application.

By default, application processes execute at the same point for every page in the application. However, you can apply conditions for specific pages to control when the process executes.

**Tip:**

To learn more about execution behavior in the case of a validation error, see ["What Happens When a Validation Fails?"](#)

- [On Demand Application Processes](#)
On Demand processes are useful when you have PL/SQL logic that you would like to run from different execution points across multiple pages.
- [About Application Processes that Execute On New Instance](#)
Processes with a Process Point of **On New Instance** enable you to retrieve information once within a user's session.

- [About Running an On Demand Process from a Page Request](#)
Run an On Demand process from a page request.
- [Example: Application Process](#)
View an application process example.
- [Creating an Application Process](#)
Create an application process from Shared Components.
- [Editing Application Process Attributes](#)
Edit application process attributes from Shared Components.
- [Creating Application Process Error Messages](#)
Learn how to define application process error message.
- [Viewing the Application Processes History Report](#)
To view the application processes History reports.



See Also:

["Understanding Page Processes"](#)

15.4.1 On Demand Application Processes

On Demand processes are useful when you have PL/SQL logic that you would like to run from different execution points across multiple pages.

An **On Demand** process is special type of application process which has a Process Point of On Demand, is of type PL/SQL, and executes when called from a page-level On Demand process or from an Ajax call from the browser.

On Demand processes should typically be created on a page and not at the application-level. On Demand processes created at the application-level are created with an initial authorization scheme of **Must Not Be Public User** to prohibit the processes from being invoked from users in unauthenticated sessions.



See Also:

["Creating Page Processes"](#)

15.4.2 About Application Processes that Execute On New Instance

Processes with a Process Point of **On New Instance** enable you to retrieve information once within a user's session.

Typically an application process runs at the same point across multiple pages in an application. Processes having a Process Point of **On New Instance** are the exception. These types of processes are useful when you only need to retrieve information once within a user's session. For example, if the application items do not depend on the logged in user, you can initialize them using the Process Point **On New Instance**. To look up information that depends on the user, you can also use **After Authentication**.

If you configure applications to share the same session by setting the same cookie name in the authentication scheme, **On New Instance** and **After Login**, the application processes fire whenever Oracle Application Express first processes a request for the application (that is, On New Instance), or processes a request of an authenticated user for the application (that is, **After Authentication**).

15.4.3 About Running an On Demand Process from a Page Request

Run an On Demand process from a page request.

You can have a page request run an On Demand process by using the following syntax:

```
f?p=application_id:page_id:session:APPLICATION_PROCESS=process_id
```

Where:

- *application_id* is the application ID or alphanumeric alias
- *page_id* is the page number or alphanumeric alias
- *session* is the session ID
- *APPLICATION_PROCESS=process_id* is the keyword *APPLICATION_PROCESS=* followed by either the process ID or an alphanumeric name of an application-level process having a Process Point of On Demand

When you use this syntax, the Application Express engine recognizes the request and processes it using the following rules:

- The page number in the URL can be the current page number or alias. A page number or alias is required in the request only as a syntactic placeholder because no specific page is accessed for this type of request.
- The process authorization scheme, the application's authorization scheme, and the process conditions are supported.
- Session state (that is, item names and values) may be set in the URL, but clear cache options are ignored.
- Any failures of authentication, authorization, or process conditions do not result in visible error messages or other indicators of such failures and most often result in a blank page being displayed. Note that if you are logged in to App Builder as a developer, an error messages displays.
- Specifying the process by name locates the first process with the specified (case-preserved) name.



See Also:

["Clearing Session State"](#)

15.4.4 Example: Application Process

View an application process example.

A shopping cart application is a good example of when you might use an application process. For example, to display the contents of a user's shopping cart with each page view, you

create a region on page zero of your application that displays the values of the application-level items `TOTAL_CART_ITEMS` and `TOTAL_PURCHASE_PRICE`.

Instead of writing a process for each page to set the values of `TOTAL_CART_ITEMS` and `TOTAL_PURCHASE_PRICE`, you could write an application process of type **On Load: Before Header** to compute these values. Then, the Application Express engine would execute the process on each page as it renders the application. As a result, each page, would display the most current values for `TOTAL_CART_ITEMS` and `TOTAL_PURCHASE_PRICE`.



See Also:

["Creating a Global Page to Display Components on Every Page"](#)

15.4.5 Creating an Application Process

Create an application process from Shared Components.

To create an application process:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Application Logic, select **Application Processes**.
The Application Processes page appears.
3. Click **Create**.
4. For Identification:
 - a. Name - Enter a name for the application process.
 - b. Sequence - Specify the sequence number for this process. The sequence number determines the order in which the process is evaluated relative to other processes that execute at the same point.
 - c. Point - Identify the point during the processing of each page in the application that this process would run. Note the option, **On Demand**, only runs when requested by a page process.
 - d. Click **Next**.
5. For Source:
 - a. PL/SQL code - Enter the PL/SQL code of your application process. The code will automatically be wrapped with a `Begin` and `End` ;.
 - b. Error Message - Enter the error message that displays if the process raises an error.
 - c. Click **Next**.
6. For Conditionality:

- a. Condition Type - Select a condition type that must be met in order for this process to execute.
- b. Expression 1 and Expression 2 - Use these attributes to conditionally control whether the process executes. Enter values in this attribute based on the specific condition type you select. The process executes if the specified condition is met.
- c. Click **Create Process**.



See Also:

["Creating Application Process Error Messages"](#)

15.4.6 Editing Application Process Attributes

Edit application process attributes from Shared Components.

1. To edit an existing page process:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.The Shared Components page appears.
 2. Under Logic, select **Application Processes**.
The Application Processes page appears.
 3. Click the process name.
 4. Edit the appropriate attributes. For more information, see field-level Help.
 5. Click **Apply Changes**.

15.4.7 Creating Application Process Error Messages

Learn how to define application process error message.

If a process raises an error, you can define an error messages that displays to the user. How the error message displays depends upon the processing point. For processes with a processing point of *On Submit - Before Computation and Validations* or *On Submit - After Computations and Validations*, you can specify whether the error message displays inline on the current page (the default) or on a separate page. For all other application processes, error messages display on a separate error page.

To create an application process error message:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.The Shared Components page appears.

2. Under Logic, select **Application Processes**.
The Application Processes page appears.
3. Click the process name.
4. Edit the following attributes:
 - a. **Source, Process Error Message** - Enter the message that displays when an unhandled exception is raised.
 - b. **Error message display location** - Applies to processes with a processing point of `On Submit - Before Computation and Validations` or `On Submit - After Computations and Validations`, you can specify where the error message displays.
Select one of the following:
 - **Inline in Notification** - Error displays inline on the page in the "notification" area (defined as part of the page template).
 - **On Error Page** - Error displays on a separate error page.
If the application contains a manually created tabular form (using `APEX_ITEM` calls in the SQL statement), select **On Error Page**. Otherwise, changes made by the user are discarded when the page is re-rendered. When errors are displayed on a separate error page, the user can use the browser's Back button to preserve the entered values.
5. Click **Apply Changes**.



See Also:

["Editing Application Process Attributes"](#)

15.4.8 Viewing the Application Processes History Report

To view the application processes History reports.

The Application Process History report displays recent modifications made to application processes.

1. To view
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Logic, select **Application Processes**.
The Application Processes page appears.
 3. Select the History tab at the top of the page.
 4. You can customize the appearance the page using the Search bar at the top of the page. Available controls include:

- **Select columns to search** - Resembles a magnifying glass. Click this icon to narrow your search. To search all columns, select **All Columns**.
- **Text area** - Enter case insensitive search criteria (wildcard characters are implied) to search for a process by name and click **Go**.
- **Go button** - Executes a search or applies a filter.
- **Actions menu** - Use the Actions menu to customize the report view.

**See Also:**

["About the Actions Menu"](#)

15.5 About Branches

A branch is an instruction to go to a specific page, procedure, or URL. For example, you can branch from page 1 to page 2 after page 1 is submitted. When you create a branch, you specify a Branch Point and Branch Type.

**See Also:**

["Controlling Navigation Using Branches"](#)

15.6 Understanding Application Computations

Create an application computation to set the value of a single page or application-level item. Application computations run at the same point across multiple pages in an application.

**Tip:**

To learn more about execution behavior in the case of a validation error, see ["What Happens When a Validation Fails?"](#)

- [About Application Computations](#)
Application Computations are units of logic that set the value of a single page or application-level item and are run at the same point across multiple pages in an application.
- [About Application Computations that Execute On New Instance](#)
Use the On New Instance Computation Point to retrieve information once within a user's session.
- [Creating an Application Computation](#)
Create an application computation from Shared Components.
- [Accessing the Application Computation History Report](#)

15.6.1 About Application Computations

Application Computations are units of logic that set the value of a single page or application-level item and are run at the same point across multiple pages in an application.

Similar to page-level computations, application computations can be based on static values, item values, PL/SQL, or SQL. A common use of an application item is to store the value of the last page viewed in the application. By storing the value in an item, you can add a back button and then redirect the user to the page number captured by the computation. This type of computation works well, for example, when you need to enable users to back out of an error page.

Example: Storing the Last Visited Page

The following is an example of a computation that stores the last page visited. In this example, the computation:

- Stores the last application page visited to an item named `LAST_PAGE`
- Checks that the value of a `CURRENT_PAGE_ITEM` is of type PL/SQL Function Body with a Computation body of:

```
BEGIN
  :LAST_PAGE := nvl(:CURRENT_PAGE, :APP_PAGE_ID);
  :CURRENT_PAGE := :APP_PAGE_ID;
  RETURN :LAST_PAGE;
END;
```

v

15.6.2 About Application Computations that Execute On New Instance

Use the On New Instance Computation Point to retrieve information once within a user's session.

Typically an application computation runs at the same point across multiple pages in an application. The exception is computations having a **Computation Point of On New Instance**. These types of computations are useful when you only need to retrieve information once within a user's session. For example, if the application items do not depend on the logged in user, you can initialize them using the Computation Point **On New Instance**. To look up information that depends on the user, you can also use **After Authentication**.

If you configure applications to share the same session by setting the same cookie name in the authentication scheme, **On New Instance** and **After Login**, the application processes fire whenever Oracle Application Express first processes a request for the application (that is, **On New Instance**), or processes a request of an authenticated user for the application (that is, **After Authentication**).

15.6.3 Creating an Application Computation

Create an application computation from Shared Components.

1. To create an application computation:
1. Navigate to the Shared Components page:

- a. On the Workspace home page, click **App Builder**.
- b. Select an application.
- c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Logic, select **Application Computations**.
3. Click **Create**.
4. Edit the following attributes:
 - a. **Item, Sequence** - Specify the sequence for this component. The sequence determines the order of evaluation.
 - b. **Item, Computation Item** - Select the item this computation affects.
 - c. **Frequency, Computation Point** - Select a process point at which this computation should be performed. Selecting **After Submit** causes the computation to be performed only after the page is displayed and then submitted.
 - d. **Computation, Computation Type** - Select the manner in which this computation is performed.
 - e. **Computation, Computation** - Enter the computation logic that corresponds to the computation type. See field-level Help for examples.
 - f. **Computation, Computation Error Message** - Enter the error message that displays if the computation fails.
 - g. **Authorization, Authorization Scheme** (optional) - Select an authorization scheme which must evaluate to True in order for this computation to execute.
 - h. **Condition, Condition Type** (optional) - Select a condition type that must be met in order for this computation to execute.
 - i. **Build Option** (optional) - Select a build option for this component.
5. Click **Create Computation**.

**See Also:**

["Using Build Options to Control Configuration"](#)

15.6.4 Accessing the Application Computation History Report

Once you create an application computation, you can view the Application Computation History report. The Application Computation History report displays a history of recently changed application computations by date.

1. To access the Application Computation History report:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.

2. Under Logic, select **Application Computations**.
3. Select the **History** at the top of the page.
4. You can customize the appearance the page using the Search bar at the top of the page. Available controls include:
 - **Select columns to search** - Resembles a magnifying glass. Click this icon to narrow your search. To search all columns, select **All Columns**.
 - **Text area** - Enter case insensitive search criteria (wildcard characters are implied) and click **Go**.
 - **Go button** - Executes a search or applies a filter.
 - **Actions menu** - Use the Actions menu to customize the report view.



See Also:

["About the Actions Menu"](#)

15.7 Using the Attribute Dictionary

Use the Manage Attribute Dictionary page to update values on the current page with those in the Attribute Dictionary, or to update the Attribute Dictionary with the values on the current page.

- [About the Attribute Dictionary](#)
The Attribute Dictionary contains a set of attributes about a column that are used in creating forms and reports.
- [Accessing the Manage Attribute Dictionary](#)
Access the Manage Attribute Dictionary page:

15.7.1 About the Attribute Dictionary

The Attribute Dictionary contains a set of attributes about a column that are used in creating forms and reports.

These definitions are matched by column name and a particular definition can be shared among several columns by using synonyms.

15.7.2 Accessing the Manage Attribute Dictionary

Access the Manage Attribute Dictionary page:

1. To access the Manage Attribute Dictionary page:
 1. On the Workspace home page, click the **App Builder** icon.
The App Builder home page appears.
 2. Select an application.
 3. Click **Utilities**.
 4. Click **Utilities** and click **Attribute Dictionary**.

The page is divided into two sections: **Page Items** and **Report Columns**.

Use Page Item and Report Column definitions to update the Attribute Dictionary. You can also use the Attribute Dictionary to update Page Items and Report Columns.

Hidden objects (that is, those in hidden regions and button items) are not counted in the number of candidate Items and Report Columns as these are not used in the updates.

5. To update the current page or update the Attribute dictionary, select the appropriate page link.

The Attribute Dictionary appears.

Only Items and Report Columns that have different values for at least one attribute are shown. You choose which objects to insert or update and which attributes to include. The number of Items and Report Columns that can be used might be less than the total because hidden objects, objects in hidden regions, and button items are not included.



Tip:

You can access the Attribute Dictionary in Page Designer by clicking **Utilities** and then selecting **Attribute Dictionary**.

Managing Shared Components

Shared components can display or be applied on any page within an application. Developers can use the tools and wizards on the Shared Components page either at the application-level or on specific pages.

- [Accessing the Shared Components Page](#)
Access the Shared Components page by selecting an application and then clicking **Shared Components**.
- [Shared Components Page](#)
Use the tools and wizards on the Shared Components page either at the application-level or on specific pages.
- [Managing Automations](#)
Automations initiate a sequential set of actions based on a schedule.
- [Managing Application Settings](#)
Create Application Settings to define application-level configuration options.
- [Creating Lists of Values at the Application-Level](#)
Create a static or dynamic list of values (LOV) at the application-level which can be referenced by page items or report fields.
- [Managing Component Settings](#)
Use Component Settings to set application level values for built-in Application Express components and installed plug-ins.
- [Using Shortcuts](#)
Use shortcuts to avoid repetitive coding of HTML or PL/SQL functions.
- [Managing Email Templates](#)
Enable users to send emails from your application by creating email templates.
- [Managing Static Application Files](#)
Navigate to Shared Components to upload, view, download, and delete static application files (including images, CSS files, and other files which must be managed independently).
- [Managing Static Workspace Files](#)
Navigate to Shared Components to upload, view, download, and delete static workspace files (including images, CSS files, and other files which must be managed independently).
- [Managing Application-Level Items](#)
Application-level items do not display, but are used as global variables to the application. You can use an application item as a global variable.
- [Creating Lists](#)
Add a shared collection of links (or a list) to a database application. To add a list to a page, create a region and specify the region type as List. You control the appearance of a list through list templates.
- [Managing Report Output](#)
Learn how to print a report region by defining a report query and how to use a report layout to format a report region.

 **See Also:**

- ["App Builder Concepts"](#)
- ["Creating Database Applications"](#)
- ["Controlling Page Layout"](#)
- ["Adding Navigation"](#)

16.1 Accessing the Shared Components Page

Access the Shared Components page by selecting an application and then clicking **Shared Components**.

To access the Shared Components page:

1. On the Workspace home page, click **App Builder**.
2. Select an application.
3. On the Application home page, click **Shared Components** in the center of the page.

The Shared Components page appears.

4. To create or edit a shared component, select the appropriate link.

 **Tip:**

Once you select an application, you can also access the Shared Components page by clicking the **Shared Components** icon at the top of the page. The Shared Components icon consists of a triangle above a circle and a square. This icon displays at the top of most App Builder pages including the Application home page, Page Designer, Supporting Objects, and Utilities.

16.2 Shared Components Page

Use the tools and wizards on the Shared Components page either at the application-level or on specific pages.

The Shared Components page is divided into regions.

- [Application Logic](#)
- [Security](#)
- [Other Components](#)
- [Navigation](#)
- [User Interface](#)
- [Files](#)

- [Data Sources](#)
- [Reports](#)
- [Globalization](#)
- [Tasks Region](#)
- [Workspace Objects Region](#)

16.2.1 Application Logic

The following table describes the links under **Application Logic** on the Shared Components page.

Table 16-1 Application Logic Links on the Shared Components Page

Link	Description
Application Definition Attributes	Links to the Edit Application Definition page. Use this page to edit attributes for an application. Attributes are grouped into four categories: Definition, Security, Globalization, and User Interface. See Also: Managing Application Attributes
Application Items	Application-level items do not display, but are used as global variables to the application. Commonly, you set the value of a page-level item using an application or page computations. See Also: Managing Application-Level Items
Application Processes	Use application processes to run PL/SQL logic: <ul style="list-style-type: none"> • At specific points for each page in an application • As defined by the conditions under which the process is set to execute • Upon the creation of a new session Note that On Demand processes execute only when called from a page-level On Demand process or when called using Ajax from the browser. See Also: Understanding Application Processes
Application Computations	Use application-level computations to assign values to application and page-level items for each page displayed or upon the creation of a new application session. You can also create an application-level computation and execute it conditionally on multiple pages. See Also: Understanding Application Computations
Application Settings	Application Settings enable developers to define application level configuration options. See Also: Managing Application Settings
Automations	Create automations to initiate a sequential set of actions based on a schedule. Use automations to monitor data and then perform the appropriate action. See Also: Managing Automations
Build Options	Use build options to conditionally display or process specific functionality within an application. You can use build options to control which features of an application are turned on for each application deployment. See Also: Using Build Options to Control Configuration

16.2.2 Security

The following table describes the links under **Security** on the Shared Components page.

Table 16-2 Security Links on the Shared Components Page

Link	Description
Security Attributes	Use the Edit Security Attributes page to configure general security attributes for all pages within an application. See Also: Configuring Security Attributes
Authentication Schemes	Authentication is the process of establishing each user's identity before they can access your application. Authentication may require a user to enter a user name and password or may involve verification of a user's identity or use of a secure key. See Also: Establishing User Identity Through Authentication
Authorization Schemes	Authorization restricts user access to specific controls or components based on predefined user privileges. See Also: Providing Security Through Authorization
Application Access Control	Manage application access control roles and user role assignments. See Also: Managing Roles and User Assignments
Session State Protection	Session State Protection is a built-in functionality that prevents hackers from tampering with the URLs within your application. URL tampering can adversely affect program logic, session state contents, and information privacy. See Also: Preventing URL Tampering
Web Credentials	Web Credentials to connect to REST Enabled SQL or other external REST services. Oracle Application Express stores these securely stores and encrypts these credentials for use by Oracle Application Express components. Credentials cannot be retrieved back in clear text. See Also: Managing Web Credentials

16.2.3 Other Components

The following table describes the links under **Other Components** on the Shared Components page.

Table 16-3 Other Component Links on the Shared Components Page

Link	Description
List of Values	A list of values (LOV) is a static or dynamic set of values used to display a popup list of values, select list, check box, or radio group. See Also: Creating Lists of Values at the Application-Level

Table 16-3 (Cont.) Other Component Links on the Shared Components Page

Link	Description
Plug-ins	App Builder includes built-in item types, region types, dynamic actions, and processes. Use plug-ins to add new declarative types in to your application. See Also: Implementing Plug-ins
Component Settings	Use Component Settings to set application-level values for built-in Oracle Application Express components and installed plug-ins. See Also: Managing Component Settings
Shortcuts	Use shortcuts to avoid repetitive coding of HTML or PL/SQL functions. You can create a shortcut to define a page control such as a button, HTML text, a PL/SQL procedure, or HTML. Once you define a shortcut, it is stored in a central repository so you can reference it from various locations within your application. See Also: Using Shortcuts
Email Templates	Create templates to define the HTML format and Plain Text formats for the emails you wish to send from an application. See Also: Managing Email Templates

16.2.4 Navigation

The following table describes the links under **Navigation** on the Shared Components page.

Table 16-4 Navigation Links on the Shared Components Page

Link	Description
Lists	A list is a shared collection of links. You control the appearance of a list through list templates. Each list element has a display condition that enables you to control when it displays. See Also: Creating Lists
Navigation Menu	A navigation menu is a list links that enables users to navigate the pages in an application. Navigation menus are only supported in applications using the <i>Universal Theme - 42</i> . See Also: Managing Navigation Menus
Tabs	Note: Tabs only appear if the associated application uses an older theme. In new themes, Tabs have been replaced with Navigation Menu. Tabs are an effective way to navigate users between pages in an application. You can create two types of tabs: standard tabs or parent tabs. A standard tab set is associated with a specific page and page number. A parent tab set functions as a container to hold a group of standard tabs. See Also: Managing Tabs

Table 16-4 (Cont.) Navigation Links on the Shared Components Page

Link	Description
Breadcrumbs	Breadcrumbs provide users with hierarchical navigation. A breadcrumb is a hierarchical list of links that display using templates. You can display a breadcrumb as a list of links or as a breadcrumb path. See Also: Creating Breadcrumbs
Navigation Bar List	Navigation bar lists offer users a simple navigation path for moving between pages in an application. The location of a navigation bar depends upon the associated page template. A list entry can be an image, an image with text beneath it, or text. See Also: Managing a Classic Navigation Bar

16.2.5 User Interface

The following table describes the links under **User interface** on the Shared Components page.

Table 16-5 User interface Links on the Shared Components Page

Link	Description
User Interface Attributes	Use User Interface page to specify user interface options for an application. See Also: Editing User Interface Attributes
Themes	A theme is a named collection of templates that defines the application user interface. See Also: Using Themes
Templates	Templates control the look and feel of specific constructs within your application, such as pages, regions, items, and menus. See Also: Creating Custom Themes

16.2.6 Files

The following table describes the links under **Files** on the Shared Components page.

Table 16-6 Files Links on the Shared Components Page

Link	Description
Static Application Files	Use this link to upload, edit, and delete static files associated with the current application, including style sheets (CSS), images and JavaScript files. See Also: Managing Static Application Files
Static Workspace Files	Use this link to upload, edit, and delete static files associated with the current application, including style sheets (CSS), images and JavaScript files. See Also: Managing Static Workspace Files

16.2.7 Data Sources

The following table describes the links under **Data Sources** on the Shared Components page.

Table 16-7 Links Under Data Sources on the Shared Components Page

Link	Description
Data Load Definitions	Use Data Load Tables to define tables for use in the Data Loading create page wizard. A Data Load Table is an existing table in your schema that has been selected for use in the data loading process to upload data. See Also: Creating Applications with Data Loading Capability and Managing Applications with Legacy Data Loading Capability
REST Enabled SQL	Use REST Enabled SQL to execute SQL or PL/SQL defined in Application Express components on a remote Oracle database. See Also: Managing REST Enabled SQL References
REST Data Sources	REST Data Sources act as a reference to one or multiple external web (REST) services. A REST Data Source can contain one or many Operations which are the references to a concrete external web service. Configurations at the REST source level are shared across all contained operations. See Also: Managing REST Data Sources
Legacy Web Service References (SOAP)	The Application Express engine can use Web Service References to access a Web service across the network. The Web service performs an action and then sends back a response. See Also: Managing Legacy Web Services

16.2.8 Reports

The following describes the links under User interface on the Shared Components page.

Table 16-8 Data References Links on the Shared Components Page

Link	Description
Report Queries	Use the Report Queries link to view a report of stored queries within the current application. See Also: Printing a Report Region by Defining a Report Query
Report Layouts	Use Report Layouts with a report or shared query to render data in a printer-friendly format, such as Adobe Portable Document Format (PDF), Microsoft Word Rich Text Format (RTF), or Microsoft Excel (XLS) format. See Also: Formatting a Report Region or Report Query Using Report Layouts

16.2.9 Globalization

The following table describes the links under **Globalization** on the Shared Components page.

Table 16-9 Globalization Links on the Shared Components Page

Link	Description
Globalization Attributes	You can develop applications that can run concurrently in different languages. Click this link to specify globalization options such as the Application Primary Language and Application Language Derived From attributes. See Also: Configuring Globalization Attributes and Understanding Application Translation and Globalization Support
Text Messages	Text messages are named text strings that can be called from the PL/SQL code you write. This PL/SQL can be anonymous blocks within page processes and page regions, or in packages and procedures. See Also: Translating Messages
Translate Application	You can develop applications in Oracle Application Express that can run concurrently in different languages. A single Oracle database and Oracle Application Express instance can support an application in multiple languages. Translating an application involves multiple steps. See Also: Understanding Application Translation and Globalization Support and Understanding the Translation Process

16.2.10 Tasks Region

The following table describes the Tasks region on the right side of the Shared Components page.

Table 16-10 Tasks

Link	Description
Export Application Components	Links to the Component Export page. Use this page to identify the components of an application to be exported either for backup purposes or to load the components on another instance. See Also: Exporting Application Components
Manage Supporting Objects	Links to the Supporting Objects page. Use this page to create a custom application. See Also: How to Create a Custom Application
Edit Application Comments	Links to the Application Comments page. Use this page to enter comments specific to the currently selected application. See Also: Adding Database Application Comments
Developer Comments	Links to Developer Comments page. See Also: Adding Developer Comments

16.2.11 Workspace Objects Region

The Workspace Objects region displays on the right side of the Shared Components page. Workspace Objects are stored at the workspace-level and are therefore visible in all applications.

Table 16-11 Workspace Objects

Link	Description
Static Workspace Files	Static workspace files are available to all applications for a given workspace. Use #WORKSPACE_IMAGES# in your application to reference a file. See Also: Exporting Application Components
Credentials	Use Credentials to connect to REST Enabled SQL or other external REST services. Oracle Application Express stores these securely stores and encrypts these credentials for use by Oracle Application Express components. Credentials cannot be retrieved back in clear text. See Also: Managing Web Credentials
REST Enabled SQL	Use REST Enabled SQL to execute SQL or PL/SQL defined in Application Express components on a remote Oracle database. See Also: Managing REST Enabled SQL References
Remote Servers	Links to the Remote Servers page. Remote Servers can be shared among multiple REST Data Sources. Remote Servers are stored at the Workspace-level and therefore visible in all applications. When an application is being exported, the used Remote Servers are being added to the export file. See Also: Managing Remote Servers

16.3 Managing Automations

Automations initiate a sequential set of actions based on a schedule.

- [About Automations](#)
Automations are a sequential set of actions, triggered by query results that monitor data and then perform the appropriate action.
- [About Importing and Exporting Automations](#)
After importing an application, automations are disabled. Learn how to enable automations after importing.
- [Creating an Automation](#)
Create an automation as a Shared Component on the Automations page.
- [Editing an Existing Automation](#)
Edit an existing automation on the Automation page.
- [Managing the Automation Execution Log](#)
View and clear the Automation Execution Log records on the Automations, Execution Log page.
- [Viewing the Automation History Report](#)
View recent automation modifications on the Automations History report.

16.3.1 About Automations

Automations are a sequential set of actions, triggered by query results that monitor data and then perform the appropriate action.

Create automations to monitor data and then perform the appropriate action. Common automation use cases include approving specific requests and sending email alerts. An automation executes as a query or a PL/SQL function based on a defined schedule. Automations support Data Sources so the query can execute on a local database, a REST Enabled SQL service, or a REST Data Source.

Key features of automations include:

- **Define Automation Actions** - Define multiple actions and have them execute for each automation query row in sequential order. The typical automation action is PL/SQL code. Automation actions can be executed for each row of the query results when the query returns no result, or when the PL/SQL function returns TRUE. Conditions control whether or not an automation executes. Column values from the query result rows are available as bind variables. Alternatively, you can also use Process Type plug-ins as an automation action.
- **Specify Error Handling** - Define automation behavior for cases when an error occurs. Errors can be ignored, the automation can be stopped, or set to "disabled" mode.
- **Trigger Automations Programmatically** - The `APEX_AUTOMATION` package provides a PL/SQL interface for triggering an automation programmatically.
- **Review Automation Logs** - View the Automation Execution Log and Log Messages view details about previous automation executions. The Automations History report lists a history of recent automation modifications.

A coordinator job runs automation executions in regular intervals. Each automation actually executes up to a few minutes after the Next Execution Due time. Thus, while the automation edit page shows when the next execution is due; the actual execution will happen a few minutes time shown.

Note:

The `CREATE JOB` privilege must be granted to the application's parsing schema in order to execute scheduled automations.

See Also:

- "APEX_AUTOMATION" package in *Oracle Application Express API Reference*
- "Configuring Background Jobs" in *Oracle Application Express Administration Guide*

16.3.2 About Importing and Exporting Automations

After importing an application, automations are disabled. Learn how to enable automations after importing.

Developers often import applications into a workspace multiple times, for versioning or other purposes. If automations were enabled during these imports, this would lead to multiple instances of the automation running simultaneously which is not the desired result. Therefore, Oracle Application Express disables automations after you import an application.

You can activate automations directly in Shared Components, Automations, or in Runtime Only environment by using the following PL/SQL block as shown in the following examples:

Example 1: Enable automation and start execution schedule immediately.

```
declare
    l_app_id number := {new application ID};
begin
    apex_session.create_session(
        p_app_id      => l_app_id,
        p_page_id     => {one of the application pages},
        p_username    => '{workspace user}');

    apex_automation.enable(
        p_application_id => l_app_id,
        p_static_id     => '{automation static ID}');
end;
```

Example 2: Enable automation and set next execution timestamp explicitly

```
declare
    l_app_id number := {new application ID};
begin
    apex_session.create_session(
        p_app_id      => l_app_id,
        p_page_id     => {one of the application pages},
        p_username    => '{workspace user}');

    apex_automation.reschedule(
        p_application_id => l_app_id,
        p_static_id     => '{automation static ID}',
        p_next_run_at   => trunc( sysdate + 1 ), -- next midnight
    );
end;
```



See Also:

["Editing an Existing Automation"](#)

16.3.3 Creating an Automation

Create an automation as a Shared Component on the Automations page.

The following example demonstrates how to create an automation that runs every two hours. This automation increases the salary (`SAL`) of salesmen. For each salesman (`SALESMAN`) with a commission (`COMM`) greater than 500, the salary (`SAL`) increases by 1.5%. For all other salesman, the salary (`SAL`) increases by 1%.



Tip:

The examples in this section are built on the `EMP` table available in the sample dataset, `EMP / DEPT`. To install a sample dataset, see "Using Sample Datasets" in *Oracle Application Express SQL Workshop Guide*.

To create an automation:

1. Create a new application.
2. Navigate to the Automations page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select the new application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 - d. Under Application Logic, select **Automations**.
The Automations page appears.
3. To create an automation, click **Create**.
The Create Automations Wizard appears.
4. Specify the automation name and define the execution schedule:
 - a. Name - Enter a name for the new Automation. For example, `Increase SAL`.
 - b. Type - Select an automation type. Select **Scheduled**.
Scheduled executes automatically based on the selected frequency. **On Demand** executes when called explicitly using the `APEX_AUTOMATION` package.
 - c. Actions initiated on - Select **Query**.
This option determines whether the execution of Automation Actions should be initiated based on a **Query** (that is, the rows returned can then be used by the actions), or if the actions should **Always** be executed..
 - d. Execution Schedule - Select an execution schedule for the new automation. Select **Custom**.
The **Frequency**, **Interval**, **Execution Minute** attributes only display if Execution Schedule is set to **Custom**.
 - e. Frequency - Specify whether the execution schedule should be based on a daily, hourly or minutely basis. Select **Hourly**.

- f. Interval - Enter 2 so that automation executes every 2 hours.
- g. Execution Minute - Specify the execution minute, from 0 to 59. Leave this to the default, 0.

The Create Automation Wizard should resemble the following illustration.

The screenshot shows the 'Create Automation' wizard with the following configuration:

- Name: Increase SAL
- Type: Scheduled
- Actions initiated on: Query
- Execution Schedule: Custom
- Frequency: Hourly
- Interval: 2
- Execution Minute: 0

Buttons: Cancel, Next >

- h. Click **Next**.
5. Define the source:
- This example is based on the local table, EMP.
- a. Data Source - Select the data source for this automation. Select **Local Database**.
 - b. Source Type - Select **Table**.
 - c. Table/View Owner - Select the owner of the table on which you are basing this automation.
 - d. Table/View Name - Select the table or view on which the automation will be based. For this example, select **EMP (table)**.
 - e. Execute Action When - This option determines if Automation Actions should execute when the query returns rows, or when the query does not return rows. Select **Rows returned**.

The Create Automation Wizard should resemble the following illustration.

The screenshot shows the 'Create Automation' dialog box. It has a title bar with a close button (X). The main area contains the following fields and options:

- Data Source:** Local Database (selected), REST Enabled SQL Service, REST Data Source
- Source Type:** Table (selected), SQL Query
- * Table / View Owner:** EXAMPLE
- * Table / View Name:** EMP (table)
- Execute Actions When:** Rows returned (selected), No Rows returned

At the bottom of the dialog, there are two buttons: 'Cancel' and 'Create'.

f. Click **Create**.

The automation edit page appears. The following message displays at the top of the page:

Automation has been created and is in "Disabled" state. Now create *Actions* to execute when the automation runs.

6. Edit the action for the first salary increase:

a. Scroll down to **Actions**.

Note that the wizard created an action, named **New Action**.

b. Edit the new action, **New Action**:

- Click the **Edit** icon adjacent to **New Action**.

The Edit Action page appears.

- Name - Enter a meaningful name such as Increase SAL for SALESMAN.

The Edit Action page should resemble the following illustration.

Edit Action Cancel Delete Apply Changes

Show All Action Code Edit Action Error Handling Server Side Condition Advanced

Action

* Name

* Type

* Execution Sequence

Code

Location REST Enabled SQL Service

Language

Code

```

1 begin
2   null;
3 end;
```

- Code - Add code for the first salary (SAL) increase.

```

begin
update emp set sal = round(sal * 1.015, 1) where empno = :EMPNO;
apex_automation.log_info('SAL for ' || :ENAME || ' increased.');
```

Note that the code will run on each row. In this example, each SQL UPDATE statement works on a single row based on the EMPNO primary key column. Also note the use of the APEX_AUTOMATION.LOG_INFO procedure . The LOG_INFO procedure writes a message with the "Information" level to the Execution Log for the automation. Available message levels as "Information" are "Warning" and "Error".

- Server Side Condition - Create a server side condition for the salary increase.
 - Server Side Condition, Condition Type - Select **Expression**.
 - Language - Select **PL/SQL**.
 - Expression 1- Enter an expression to only execute the action when the salesman (SALESMAN) has a commission (COMM) of more than 500. Enter:

```
:JOB = 'SALESMAN' and :COM > 500
```

- Execute for Each Row - Enable this option to specify the condition execute for each row.
 - d. Click **Apply Changes**.
7. Create another action the second salary increase:
- a. Scroll down to **Actions** again and click **Add Action**.
The Edit Action page appears.
 - b. Edit the new action:
 - Name - Enter a meaningful name such as Increase SAL for all others.
 - Code - Update the code to increase the salary (SAL) for all other salesman.

```
begin
update emp set sal = round(sal * 1.01, 1) where empno
= :EMPNO;
apex_automation.log_info('SAL for ' || :ENAME || ' increased
by 1%.');
end;
```
 - c. Server Side Condition - Create a server side condition for the salary increase.
 - Condition Type - Select **Expression**.
 - Language - Select **PL/SQL**.
 - Expression - Enter an expression to only execute this action when the salesman (SALESMAN) has a commission (COMM) is less than or equal to 500 or null.

```
:JOB != 'SALESMAN' and :COM <= 500 or :COMM is null
```

 - Execute for Each Row - Enable this option to specify the condition execute for each row.
 - d. Click **Create**.
8. Run the automation. On the Automation Edit page, click **Save and Run**.
When you click **Save and Run**, the automations execute in the background. Note that the browser displays again immediately even if the actions are still running.
The following message appears:
Changes applied. Automation Execution initiated.
9. Review the Automation Execution Log:
- a. Return to the Automations page by clicking the **Automations** breadcrumb.
 - b. Click the **Execution Log** tab and verify the automation executed.
 - c. Click the link under **Messages** to view individual messages for processed rows.

 **Tip:**

You can also view the target table in SQL Workshop, Object Browser to validate that the automation is actually changing the data. See "Browsing a Table" in *Oracle Application Express SQL Workshop Guide*.

10. Clear the Automation Execution Log:
 - a. On the Execution Log page, click **Purge Log**.
The Clear Automation Log dialog appears.
 - b. In the Clear Automation Log dialog:
 - From the Automation list, select the Automation (for example, Increase Sal).
 - Click **Clear Log**.
11. Update the automation Settings to enable the schedule:
 - a. Return to the Automations page by clicking **Automations** breadcrumb.
 - b. Select the name of the automation to be edited. For example, select **Increase SAL**.
 - c. **Settings, Schedule Expression** - Click **Schedule Builder** to right of the Schedule Expression field and update the following:
 - Frequency - Select **Weekly**.
 - Interval - Accept the default, 1.
 - Execution Day - Select **Mon, Tue, Wed, Thu, and Fri**.
 - Execution Hour - Enter 14.
 - Execution Minutes - Enter 30.
 - Click **Set Execution Interval**.

In the previous example, the automation execution would be due every working day at 2:30pm. The automation scheduler runs in the time zone of the database server.
 - d. Schedule Status - Select **Active**.
 - e. To save your edits, click **Save Changes**.

 **See Also:**

- "Configuring Background Jobs" in *Oracle Application Express Administration Guide*
- "APEX_AUTOMATION" package in *Oracle Application Express API Reference*

16.3.4 Editing an Existing Automation

Edit an existing automation on the Automation page.

To edit an automation:

1. Navigate to the Automations page:

- a. On the Workspace home page, click **App Builder**.
 - b. Select the new application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 - d. Under Application Logic, select **Automations**.
2. On the Automations page, click the automation Name.
The Automation: *Name* edit page appears. Edit the appropriate attributes.
3. Name:
 - a. Name - Defines the name of the automation.
 - b. Static ID - Defines the Static ID for this automation. Use the Static ID when manually executing the automation with the `APEX_AUTOMATION` package (for example, `APEX_AUTOMATION.EXECUTE`).
4. Settings:
 - a. Type - **Scheduled** executes automatically based on the selected frequency. **On Demand** executes when called explicitly using the `APEX_AUTOMATION` package.
 - b. Schedule Expression - Use **Database Scheduler calendaring syntax** to define repeating execution schedules, such as "every Tuesday and Friday at 4:00 p.m." or "the second Wednesday of every month".

The calendaring syntax can either be entered manually, or declaratively to build simple expressions by using the **Interval Builder**. Access Interval Builder by clicking the **Schedule Builder** icon to the right of the text area.

`BACKGROUND_MIN_EXECUTION_CADENCE` controls the minimum amount of minutes which must be between two subsequent automation executions. Note that the automation scheduler works in the time zone of the database server.
 - c. Schedule Status - Indicates the state of the Automation Schedule. Options include:
 - **Active** - Schedule is active and the automation will be executed based on the Schedule Expression.
 - **Disabled** - Schedule will not be executed. However, the automation can still be executed by calling the `APEX_AUTOMATION` package.
 - **Error** - Schedule is disabled because an error occurred during the last execution. However, the automation can still be executed by calling the `APEX_AUTOMATION` package.
 - d. Actions Initiated On - Specify the data source type for this automation. Options include:
 - **Query** - A SQL Query will be executed. Automation actions can be executed when data is found (for each row), or when no data is found (once).
 - **PL/SQL Returning Boolean** - A PL/SQL function body is executed. If it returns TRUE, then the automation actions are executed once.
 - **Always** - Automation actions are always executed. This option is suitable to be used with the **Schedule** type to execute the actions based on a schedule regardless of the presence of certain data.

5. Source:

- Data Source - Defines the Data Source for this automation. Options include:
 - **Local Database** - Data is sourced from the local database.
 - **REST Enabled SQL Service** - Data is sourced from a remote database, where the connection is defined using REST Enabled SQL. To create or maintain REST Enabled SQL references, navigate to Shared Components, REST Enabled SQL.
 - **REST Data Source** - Data is sourced from a RESTful web service defined using REST Data Sources. To create or maintain REST Data Sources, navigate to Shared Components, REST Data Sources.

The option you select determines the subsequent UI options. To learn more about an attribute, see item Help.

6. Actions:

- a. Add an Action - Click **Add Action**.

The Edit Action page appears. Edit the attributes and click **Create**.

- b. Edit an action - Click the **Edit** icon adjacent to the action Name.

The Edit Action page appears. Edit the attributes and click **Apply Changes**.

To learn more about an attribute on the Edit Action page, see item Help.

7. Action Execution:

- a. Execute Actions When - Specify whether the automation actions should execute when the query returns rows or when the query does not return rows.
- b. Primary Key Column - Optionally, specify the primary key column within the query result. The value of this column will be added to the log messages, in order to allow correlating log messages to source rows.
- c. Commit - Specify whether to commit after the actions for each row have been executed or to commit just once after all rows have been processed.
- d. Maximum Rows to Process - If defined, the automation execution stops when that maximum is reached and the automation is logged as `Incomplete`.
- e. Action Error Handling - Select what should happen when the automation encounters an error:
 - **Ignore** - Ignore error and continue processing automation
 - **Abort Automation** - Abort automation but leave it enabled
 - **Disable Automation** - Abort automation and disable it

8. Additional Code Execution:

- a. Executable PL/SQL Code - Enter a PL/SQL anonymous block of code that contains procedures to be called for the initialization or cleanup of the automation, or before action processing for each row. For performance reasons you can also store this code in a PL/SQL package in the database.
- b. Initialization Procedure Name - Provide the name of an Initialization Procedure to execute at the very beginning of an automation execution. Define the procedure as a PL/SQL object in the database schema, or above in **Executable PL/SQL Code**.
- c. Before Row Processing Procedure Name - Provide the name of a Before Row Processing Procedure to execute for each row, before executing the defined actions. Define the procedure as a PL/SQL object in the database schema, or above in **Executable PL/SQL Code**.

- d. Cleanup Procedure Name - Provide the name of a Cleanup Procedure to execute at the very end of the automation execution. Define the procedure as a PL/SQL object in the database schema, or above in **Executable PL/SQL Code**.
9. Server Side Condition:
 - a. Condition Type - Select a condition type from the list that must be met in order for this automation to be executed.

The Condition Type determines what appears in this region. As an example, this task shows the options for the Condition Type of **Expression**.
 - b. Language - Select a language that is used to evaluate the entered programming code.
 - c. Expression 1 - Enter an expression to conditionally control the circumstances under which this automation will be executed. Enter values in this attribute based on the specific condition type selected. The automation will execute only if the specified condition is met.
 10. Advanced:
 - a. Build Option - Select a build option for this automation. Build options are predefined settings that determine whether or not components within an application are enabled.
 - b. Comments - Enter any developer comments or notes here. These comments only display within App Builder and never display when running the application.
 11. To save your edits, click **Save Changes**.
 12. To execute the automation, click **Save and Run**.
 13. To delete the automation, click **Delete**.



See Also:

- "APEX_AUTOMATION" package in *Oracle Application Express API Reference*
- "Configuring Background Jobs" in *Oracle Application Express Administration Guide*
- "DBMS_SCHEDULER Operational Notes" in *Oracle Database PL/SQL Packages and Types Reference*

16.3.5 Managing the Automation Execution Log

View and clear the Automation Execution Log records on the Automations, Execution Log page.

Oracle Application Express purges log information by default every 14 days. Other retention periods can be configured in Administration Services.

- [Viewing the Automation Execution Log](#)
View the Automation Execution Log details about previous automation executions such as start and end timestamps as well as details about processed rows (successful and with errors).
- [Purging the Automation Execution Log](#)
Purge the Automation Execution Log records by clicking Purge Log on Execution Log page.



See Also:

"Configuring or Deleting the Automation Log" in *Oracle Application Express Administration Guide*

16.3.5.1 Viewing the Automation Execution Log

View the Automation Execution Log details about previous automation executions such as start and end timestamps as well as details about processed rows (successful and with errors).

The Automation Execution Log contains start and end timestamps as well as details about processed rows (successful and with errors). Drill down into **Messages** to see individual messages for processed rows.

To access the Execution Log:

1. Navigate to the Automations page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select the new application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 - d. Under Application Logic, select **Automations**.
The Automations page appears.
2. Click the **Execution Log** tab.

The Execution Log appears displaying the following: Start Timestamp, Automation name, Status, Successful Rows, Error Rows, and Messages.

3. Click the link under Messages to view individual messages for processed rows.
The Log Messages appear.

Timestamp ↓	Message	Message Type	Primary Key Value
09/24/2020 02:31:05 PM	SAL for MILLER increased by 1%.	Information	
09/24/2020 02:31:05 PM	SAL for JAMES increased by 1%.	Information	
09/24/2020 02:31:05 PM	SAL for ADAMS increased by 1%.	Information	
09/24/2020 02:31:05 PM	SAL for SMITH increased by 1%.	Information	
09/24/2020 02:31:05 PM	SAL for FORD increased by 1%.	Information	
09/24/2020 02:31:05 PM	SAL for SCOTT increased by 1%.	Information	
09/24/2020 02:31:05 PM	SAL for JONES increased by 1%.	Information	
09/24/2020 02:31:05 PM	SAL for CLARK increased by 1%.	Information	
09/24/2020 02:31:05 PM	SAL for BLAKE increased by 1%.	Information	
09/24/2020 02:31:05 PM	SAL for KING increased by 1%.	Information	

Each log message displays the following: Timestamp, the Message text, the Message Type (Information, Warning, or Error), and (optionally) the primary key value of the row for which the message was generated.

**Tip:**

You can view the target table in SQL Workshop, Object Browser to validate that the automation is actually changing the data. See "Browsing a Table" in *Oracle Application Express SQL Workshop Guide*.

16.3.5.2 Purging the Automation Execution Log

Purge the Automation Execution Log records by clicking Purge Log on Execution Log page.

To purge the Automations Execution Log:

1. Navigate to the Automations page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select the new application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 - d. Under Application Logic, select **Automatons**.
The Automatons page appears.
2. Click the **Execution Log** tab.
The Execution Log page appears.
3. Click **Purge Log**.
4. In the Clear Automation Log dialog:
 - a. From the Automation list, select the log to purge.
 - b. Click **Clear Log**

16.3.6 Viewing the Automation History Report

View recent automation modifications on the Automations History report.

To view the Automations History report:

1. Navigate to the Automations page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select the new application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 - d. Under Application Logic, select **Automations**.
The Automations page appears.
2. Click the **History** tab.
The History report appears displaying the following: Audit Date, Action, Developer, Object Type, and Component Name.

16.4 Managing Application Settings

Create Application Settings to define application-level configuration options.

 **Tip:**

You also use the `APEX_APP_SETTING` API to access application settings. See `APEX_APP_SETTING` in *Oracle Application Express API Reference*.

- [Creating an Application Setting](#)
Create an Application Settings. Application Settings enable developers to define application level configuration options.
- [Editing or Deleting Application Setting](#)
Edit or delete an existing setting on the Application Settings page.

16.4.1 Creating an Application Setting

Create an Application Settings. Application Settings enable developers to define application level configuration options.

To create an Application Setting:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Application Logic, select **Application Settings**.
3. Click **Create Setting**.
4. On Application Setting:
 - a. Name - Enter a descriptive name for this application setting.
 - b. Value - Enter the default value for this application setting.
 - c. Value Required - Select whether this Application Setting requires a value. Select **On** or **Off**.
 - d. Valid Values - Enter comma separated valid values. If defined, Application Express only accepts valid values when the settings change.
 - e. On Upgrade Keep Value - Select whether the application setting value in the deployed application should be kept, or overwritten with the specified value when the application is upgraded. Selecting **On** to keep the deployed value is useful if the application supports application setting configuration (using the `APEX_APP_SETTING.SET_VALUE` API) to change the application setting value in the deployed application, and where you want to respect those values upon upgrade.

- [Creating a Named LOV at the Application-Level](#)
You define named (or shared) LOVs at the application-level by running the Create LOV Wizard and adding them to the List of Values repository.
- [About Static LOVs](#)
Static LOVs are based on a static list of display values and return values you specify when you run the Create LOV Wizard.
- [Editing an Existing LOV](#)
To edit an existing LOV, select the LOV on the Lists of Values page.
- [About Referencing Session State Within an LOV](#)
You can reference session state in an LOV by using bind variables.
- [Accessing LOV Reports](#)
Access LOV reports by selecting a report on the List of Values page.



See Also:

- ["Creating Page-Level Items"](#)
- ["Managing Shared Components"](#)

16.5.1 What is a List of Values?

A list of values (LOV) is a static or dynamic definition used to display a specific type page item.

A LOV can be *static*, meaning it is based on values the user enters or *dynamic*, meaning it is based on a Local data source, REST Enabled SQL Reference, or REST Data Source. A LOV can be referenced by page items such popup lists of values, a select list, a check box, a radio group, or multiple select lists.

By creating a list of values at the application-level, you are creating shared component. Creating a LOV as a shared component has several advantages:

- You can add it to any page within an application.
- All LOV definitions are stored in one location, making them easy to locate and update.
- You can define LOVs on different data sources and make use of new functionality only included in Shared LOVs, for example multi-column support, icon and grouping columns.

16.5.2 Creating a Named LOV at the Application-Level

You define named (or shared) LOVs at the application-level by running the Create LOV Wizard and adding them to the List of Values repository.

All LOVs can be defined as **static** or **dynamic**. Static lists are based on predefined pairs of display values and return values. Dynamic list of values retrieve data from a Local data source, REST Enabled SQL reference, or REST Data Source.

To create a named LOV:

1. Navigate to the Shared Components page:

- a. On the Workspace home page, click **App Builder**.
- b. Select an application.
- c. On the Application home page, click **Shared Components**.

The Shared Components page appears.

2. Under Other Components, select **List of Values**.

The Lists of Values page appears.

3. To create a LOV, click **Create**.

4. Follow the on-screen instructions.

New named LOVs are added to the List of Values repository. To add the LOV to a page, you must edit the appropriate item or column and select the named LOV.

16.5.3 About Static LOVs

Static LOVs are based on a static list of display values and return values you specify when you run the Create LOV Wizard.

To create a static LOV, run the Create LOV Wizard and select the LOV type **Static**. Oracle Application Express stores the display values, return values, and sort sequence you specify in the List of Values repository. Once you add a static LOV to the repository, you can create an item and display it as a check box, radio group, select list, or popup list based on this definition.

16.5.4 Editing an Existing LOV

To edit an existing LOV, select the LOV on the Lists of Values page.

- [Editing a LOV](#)
- [Editing LOVs in Bulk](#)

16.5.4.1 Editing a LOV

To edit a LOV:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.

The Shared Components page appears.

2. Under Other Components, select **List of Values**.

The Lists of Values page appears.

3. Select an LOV.

The Edit page appears.

4. Edit the attributes.

 **Tip:**

To learn more about an attribute, see field-level Help.

5. Click **Apply Changes**.

 **See Also:**

"Viewing Help"

16.5.4.2 Editing LOVs in Bulk

You can edit the display values of all static LOVs by clicking the Grid Edit button on the Edit List of Values page.

To perform a bulk edit of static LOVs:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, select **List of Values**.
By default, LOVs display as icons.
3. Click the **Grid Edit** tab.
4. Edit the display text and click **Apply Changes**.

16.5.5 About Referencing Session State Within an LOV

You can reference session state in an LOV by using bind variables.

Keep in mind that referencing session state makes an LOV a bit less reusable, but is still a recommended development practice. In the following example, this LOV only works if the item called *my_deptno* contains a valid department number.

```
SELECT ename, empno FROM emp WHERE deptno = :P1_DEPTNO
```

16.5.6 Accessing LOV Reports

Access LOV reports by selecting a report on the List of Values page.

To access LOV reports:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.

- c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, select **List of Values**.
By default, LOVs display as icons.
3. Select one of the following tabs at the top of the page:
 - **List of Values** - Displays all LOVs that are defined locally with the definition of an item. LOVs that are usable by multiple pages can be converted into shared lists of values. Converting locally defined lists of values into a shared list of values promotes reuse.
 - **Edit Null Text** - Edit null text for all LOVs in your application.
 - **Locally Defined** - View all lists of values that are defined locally with the definition of the item. Lists of values that are usable by multiple pages can be converted into shared lists of values. Converting locally defined lists of values into a shared list of values promotes reuse..
 - **Grid Edit** - Find and edit static list of value entries over all static lists of values. Use this page to standardize display text.
 - **Conditional Entries** - Displays all LOVs that display conditionally.
 - **Subscription** - Displays all subscribed LOVs in your application.
 - **Utilization** - Displays where LOVs used in the current application.
 - **History** - Displays displays recent modifications made to lists of values in in the current application.
4. Follow the on-screen instructions.

16.6 Managing Component Settings

Use Component Settings to set application level values for built-in Application Express components and installed plug-ins.



Tip:

The Component Settings in your environment will vary based on the currently selected application.

- [Configuring Component Settings](#)
Developers can configure Component Settings to set application level values for built-in Application Express components and installed plug-ins.
- [Integrating with Google Calendar](#)
Developers can enable calendars within an application to integrate with Google calendar data by configuring the Component Settings, Calendar.
- [Configuring Check Box](#)
Configure application-level component settings defined in Shared Components, Component Settings, Checkbox.

- [Configuring Date Picker](#)
Configure application-level component settings defined in Shared Components, Component Settings, Date Picker.
- [Configuring Color Picker Display](#)
Configure application-level component settings defined in Shared Components, Component Settings, Color Picker.
- [Configuring Interactive Report Action Menu Structure](#)
Configure application-level component settings defined in Shared Components, Component Settings Interactive Report to use the new Action Menu or keep the legacy structure from earlier releases.
- [Dynamically Adding Sliders to Regions](#)
Configure application-level component settings defined in Shared Components, Component Settings, Region Display Selector to dynamically add a slider to the region if the displayed region name exceeds the width of the region.
- [Configuring Rich Text Editor Responsiveness](#)
Determine whether the Rich Text Editor automatically adjusts to the width of the container region by configuring application-level component settings defined in Shared Components, Component Settings, Rich Text Editor.
- [Configuring Star Rating](#)
Configure application-level component settings defined in Shared Components, Component Settings, Star Rating.
- [Configuring Switch Defaults](#)
Configure application-level component settings defined in Shared Components, Component Settings, Switch to determine the default display style for the Switch item type.
- [Viewing the Component Settings History Report](#)
You can view a report of modifications made to Oracle Application Express components and installed plug-ins on the Component Settings History page.

16.6.1 Configuring Component Settings

Developers can configure Component Settings to set application level values for built-in Application Express components and installed plug-ins.

1. To configure Component Settings:
 1. On the Workspace home page, click **App Builder**.
 2. Select an application.
 3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 4. Under Other Components, click **Component Settings**.
 5. Click the component name.
 6. In the Component Settings configure the appropriate settings and click **Apply Changes**.

 **Tip:**

To learn more about a specific setting, see item Help.

16.6.2 Integrating with Google Calendar

Developers can enable calendars within an application to integrate with Google calendar data by configuring the Component Settings, Calendar.

 **Note:**

The **Google Calendar API Key [Deprecated]** attribute described in this topic only applies to calendars based on the FullCalendar v3 library. Calendars based on FullCalendar v3 have been deprecated and will be desupported in a future release. New calendars created in App Builder are based on the FullCalendar v5 library.

1. To configure the Component Settings, Calendar:
 1. On the Workspace home page, click **App Builder**.
 2. Select an application.
 3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 4. Under Other Components, click **Component Settings**.
 5. Click the component name, **Calendar**.
 6. In the Component Settings dialog:
 - a. Google Calendar API Key [Deprecated] - Enter the Google Calendar API key to enable calendars within this application to integrate with Google calendar data.
 - b. Click **Apply Changes**.

16.6.3 Configuring Check Box

Configure application-level component settings defined in Shared Components, Component Settings, Checkbox.

To configure Check Box application-level component settings:

1. On the Workspace home page, click **App Builder**.
2. Select an application.
3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
4. Under Other Components, click **Component Settings** and then **CheckBox**.
5. In the Component Settings dialog:
 - a. Checked Value - Enter the value stored in the page item if the end user checks the checkbox. The value can be up to 255 characters long.

- b. Unchecked Value - Enter the value stored in the page item if the user unchecks the checkbox. This attribute can also be left blank if you want to store NULL when checked. The value can be up to 255 characters long.
- c. Click **Apply Changes**.

16.6.4 Configuring Date Picker

Configure application-level component settings defined in Shared Components, Component Settings, Date Picker.

To configure Date Picker application-level component settings:

1. On the Workspace home page, click **App Builder**.
2. Select an application.
3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
4. Under Other Components, click **Component Settings** and then **Date Picker**.
5. In the Component Settings dialog:
 - a. Appearance - Control the appearance of the calendar used to select dates. Options include **Show Week**, **Month Picker**, and **Year Picker**.
This option is only used when **Display As** is set either **Popup** or **Inline**.
 - b. Days Outside Month - Dictates the behavior of days outside the current viewing month. Options include **Hidden**, **Selectable**, and **Visible**.
This option is only used when **Display As** is set either **Popup** or **Inline**.
 - c. Time Increment - Time increment in minutes used by the time selection control. This attribute is used for selecting the time of increments that can still be manually entered and saved.
This option is only used when **Display As** is set to either **Popup** or **Inline**.
 - d. Click **Apply Changes**.

16.6.5 Configuring Color Picker Display

Configure application-level component settings defined in Shared Components, Component Settings, Color Picker.

To configure Color Picker application-level component settings:

1. On the Workspace home page, click **App Builder**.
2. Select an application.
3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
4. Under Other Components, click **Component Settings**.
5. Click the component name, **Color Picker**.
6. In the Component Settings dialog:

- a. Display As - Select how the color picker displays. Options include **Popup**, **Inline**, **Color-only Popup**, and **Native Color Picker**.
- b. Mode - Select the amount of information shown in the color picker. Options include **Simple** or **Full**.
- c. Click **Apply Changes**.

16.6.6 Configuring Interactive Report Action Menu Structure

Configure application-level component settings defined in Shared Components, Component Settings Interactive Report to use the new Action Menu or keep the legacy structure from earlier releases.

The structure of the interactive report Actions menu has changed to be consistent with interactive grids.

To configure Interactive Report application-level component settings:

1. On the Workspace home page, click **App Builder**.
2. Select an application.
3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
4. Under Other Components, click **Component Settings** and then **Interactive Report**.
5. Click the component name, **Interactive Report**.
6. In the Component Settings dialog:
 - a. Actions Menu Structure - Specify how the Actions menu displays in interactive reports. Options include:
 - Interactive Grid - Select **Interactive Grid** to have the interactive report Actions menu match interactive grid.
 - Legacy - Select **Legacy** to have the interactive report Actions menu use the legacy structure.
 - b. Click **Apply Changes**.

16.6.7 Dynamically Adding Sliders to Regions

Configure application-level component settings defined in Shared Components, Component Settings, Region Display Selector to dynamically add a slider to the region if the displayed region name exceeds the width of the region.

To configure Region Display Selector application-level component settings:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, click **Component Settings** and then **Region Display Selector**.

3. In the Component Settings dialog:
 - a. Include Slider - Select **Yes** to dynamically add a slider to the region if the displayed region name exceeds the width of the region.
 - b. Click **Apply Changes**.

16.6.8 Configuring Rich Text Editor Responsiveness

Determine whether the Rich Text Editor automatically adjusts to the width of the container region by configuring application-level component settings defined in Shared Components, Component Settings, Rich Text Editor.

For new apps, this setting is enabled by default. For older apps (pre-18.1), this is disabled by default.

This setting requires a responsive application theme (such as Universal Theme).

To configure Rich Text Editor application-level component settings:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, click **Component Settings** and then **Rich Text Editor**.
3. In the Component Settings dialog:
 - a. Responsive [Deprecated] - Specify whether the Rich Text editor should automatically adjust to the container region size. This requires the Application to use Universal Theme or another responsive theme.
 - b. Click **Apply Changes**.

16.6.9 Configuring Star Rating

Configure application-level component settings defined in Shared Components, Component Settings, Star Rating.

To configure Star Rating application-level component settings:

1. On the Workspace home page, click **App Builder**.
2. Select an application.
3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
4. Under Other Components, click **Component Settings** and then **Star Rating**.
5. In the Component Settings dialog:
 - a. **Default Icon** - Choose the default icon to use (such as `fa-star`, `fa,-thumbs-up`, or `fa-database`).
 - b. **Active Color** - Default color for active stars.
 - c. **Inactive Color** - Default color for inactive stars.

- d. **Tooltip** - The template for the tooltip when end users hover the mouse over the item. This rating value replaces the #VALUE# substitution (for example, the movie rating is #VALUE#).
- e. Click **Apply Changes**.

16.6.10 Configuring Switch Defaults

Configure application-level component settings defined in Shared Components, Component Settings, Switch to determine the default display style for the Switch item type.

Display options include On/Off switch toggle, pill button, or select list.

To configure Switch application-level component settings:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, click **Component Settings** and then **Switch**.
3. Configure the following Component Settings:
 - a. Display Style - Options include:
 - **Switch**
 - **Pill Button**
 - **Select List**
 - b. On Value - Enter the value stored in the page item if the end user picks the **On** option. The value can be up to 255 characters long.
 - c. On Label - Enter the text displayed for the **On** option. If no text is entered, the system default label is used.
 - d. Off Value - Enter the value stored in the page item if the user picks the **Off** option. The value can be up to 255 characters long. This value is used if the page item is populated with a value which does not match either the **On Value** or **Off Value**.
 - e. Off Label - Enter the text displayed for the **Off** option. If no text is entered, the system default label is used.
4. Click **Apply Changes**.

16.6.11 Viewing the Component Settings History Report

You can view a report of modifications made to Oracle Application Express components and installed plug-ins on the Component Settings History page.

1. To view the Component Settings History report:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.

The Shared Components page appears.

2. Under Other Components, click **Component Settings**.
3. Click the **History** tab.

The History page displays as an interactive report. To customize the report, use the Search bar at the top of the page.

16.7 Using Shortcuts

Use shortcuts to avoid repetitive coding of HTML or PL/SQL functions.

- [What is a Shortcut?](#)
Use a shortcut to define frequently used code once and then reference it in many places thus reducing code redundancy. For example, you can create a shortcut to define a page control such as a button, HTML text, a PL/SQL procedure, or HTML.
- [Supported Shortcut Types](#)
Oracle Application Express supports six types of shortcuts.
- [Defining a Shortcut from Scratch](#)
Define a shortcut on the Shortcuts page.
- [Copying an Existing Shortcuts](#)
Copy existing shortcuts from the Shortcut repository.
- [Editing Existing Shortcuts](#)
Once you create a shortcut, you can alter it by editing attributes on the Edit Shortcut page.
- [Accessing Shortcut Reports](#)
View the shortcut Subscription and History reports.

16.7.1 What is a Shortcut?

Use a shortcut to define frequently used code once and then reference it in many places thus reducing code redundancy. For example, you can create a shortcut to define a page control such as a button, HTML text, a PL/SQL procedure, or HTML.

You can use a shortcut within the following locations:

- The Region Source attribute of regions defined as HTML Text (with shortcuts).
- Region Header and Footer Text attribute.
- Item Label attributes, Pre Element Text, Post Element Text, and Default Value attribute.
- Region Templates attributes.

Referencing a Shortcut

Once you define a shortcut, you can invoke it using specific syntax unique to the location in which the shortcut is used.

You reference shortcuts using the following syntax:

```
"MY_SHORTCUT"
```

The shortcut name must be capitalized and enclosed in quotation marks.

 **See Also:**

- ["About Regions"](#)
- ["Specifying a Region Header and Footer"](#)
- ["Creating Custom Themes"](#)

16.7.2 Supported Shortcut Types

Oracle Application Express supports six types of shortcuts.

When you create a shortcut you select a shortcut type. Supported shortcut types include:

- PL/SQL Function Body
- HTML Text
- HTML Text with Escaped Special Characters
- Image
- Text with JavaScript Escaped Single Quotes
- Message
- Message with JavaScript Escaped Special Quotes

Text with JavaScript Escaped Single Quotes

Use this type of shortcut to reference a shortcut inside of a JavaScript literal string. This shortcut defines a text string. When the shortcut is referenced, it escapes the single quotation marks required for JavaScript.

Message

Use this type of shortcut to reference a translatable message at runtime. Since this shortcut does not have a shortcut body, the name of the shortcut must match the corresponding message name. At runtime, the name of the shortcut expands to the text of the translatable message for the current language.

Message with JavaScript Escaped Single Quotes

Use this type of shortcut to reference a shortcut inside of JavaScript literal string and reference a translatable message at runtime.

 **See Also:**

- ["Understanding Application Translation and Globalization Support"](#)

16.7.3 Defining a Shortcut from Scratch

Define a shortcut on the Shortcuts page.

To define a shortcut:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, select **Shortcuts**.
3. Click **Create**.
4. For Create Shortcut, select **From Scratch** and click **Next**.
5. On Shortcut Attributes:
 - a. Name - Enter the name by which the shortcut will be referenced.
 - b. Type - Select a shortcut type. Options include:
 - PL/SQL Function Body
 - HTML Text
 - HTML Text with Escaped Special Characters
 - Image
 - Text with JavaScript Escaped Single Quotes
 - Message
 - Message with JavaScript Escaped Special Quotes
 - c. Shortcut - Enter the text of the shortcut. The shortcut must be less than 30,000 characters in length.
 - d. Error Text - Enter the text to display if an error should occur during the processing of a shortcut.
 - e. Build Option - Select a build option for this component.
6. Click **Create**.

New shortcuts are added to the Shortcuts page (also referred to as the Shortcut repository).

16.7.4 Copying an Existing Shortcuts

Copy existing shortcuts from the Shortcut repository.

To copy an existing shortcut:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.

- c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, select **Shortcuts**.
3. Click **Create**.
4. On Creation Method, select **As a Copy of an Existing Shortcut** and click **Next**.
5. From Copy From Application, select the application you want to copy shortcuts from and click **Next**.
6. On New Shortcuts:
 - a. To Name - Enter the new name of the shortcut to be copied.
 - b. Copy - Select **Yes**, **No**, or **Copy and Subscribe**.
 - c. Click **Copy Shortcut**.New shortcuts are added to the Shortcuts page (also referred to as the Shortcut repository).

16.7.5 Editing Existing Shortcuts

Once you create a shortcut, you can alter it by editing attributes on the Edit Shortcut page.

To edit an existing shortcut:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, select **Shortcuts**.
3. Select a shortcut.
The Edit Shortcut page appears.
4. Edit the attributes.
To learn more about an attribute, see field-level Help.
5. Click **Apply Changes**.



See Also:

["Viewing Help"](#)

16.7.6 Accessing Shortcut Reports

View the shortcut Subscription and History reports.

To access shortcut reports:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.The Shared Components page appears.
2. Under Other Components, select **Shortcuts**.
3. Click one of the following tabs:
 - **Subscription** - Displays the Subscribed Shortcuts page which displays all subscribed shortcuts in your application.
 - **History** - Display the Shortcut History page which displays a history of recently changed shortcuts by date.

 **Note:**

The Subscription and History tabs only appear after you create a shortcut.

16.8 Managing Email Templates

Enable users to send emails from your application by creating email templates.

 **Note:**

Before you can send email from an application, your Instance administrator must sign in to Oracle Application Express Administration Services, navigate to the Instance Settings page and configure Email attributes.

- [Defining an Email Template](#)
Define email templates for your application. Email templates include both an HTML Format and a Plain Text Format.
- [Viewing Sample Email Templates](#)
View the sample email templates: Load Order Details, Load Event Reminder, or Load Scheduled Outage.
- [About Including Dynamic Text](#)
Provide dynamic text in your email templates using existing substitution modifiers.
- [Editing Email Templates](#)
Edit or delete existing email templates.

 **See Also:**

- "Configuring Email" in *Oracle Application Express Administration Guide*
- "APEX_MAIL" in *Oracle Application Express API Reference*

16.8.1 Defining an Email Template

Define email templates for your application. Email templates include both an HTML Format and a Plain Text Format.

To define an email template:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.The Shared Components page appears.
2. Under Other Components, select **Email Templates**.
3. On the Email Templates page, click **Create Email Template**.

The Details page appears.

 **Tip:**

To get started, review the sample email templates available under **Sample Templates** on the right side of the page. To load a sample email template, simply select it. See "[Viewing Sample Email Templates](#)".

4. Next, define your template.

 **Tip:**

For **Email Subject**, **HTML Format** or **Plain Text Format**, support substitution strings using the format `#STRING_NAME#`. You can pass in values for these strings using the `APEX_MAIL` API.

5. Under Identification:
 - a. **Template Name** - Enter a descriptive name for this template .
 - b. **Static Identifier** - Static string identifier used to refer to the template when calling the `APEX_MAIL` APIs.
 - c. **Email Subject** - Enter the text to display for the email subject.
6. Under HTML Format:
 - a. Define the **Header**, **Body**, and **Footer**. Body supports basic HTML markup.

16.8.2 Viewing Sample Email Templates

View the sample email templates: Load Order Details, Load Event Reminder, or Load Scheduled Outage.

To view sample email template:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.The Shared Components page appears.
2. Under Other Components, select **Email Templates**.
3. On the Email Templates page, click **Create Email Template**.
The Details page appears.
4. On the right side of the page, find the **Sample Templates** region.
The Sample Templates region contains three templates:
 - Load Order Details
 - Load Event Reminder
 - Load Scheduled Outage
5. Select a template. For example, select **Load Order Details**.
The template appears.
6. Expand the **Sample API Usage** region at the bottom of the page to see an example. The following is the **Load Order Details** API example.

```
begin
  apex_mail.send (
    p_to                => email_address_of_user,
    p_template_static_id => '',
    p_placeholders      => '{'
    '    "CUSTOMER_NAME":'          ||
apex_json.stringify( some_value )
    '    ,"ITEMS_ORDERED":'        ||
apex_json.stringify( some_value )
    '    ,"MY_APPLICATION_LINK":'  ||
apex_json.stringify( some_value )
    '    ,"ORDER_DATE":'          ||
apex_json.stringify( some_value )
    '    ,"ORDER_NUMBER":'       ||
apex_json.stringify( some_value )
    '    ,"ORDER_TOTAL":'        ||
apex_json.stringify( some_value )
    '    ,"ORDER_URL":'          ||
apex_json.stringify( some_value )
    '    ,"SHIPPING_ADDRESS_LINE_1":' ||
apex_json.stringify( some_value )
    '    ,"SHIPPING_ADDRESS_LINE_2":' ||
```

```

apex_json.stringify( some_value )
    '    ', "SHIP_TO":'                ||
apex_json.stringify( some_value )
    '}' );
end;
```

16.8.3 About Including Dynamic Text

Provide dynamic text in your email templates using existing substitution modifiers.

For security reason, the values substituted for the placeholders (#NAME#) in the email templates are automatically escaped based on the context. In other words, HTML formatted templates include HTML escaping and Plain Text templates do not. If this is not the desired behavior for your environment, you can provide dynamic text which contains HTML tags using the existing substitution modifiers:

- #NAME!RAW# - Text is substituted as is.
- #NAME!STRIPHTML# - All HTML tags are removed.

Extending the Email Templates

For example, you can extend the **HTML Format - Body** template with:

```

<tr>
    left">Additional Information</th>
    <td>#ADDITIONAL_INFO!RAW#</td>
</tr>
```

Similarly, you can extend the **Plain Text Format** template with:

```

Additional Info: #ADDITIONAL_INFO!STRIPHTML#
```

Sample PL/SQL

The PL/SQL code would look similar to this:

```

begin
    apex_mail.send (
        p_to                => 'steven.king@example.com',
        p_template_static_id => 'ORDER_CONFIRMATION',
        p_placeholders       => q'~
        {
            "CUSTOMER_NAME": "Steven King",
            "ORDER_NUMBER": 1234,
            "ORDER_DATE": "02-Feb-2018",
            "SHIP_TO": "Steven King",
            "SHIPPING_ADDRESS_LINE_1": "2004 Charade Rd",
            "SHIPPING_ADDRESS_LINE_2": "Seattle, Washinton",
            "ITEMS_ORDERED": 3,
            "ORDER_TOTAL": "$ 1,200.99",
            "ORDER_URL": "http://domain/apex/f?p=&APP_ID"
            "ADDITIONAL_INFO": "We plan to deliver your ordered
items <strong>tomorrow morning between 08:00 and 09:00</strong>
```

```
        }~' );  
    apex_mail.push_queue;  
end;
```

16.8.4 Editing Email Templates

Edit or delete existing email templates.

To edit or delete an email template:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, select **Email Templates**.
The Email Templates page appears.
3. To edit an email template:
 - a. Click the email template name.
 - b. Edit the appropriate attributes.
 - c. Click **Apply Changes**.
4. To delete an email template:
 - a. Click the email template name.
 - b. Click **Delete**.

16.9 Managing Static Application Files

Navigate to Shared Components to upload, view, download, and delete static application files (including images, CSS files, and other files which must be managed independently).

- [Specifying the Location of Static Application Files](#)
Specify the location of static application files.
- [Uploading Static Application Files](#)
Upload static application files from Shared Components.
- [Viewing the Static Application Files Report](#)
View the Static Application Files Report.
- [Referencing Static Application Files](#)
Reference a static application file in your application using #APP_IMAGES# substitution string.
- [Downloading Static Application Files](#)
Download an uploaded static application file, or download all static application files in a Zip.
- [Deleting Static Application Files](#)
Delete uploaded static application files.

 **See Also:**

- ["Managing Static Workspace Files"](#)
- ["About Managing Images"](#)

16.9.1 Specifying the Location of Static Application Files

Specify the location of static application files.

Application files are stored with your application definition in the Oracle database. For performance reasons, you can also store your application files on your Web server. Edit the Static File Prefix attribute to change the location.

1. To edit the Static File Prefix attribute:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under User Interface, select **User Interface Attributes**.
 3. Click the **User Interface** tab.
 4. Under **General**, **Static File Prefix** - Enter the virtual path the Web server uses to point to static application files. Leave this attribute blank to reference files stored with your application definition in the database. For performance reasons you can also store your application files on your Web server and reference them using a valid URL. Example:

```
/myFiles/  
http://contentDeliveryNetwork.com/myFiles/
```

5. Click **Apply Changes**.

16.9.2 Uploading Static Application Files

Upload static application files from Shared Components.

1. To upload a static application file:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Files, select **Static Application Files**.
The Static Application Files page appears.
 3. To upload a file, click **Upload File**.

4. On **Upload Static Application File(s)**:
 - a. **Directory** - Enter the name of the directory where the file should be stored. If no directory is specified, the file is stored in the root directory.
 - b. **File** - Find the location of the file to be added to the application.
 - c. **File Character Set** - Indicate the character set encoding for the file to be uploaded. This attribute only applies to text files.
 - d. **Unzip File** - If you select **On**, the uploaded Zip file is automatically unzipped and stored in the specified directory. Note that the actual Zip file is not stored. This attribute is ignored if the uploaded file is not a Zip file.
5. Click **Upload** or **Upload and Upload Another**.

16.9.3 Viewing the Static Application Files Report

View the Static Application Files Report.

1. To view static application files as a report:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under **Files**, select **Static Application Files**.
The Static Application Files page appears.
 3. If not already selected, click **View Report** icon.
A report appears. To customize the report, use the Search bar at the top of the page.
The Static Application Files report includes the following columns: File Name, Mime Type, File Size, Reference and a Download link.
4. To view file details:
 - a. Click the File Name.
The Edit Static Application File dialog appears.
 - b. To delete the file, click **Delete**.
 - c. To exit, click **Cancel**.



See Also:

["About the Search Bar"](#)

16.9.4 Referencing Static Application Files

Reference a static application file in your application using `#APP_IMAGES#` substitution string.

Static application files are only available to the currently selected application. To view sample syntax for uploaded images, see the Reference column on the Static Application Files report.



See Also:

["About Using Substitution Strings"](#)

16.9.5 Downloading Static Application Files

Download an uploaded static application file, or download all static application files in a Zip.

- [Downloading a Static Application File](#)
- [Downloading All Static Application Files in a Zip](#)

16.9.5.1 Downloading a Static Application File

1. To download an uploaded static application file:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Files, select **Static Application Files**.
The Static Application Files page appears.
 3. If not already selected, click **View Report** icon.
A report appears.
 4. Locate the file to be downloaded and click the **Download** link.

16.9.5.2 Downloading All Static Application Files in a Zip

1. To download all static application files in a Zip:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.

The Shared Components page appears.

2. Under Files, select **Static Application Files**.
The Static Application Files page appears.
3. Click **Download as Zip**.

16.9.6 Deleting Static Application Files

Delete uploaded static application files.

- [Deleting a Static Application File](#)
Delete an uploaded static application file in the Edit Static Application File dialog.
- [Deleting All Static Application Files](#)

16.9.6.1 Deleting a Static Application File

Delete an uploaded static application file in the Edit Static Application File dialog.

1. To delete an uploaded static application file:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Files, select **Static Application Files**.
The Static Application Files page appears.
 3. If not already selected, click the **View Report** icon.
A report appears. To customize the report, use the Search bar at the top of the page.
 4. Click the File Name of the file to be deleted.
 5. On the Edit Static Application File page, click **Delete**.

16.9.6.2 Deleting All Static Application Files

1. To delete all uploaded static application files:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Files, select **Static Application Files**.
The Static Application Files page appears.
 3. Click **Delete All Files**.

16.10 Managing Static Workspace Files

Navigate to Shared Components to upload, view, download, and delete static workspace files (including images, CSS files, and other files which must be managed independently).

- [Uploading Static Workspace Files](#)
Upload static workspace files from Shared Components.
- [Viewing the Static Workspace File Report](#)
View the Static Workspace Files report.
- [About Referencing Static Workspace Files](#)
Reference a static workspace file in your application using `#WORKSPACE_IMAGES#` substitution string.
- [Downloading Static Workspace Files](#)
Download an uploaded static workspace file, or download all static application files in a Zip.
- [Deleting Static Workspace Files](#)
Delete uploaded static workspace files.



See Also:

- ["Managing Static Application Files"](#)
- ["About Managing Images"](#)

16.10.1 Uploading Static Workspace Files

Upload static workspace files from Shared Components.

1. To upload a static workspace file:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Files, select **Static Workspace Files**.
The Static Workspace Files page appears.
3. To upload a file, click **Upload File**.
4. On the Upload Static Workspace File(s) dialog:
 - a. **Directory** - Enter the name of the directory where the file should be stored. If no directory is specified, the file is stored in the root directory.
 - b. **File** - Enter the location of the file to be added to the application.



See Also:

["Using Built-in Substitution Strings"](#)

16.10.4 Downloading Static Workspace Files

Download an uploaded static workspace file, or download all static application files in a Zip.

- [Downloading a Static Workspace File](#)
- [Downloading All Static Workspace Files in a Zip](#)

16.10.4.1 Downloading a Static Workspace File

1. To download an uploaded static workspace file:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Files, select **Static Workspace Files**.
The Static Workspace Files page appears.
 3. If not already selected, click **View Report** icon.
A report appears.
 4. Locate the file to be downloaded and click the **Download** link.

16.10.4.2 Downloading All Static Workspace Files in a Zip

1. To download all static workspace files in a Zip:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Files, select **Static Workspace Files**.
The Static Workspace Files page appears.
 3. Click **Download as Zip**.

16.10.5 Deleting Static Workspace Files

Delete uploaded static workspace files.

- [Deleting a Static Workspace File](#)
- [Deleting All Static Workspace Files](#)

16.10.5.1 Deleting a Static Workspace File

1. To delete an uploaded static workspace file:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Files, select **Static Workspace Files**.
The Static Workspace Files page appears.
 3. If not already selected, click the **View Report** icon.
A report appears. To customize the report, use the Search bar at the top of the page.
 4. Click the File Name of the file to be deleted.
 5. On the Edit Static Application File page, click **Delete**.



See Also:

["About the Search Bar"](#)

16.10.5.2 Deleting All Static Workspace Files

1. To delete all uploaded static workspace files:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Files, select **Static Workspace Files**.
The Static Workspace Files page appears.
 3. Click **Delete All Files**.

16.11 Managing Application-Level Items

Application-level items do not display, but are used as global variables to the application. You can use an application item as a global variable.

- [Creating an Application-Level Item](#)
Create a application-level item on the shared Shared Components page.

- [Viewing Application Item Usage](#)
You can view a list of where application items are used by clicking the **Utilization** tab at the top of the Application Items page.
- [Editing Application-Level Item Attributes](#)
Once you create an application-level item, you can edit it on the Create/Edit Application Item page.
- [About Creating an Application-Level Item that Functions as a Global Variable](#)
You can create a global variable by creating an application-level item with the same name across all applications and setting the scope to Global.



See Also:

- ["About the Differences Between Page Items and Application Items"](#)
- ["Referencing Item Values"](#)

16.11.1 Creating an Application-Level Item

Create a application-level item on the shared Shared Components page.

To create an application-level item:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Application Logic, select **Application Items**.
The Application Items page appears.
3. To create an application item, click **Create**.
The Create/Edit page appears.
4. For Name:
 - a. Name - Enter a name for the application-level item.
 - b. Scope - Options include:
 - **Global** - Select this option if the Application Express session is shared by more than one application and the item's value should be the same for all applications.
Applications can share the same session if their authentications have the same Session Cookie Attributes. The Scope attribute of application items has to be the same across these applications.
 - **Application** - Select this option if the application does share session state with another application.
5. Security, Session State Protection - Set session state protection for this item.
Options include:

- **Unrestricted** - The item's session state may be set by passing the item name/value in a URL or in a form. No checksum is required in the URL.

 **Note:**

If you must set this item's value in session state using Ajax, then an Unrestricted protection level must be used for the item (for example in Dynamic Actions, Set Value, Page Items to Submit or Cascading LOVs, Page Items to Submit).

- **Restricted - May not be set from browser** - The item may not be altered using the URL or POSTDATA. Use this option when you want to restrict the way that the item value can be set to internal processes, computations, and so on. This attribute is only applicable only to items that cannot be used as data entry items and is always observed even if Session State Protection is disabled. This attribute may be used for application items or for page items with any of these Display As types:
 - Display Only (Save State=No)
 - Display Only (Save State=No)
 - Stop and Start Grid Layout (Displays label only)
 - **Checksum Required: Application Level** - The item's session state may be set by passing the item name/value in a URL if a checksum specific to the schema is provided. A user-level checksum or a session-level checksum will also suffice (see next bullets). Use this option when you want to allow the item to be set only by URLs having checksums that were generated by any user running the same application in the current workspace but in a different session.
 - **Checksum Required: User Level** - The item's session state may be set by passing the item name/value in a URL if a checksum specific to the workspace, application, and user is provided. A session-level checksum will also suffice (see next bullet). Use this option when you want to allow the item to be set only by URLs having checksums that were generated by the same named user, running the same application in the current workspace but in a different session.
 - **Checksum Required: Session Level** - The item's session state may be set by passing the item name/value in a URL if a checksum specific to the current session is provided. Use this option when you want to allow this item to be set only by URLs having checksums that were generated in the current session.
6. Security, Escape Special Characters - Controls whether the application item's value is automatically escaped in substitutions (for example, when referencing the item using `&ITEM.` syntax).

To prevent Cross-Site Scripting (XSS) attacks, set Escape Special Characters to **On**. If you need to render HTML tags stored in the application item, you can set this flag to **Off**.
 7. Configuration, Build Option - Select a build option for this component. Build options are predefined settings that determine whether components within an application are enabled.
 8. Comments - Enter any notes regarding this item.
 9. Click **Create Application Item**.



See Also:

"About Creating an Application-Level Item that Functions as a Global Variable"

16.11.2 Viewing Application Item Usage

You can view a list of where application items are used by clicking the **Utilization** tab at the top of the Application Items page.

To view the Utilization report:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Application Logic, select **Application Items**.
The Application Items page appears.
3. Click the **Utilization** tab at the top of the page.

16.11.3 Editing Application-Level Item Attributes

Once you create an application-level item, you can edit it on the Create/Edit Application Item page.

To edit application-level item attributes:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Application Logic, select **Application Items**.
The Application Items page appears.
3. Select an application item.
The Create/Edit page appears.
4. Edit the attributes.
To learn more about an attribute, see field-level Help
5. Click **Apply Changes**.

 **See Also:**

- ["Viewing Help"](#)
- ["Understanding Cross-Site Scripting Protection"](#)

16.11.4 About Creating an Application-Level Item that Functions as a Global Variable

You can create a global variable by creating an application-level item with the same name across all applications and setting the scope to Global.

Large applications are often separated into several physical applications that reside in the same workspace. These applications often share session state by configuring the same cookie name in each application.

Another requirement of this type of architecture is the need to share a few global variables. While the number global variables should be kept small, global variables function as an effective means to facilitate communicate between the applications. For example:

- Properties of the current user (such as email address, employee number, and so on).
- Current company in a multitenant application.

To create an application-level item that functions as a global variable:

1. Create an application-level item with the same name in each application to share session state.
2. For Scope, select **Global**.
3. For Security, Session State Protection, select **Restricted**.

 **See Also:**

- ["Creating an Application-Level Item"](#)

16.12 Creating Lists

Add a shared collection of links (or a list) to a database application. To add a list to a page, create a region and specify the region type as List. You control the appearance of a list through list templates.

- [About Static and Dynamic Lists](#)
Oracle Application Express supports two types of lists: Static Lists and Dynamic Lists.
- [Creating Static Lists](#)
A Static List is based on predefined display and return values.
- [Creating Dynamic Lists](#)
A Dynamic List is based on a SQL query or a PL/SQL function executed at runtime.

- [Copying a List](#)
Copy a list from another application, or copy a list from the existing application.
- [Adding a List to a Page](#)
Once you create a list and list entries, the next step is to add it to a page by creating a list region.
- [Editing List Attributes](#)
Edit a list from Shared Components.
- [Accessing List Reports](#)
View the Unused, Conditional Entries, Utilization, and History reports by clicking the appropriate tab at the top of the Lists page.
- [Managing Navigation Menus](#)
Applications using newer themes, such as *Universal Theme - 42*, provide navigation with navigation menus.
- [Managing Navigation Bar Lists](#)
Applications using newer themes, such as *Universal Theme - 42*, include navigation bar lists.

 **See Also:**

- ["Creating a New Template"](#)
- ["List Templates"](#)

16.12.1 About Static and Dynamic Lists

Oracle Application Express supports two types of lists: Static Lists and Dynamic Lists.

A **Static List** is based on predefined display and return values. When you create a static list you define a list entry label and a target (either a page or URL). You can add list entries when you create the list (creating from scratch), by copying existing entries, or by adding the list entries. You can control when list entries display by defining display conditions.

A **Dynamic list** is based on a SQL query or a PL/SQL function executed at runtime. A dynamic list enables you to dynamically create styled list items that support mobile frameworks.

The list definition displays a specific type of page item, such as progress bars, sidebar, bullet navigation list, or navigation menu. You can control how a list displays through templates.

 **See Also:**

- ["Understanding Dynamic List Syntax"](#)

16.12.2 Creating Static Lists

A Static List is based on predefined display and return values.

- [About the Process of Creating a Static List](#)
- [Creating a Static List from Scratch](#)
- [About Adding Entries and Sublists to a Static List](#)
- [Adding Entries or Sublists from Scratch](#)
- [Copying Static List Entries Between Lists](#)
- [Reparenting Static List Entries](#)
- [Managing Orphaned Static List Entries](#)
- [Resequencing Static List Entries](#)

16.12.2.1 About the Process of Creating a Static List

The process of creating a static list involves the following steps:

- **Step 1:** Create the list by running the Create List Wizard.
- **Step 2:** Specify whether to create the list from scratch or by copying an existing list.
You can add list entries by either creating them from scratch or by copying entries from an existing list. If you copy an entire list, you also copy all of its list entries.
- **Step 3:** If creating a list from scratch, you are prompted to select a list type. Select **Static**.
Each list element has a display condition, which enables you to control when it displays. You can define a list element to be either *current* or *non-current* for a specific page.
- **Step 4:** Add the list to a page by creating a List region.

How you perform these steps is a personal preference. You can perform the first three steps when you run the Create List Wizard. Alternatively, you can perform these steps one at a time.

See Also:

- ["Adding a List to a Page"](#)
- ["Editing List Attributes"](#)
- ["Accessing List Reports"](#)

16.12.2.2 Creating a Static List from Scratch

To create a list from scratch:

1. Access the Create/Edit Lists Wizard:
 - a. On the Workspace home page, click the **App Builder** icon.

- b. Select an application.
 - c. On the Application home page, click **Shared Components**.
 - d. Under Navigation, click **Lists**.
 - e. Click **Create**.
 2. For Source, select **From Scratch** and click **Next**.
 3. For Name and Type:
 - a. Name - Enter a numeric or alphanumeric name for the list.
 - b. Type - Select **Static**.
 - c. Build Option - If applicable, select a build option for this component. Build options are predefined settings that determine whether components within an application are enabled.
 - d. Click **Next**.
 4. For Define List Entries, specify the following:
 - a. List Entry Label - Enter a numeric or alphanumeric name for the list.
 - b. Target Page ID or custom URL - Select a target page or enter a custom URL.
 - c. Click **Next**.
 5. For Confirm, specify the following:
 - a. Create List Regions - Select whether to create a list region. Options include:
 - **Do not create list region(s)**
 - **Create list region on current page**
 - **Create list region for each target page**
 - b. Region Position - If creating a new region, select the region position.
 - c. Region Template - If creating a new region, select a region template.
 - d. List Template - Select the list template to use to control the appearance of your list.
 - e. Click **Create List**.

16.12.2.3 About Adding Entries and Sublists to a Static List

Once you create a list, you must add entries to it. You can add list entries when creating a list from scratch, copying a list entry from within a list, or copying existing entries from one list to another.

You can also create hierarchical lists that contain sublists. To create a hierarchical list, you must:

- Select a list template that supports hierarchical lists. To determine which list templates support hierarchical lists, look for templates having the naming convention "with Sublist."
- Select a Parent List Item when you create each list entry.

 **See Also:**

- "Creating Custom Themes"
- "List Templates"

16.12.2.4 Adding Entries or Sublists from Scratch

To add an entry or sublist from scratch:

1. Navigate to the Lists page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
 - d. Under Navigation, select **Lists**.The Lists page appears.
2. Select a list.
The List Details page appears.
3. Click **Create Entry**.
4. Under Entry:
 - a. Parent List Entry - If applicable, select the parent for this list entry. Use this attribute if you are creating a hierarchical list that contains a sublist.
Note this attribute does not appear if you are creating the parent list entry.
 - b. Sequence - Indicate the order in which list the list entry appears. The sequence determines the order of evaluation.
 - c. Image/Class - Identify the image filename or Font Awesome css class to be used to display this list entry. Control over this attribute is provided by list templates.
 - d. Attributes - Identify the image attributes (such as `width="12" height="12"`) for the list element image.
Use the `#LIST_LABEL#` substitution string to reference the list label text. This substitution string enables the title image attribute to be automatically set based on the value of the list label text. For example:

```
title="#LIST_LABEL#"
```
 - e. Alt Attribute - Identify the image alt attribute for the list element image.
Use the `#LIST_LABEL#` substitution string to reference the list label text. This substitution string enables the Alt attribute to be automatically set based on the value of the list label text. For example:

```
...alt="#LIST_LABEL#"...
```
 - f. List Entry Label - Enter the label text for this link.
5. Specify a target type. Options include: **URL** or **Page in this Application**.
If the target location is a **URL**, specify the following:

- a. Target Type - Select **URL**.
- b. URL Target - Enter a URL. For example:
`http://www.example.com`

If the target location is a page:

- a. Target Type - Select **Page in this Application**.
- b. Page - Specify the target page number.

Other options include:

- **reset pagination for this page** - Select this option to have the page to return to the first set of data meeting a user's new query.
 - **Printer Friendly** - This option displays the target page using the application's Printer Friendly template. Printer friendly templates optimize a page for printing.
- c. Request - Enter text to set the built-in application item `REQUEST`. This is also the item that is set with the name of a button that was clicked.
 - d. Clear Cache - Enter the page numbers, separated by commas, for which you would like the user's session state to be cleared. To learn more, see field-level Help.
 - e. To set session state (that is, give a listed item a value):
 - Set these items - Enter a comma-delimited list of item names for which you would like to set session state.
 - With these values - Enter a comma-delimited list of values for the items specified in the previous step.

You can specify static values or substitution syntax (for example, `&APP_ITEM_NAME.`). Note that item values passed to `f?p=` in the URL cannot contain a colon. Additionally, item values cannot contain commas unless you enclose the entire value in backslashes (for example, `\1234,56\`).

6. Under Current List Entry:
 - a. List Entry Current for Pages Type - Specify when this list entry should be current based on the page type.

List items can be current or non-current. Current list items use the current template; non-current list items use the non-current list item template. The actual condition and templates are defined in subsequent attributes.
 - b. List Entry Current for Condition - Displays conditionally. Based on the selection above, define a condition to evaluate. When this condition is true, then the list item becomes current. To learn more, see field-level Help.
7. Under Conditions, specify the appropriate information to make the list entry conditional.
8. Under Authorization, you can specify an authorization scheme.

This authorization scheme must evaluate to TRUE in order for this component to be rendered or otherwise processed.
9. Under Configuration, select a build option for this component.

Build options are predefined settings that determine whether components within an application are enabled.

10. Under Click Counting, specify if you want the list entries to be included in the click count.
If this is a link to an external page, you can count clicks.
11. In User Defined Attributes, specify additional attributes. For example, the following adds a tabindex and accesskey.

```
tabindex="15" accesskey="D"
```
12. When you are finished defining list attributes, click **Create** or **Create and Create Another**.



See Also:

- ["Editing Themes"](#)
- ["Optimizing a Page for Printing"](#)
- ["COUNT_CLICK Procedure" in Oracle Application Express API Reference](#)

16.12.2.5 Copying Static List Entries Between Lists

You can copy static list entries from one list to another.

To copy list entries between lists:

1. Navigate to the Lists page.
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Lists**.
The Lists page appears.
2. Select the list to copy.
3. On the Tasks list, click **Copy List Entries from one List to Another**.
4. From Copy List Entries, select the list to copy to and click **Next**.
5. Click **Copy List Entries**.

16.12.2.6 Reparenting Static List Entries

Use the Reparent List Entries page to manage list entry hierarchy.

To reparent list entries:

1. Navigate to the Lists page.
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.

- d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Lists**.
 - The Lists page appears.
 2. Select the list.
 3. From the Tasks list, click **Reparent List Entries within this List**.
 4. Use Start With to restrict your view to a subset of hierarchy. Make a selection and click **Go**.
 5. From Reparent To, select a new parent.
 6. Select the entries to move.
 7. Click **Reparent Checked Entries**.

16.12.2.7 Managing Orphaned Static List Entries

An orphaned list entry is a list entry which has a parent, but the parent is no longer a member of the current list. When a list entry becomes orphaned, remove the parent entry.

To manage orphaned list entries:

1. Navigate to the Lists page.
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Lists**.

The Lists page appears.
2. Select the list.
3. From the Tasks list, click **Manage Orphaned List Entries**.
4. Select the entries to remove.
5. Click **Clear Parent Entries**.

16.12.2.8 Resequencing Static List Entries

You can resequence list entries in increments of 10 on the Clean Up page.

To clean up list entries:

1. Navigate to the Lists page.
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Lists**.

The Lists page appears.

2. Select the list.
3. From the Tasks list, click **Clean Up List Entries**.
4. Click **Clean Up**.

16.12.3 Creating Dynamic Lists

A Dynamic List is based on a SQL query or a PL/SQL function executed at runtime.

- [About the Process of Creating a Dynamic List](#)
- [Understanding Dynamic List Syntax](#)
- [Creating a Dynamic List from Scratch](#)

16.12.3.1 About the Process of Creating a Dynamic List

A dynamic list enables you to create a List component based on items from a SQL query or a PL/SQL function returning a SQL query. These dynamic lists can then be rendered on a page using any List Template from your theme.

The process of creating a dynamic list involves the following steps:

- **Step 1:** Create the list by running the Create List Wizard.
- **Step 2:** Specify whether to create the list from scratch or by copying an existing list.
- **Step 3:** If creating a list from scratch, you are prompted to select a list type. Select **Dynamic**.
- **Step 4:** Enter a SQL query or a PL/SQL function returning a SQL query.
- **Step 5:** Add the list to a page by creating a List region.



See Also:

- ["Adding a List to a Page"](#)
- ["Editing List Attributes"](#)
- ["Accessing List Reports"](#)

16.12.3.2 Understanding Dynamic List Syntax

You create a dynamic list using a SQL query or a function returning a SQL Query.

Syntax for a SQL query:

```
SELECT level, labelValue label,
       [targetValue]          target,
       [is_current]          is_current_list_entry,
       [imageValue]          image,
       [imageAttributeValue] image_attribute,
       [imageAltValue]       image_alt_attribute,
       [attribute1]          attribute1,
       [attribute2]          attribute2,
       [attribute3]          attribute3,
```

```

        [attribute4]          attribute4,
        [attribute5]          attribute5,
        [attribute6]          attribute6,
        [attribute7]          attribute7,
        [attribute8]          attribute8,
        [attribute9]          attribute9,
        [attribute10]         attribute10
FROM ...
WHERE ...
ORDER BY ...

```

Syntax for a function returning a SQL query:

```

RETURN
'SELECT level, labelValue label,'||
'    [targetValue]          target,'||
'    [is_current]          is_current_list_entry,'||
'    [imageValue]          image,'||
'    [imageAttributeValue] image_attribute, '||
'    [imageAltValue]       image_alt_attribute,'||
'    [attribute1]          attribute1,'||
'    [attribute2]          attribute2,'||
'    [attribute3]          attribute3,'||
'    [attribute4]          attribute4,'||
'    [attribute5]          attribute5,'||
'    [attribute6]          attribute6,'||
'    [attribute7]          attribute7,'||
'    [attribute8]          attribute8,'||
'    [attribute9]          attribute9,'||
'    [attribute10]         attribute10' ||
'FROM ...' ||
'WHERE ...' ||
'ORDER BY ...';

```

Where:

- *level* and *labelvalue* are required.
- *level* - For hierarchical lists, the *level* parameter should be supplied. For non-hierarchical lists, this parameter can be set to `NULL`.
- *labelvalue* - Text to appear as list entry.
- *targetvalue* - Target URL to branch to when list entry is selected.
- *is_current* - Controls the behavior of the list entry. Values include:
 - `NULL` - Currency of target is based upon Target URL.
 - `'YES'` - List entry is always current.
 - `'NO'` - List entry is not current.
- *imagevalue* - The name of image to be display on the list entry
- *imageattributevalue* - Attributes of the image, such as the width or height
- *imagealtvalue* - Value for Image `ALT` tag, required for accessibility purposes in templates where the user must click the image.
- *attribute1* to *10*: These attributes tie in with the existing ten User Attributes exposed on the Static List Entry page.

16.12.3.3 Creating a Dynamic List from Scratch

To create a dynamic list:

1. Access the Create/Edit Lists Wizard:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
 - d. Under Navigation, click **Lists**.
 - e. Click **Create**.
2. Click **From Scratch** and click **Next**.
3. For Name and Type:
 - a. Name - Enter a numeric or alphanumeric name for the list.
 - b. Type - Select **Dynamic**.
 - c. Build Option - If applicable, select a build option for this component. Build options are predefined settings that determine whether components within an application are enabled.
 - d. Click **Next**.
4. For Query or Static Values:
 - a. Query Source Type - Select **SQL Query** or **Function Returning SQL Query**.
 - b. Query - Enter a SQL query or function returning a SQL query. To view SQL Query examples, expand the Examples region.

Build Query - Click **Build Query** to use a wizard to build a query on the table or view you select. Follow the on-screen instructions.
 - c. Click **Next**.
5. For Create List, specify whether to create a list region:
 - a. If you select Create list region on current page, the following attribute display:
 - Region Position - If creating a new region, select the region position.
 - Region Template - If creating a new region, select a region template.
 - List Template - If creating a new region, select a list template.
 - b. Region Position - If creating a new region, select the region position.
 - c. Region Template - If creating a new region, select a region template.
 - d. Click **Create**.



See Also:

["Understanding Dynamic List Syntax"](#)

16.12.4 Copying a List

Copy a list from another application, or copy a list from the existing application.

- [Copying a List from the Current Application](#)
- [Copying a List Between Applications](#)

16.12.4.1 Copying a List from the Current Application

You can copy list entries from one list to another.

To copy list entries between lists:

1. Navigate to the Lists page.
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Lists**.
The Lists page appears.
2. Select the list to copy.
3. On the Tasks list, click **Copy List**.
4. On Copy List, select **List in this application** and click **Next**.
5. For Identify List:
 - a. Copy List - Select the list to be copied.
 - b. New List Name - Enter a new name for the copied list.
 - c. Click **Copy**.

16.12.4.2 Copying a List Between Applications

You can copy a list from the current application or from another application.

To copy a list:

1. Navigate to the Lists page.
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Shared Components**.
 - e. Under Navigation, click **Lists**.
The Lists page appears.
2. Select the list to copy.
3. On the Tasks list, click **Copy List**.

4. On Copy List, select **List in another application** and click **Next**.
5. For Identify List:
 - a. Copy From Application - Select the application from which you want to copy a list.
 - b. Copy List - Select the list you are copying.
 - c. New List Name - Enter a name for the new list.
 - d. Click **Copy**.

16.12.5 Adding a List to a Page

Once you create a list and list entries, the next step is to add it to a page by creating a list region.

To add a list to a page:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. Create a new list region:
 - a. In the Gallery at the bottom of the central pane, click **Regions** and locate **List**.
 - b. Right-click **List** and from the context menu, select **Add To** and then the location.

Tip:

In addition using the context menus, you can also use your mouse to drag and drop components to the appropriate location.

3. In the Property Editor, edit the appropriate attributes:

Tip:

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

4. Identification:
 - a. Identification, Title - Enter a region title. The region title only displays when it is defined in the region template.
 - b. Identification, Type - Select **List**.
5. Source, List - Select the source for this list.
6. Layout:
 - a. Layout, Sequence - Enter the display sequence for this item. The sequence and other layout settings determine where this item is displayed in relation to other items within the region.

- [About Editing Navigation Menu Lists](#)
Since a Navigation menu is a list, you create and edit in the same way as any other list.
- [Changing Where and How Navigation Menus Display](#)
Change how and where a navigation menu displays by editing Navigation Menu attributes on the User Interface page.
- [About Switching from Tabs to Navigation Menus](#)
You can switch from a theme using tabs to a theme using navigation menus if the existing application used one level of tabs was used.

16.12.8.1 About Navigation Menus

A **navigation menu** is list with hierarchical list entries.

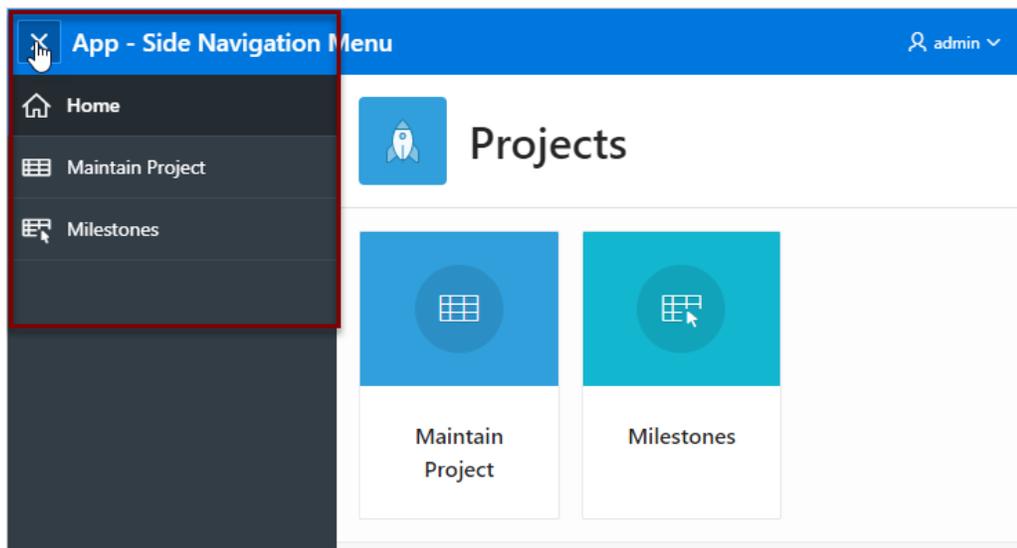
When you create an application, the Create Application Wizard automatically creates a navigation menu for you and populates it with list entries linking to the application pages you have created. Navigation menus are controlled at the theme and user interface level. You can change how and where a navigation menu displays by editing Navigation Menu attributes on the User Interface page.

Types of navigation menus include **Side Menu**, **Top Menu**, or **Mega Menu**. Navigation menus are controlled at the theme and user interface level. You can change how and where a navigation menu displays by editing Navigation Menu attributes on the User Interface page.

Side Navigation Menu

Users can expand or collapse the **Side Navigation Menu** by clicking on the menu icon from the header. This navigation menu renders the navigation items using a tree component that enables users to expand or collapse sub items. Based on the available space, Side Navigation Menu displays a full menu (as show below), or collapses to a narrow icon bar. You can also configure a navigation menu to be completely hidden (default) or to display a narrow icon bar when collapsed using Template Options.

The following example shows an application with a Side Navigation Menu.

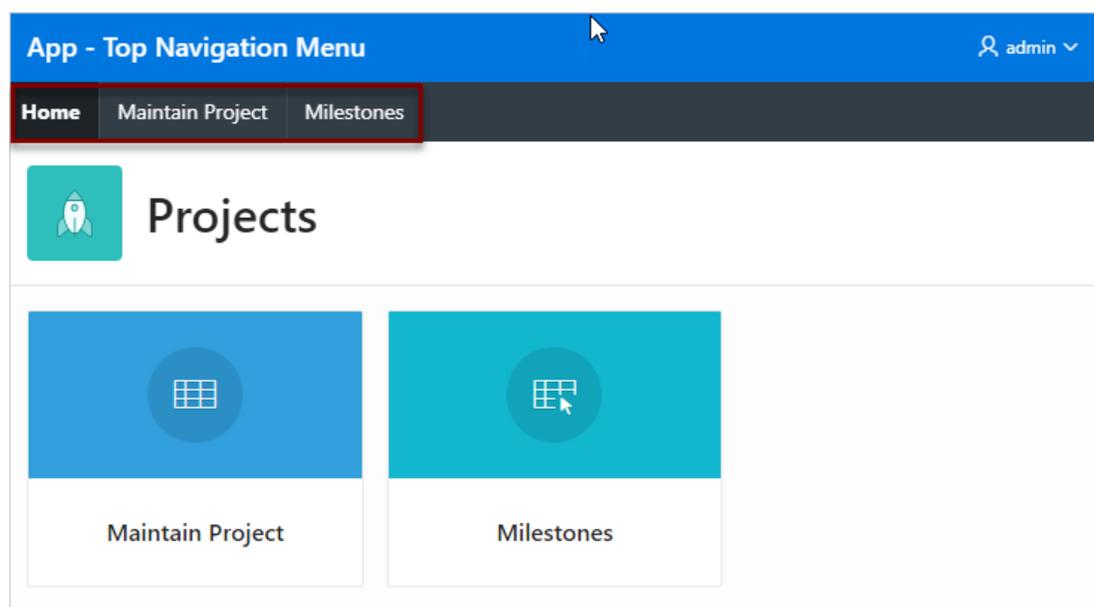


Top Navigation Menu

A **Top Navigation Menu** displays at the top of the application. You can control how the menu displays by choosing between two templates:

- **Top Navigation Tabs** - The **Top Navigation Tabs** template renders your application navigation as tabs and is ideally suited for simple applications where you have six or fewer tabs. This template automatically positions to the bottom of the screen for small screen or mobile devices.
- **Top Navigation Menu** - The **Top Navigation Menu** template renders your application navigation as a menu bar, similar to what you find on most desktop applications. Developers commonly use this option for more complex applications with several layers of hierarchy within the navigation.

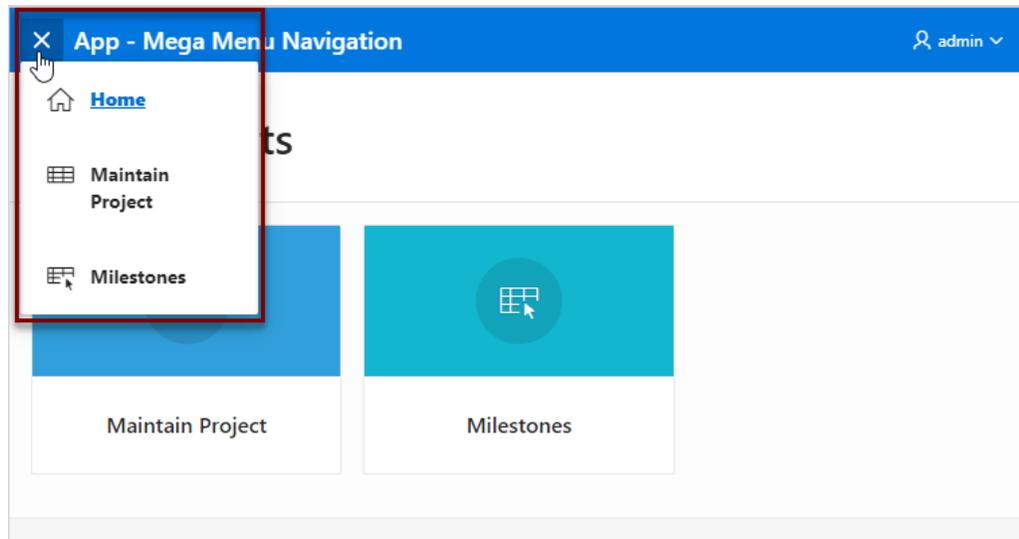
The following example shows an application with a Top Navigation Menu that uses the Top Navigation Menu template.



Mega Menu Navigation

The **Top Navigation Mega Menu** template renders your application navigation in a pop-up panel that can be opened or closed from the header menu button. Users can expand or collapse a Mega Menu by clicking on the menu icon from the header. Mega menus are especially useful when you want to display all navigation items at once to your user.

The following example shows an application with a Mega Menu using the Top Navigation Mega Menu template.



16.12.8.2 About Editing Navigation Menu Lists

Since a Navigation menu is a list, you create and edit in the same way as any other list.

You can access Navigation menus in Shared Components in the Navigation region in two ways:

- Select the application and then click **Shared Components**. Under the Navigation region, select **Navigation Menu**.
- Select the application and then click **Shared Components**. Under the Navigation region, select **Lists**.

Once you select the Navigation Menu, you edit it as you would any other list.

 **See Also:**
["Creating Lists"](#)

16.12.8.3 Changing Where and How Navigation Menus Display

Change how and where a navigation menu displays by editing Navigation Menu attributes on the User Interface page.

Navigation menus are controlled at the theme and user interface level.

 **Tip:**

You can access the User Interface page from the Application Definition as described in the following procedure, or by navigating to **Shared Components, User Interface** and selecting **User Interface Attributes**.

1. To edit the Navigation menu attributes:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select the application.

The Application home page appears.
 3. Click the **Edit Application Properties** button.

The Edit Application Definition page appears.
 4. Click the **User Interface** tab.
 5. Edit the attributes under **Navigation Menu**:
 - **Display Navigation** - Turn navigation on or off by selecting **On** or **Off**.
 - **Navigation Menu List** - Select the list utilized for the navigation menu for the application.
 - **Position** - Select the position where you would like your navigation menu to be placed in this application.
 - **Side** - Setting the position to **Side** renders the navigation menu list template in the #SIDE_GLOBAL_NAVIGATION_LIST# position on your page template.
 - **Top** - Setting the position to **Top** renders the navigation menu list template in the #TOP_GLOBAL_NAVIGATION_LIST# position on your page template.

For example, if you choose **Side**, your navigation could be rendered as a tree on the left side of your pages. In contrast, choosing **Top** can render your navigation as a menu bar in the header of your pages.
 - **List Template** - Select the List Template used to render the navigation menu for the application.
 - **Template Options** - Set Template Options for the List Template used for the navigation menu list for the application.
 6. Click **Apply Changes** to save your changes.
 7. Run the application to view your changes.



See Also:

- ["Editing User Interface Attributes"](#)
- ["List Templates"](#)
- ["Understanding Template Options"](#)

16.12.8.4 About Switching from Tabs to Navigation Menus

You can switch from a theme using tabs to a theme using navigation menus if the existing application used one level of tabs was used.

If an existing applications uses two levels of tabs, you must convert it to one level before changing the theme.

 **See Also:**
"Editing Themes"

16.12.9 Managing Navigation Bar Lists

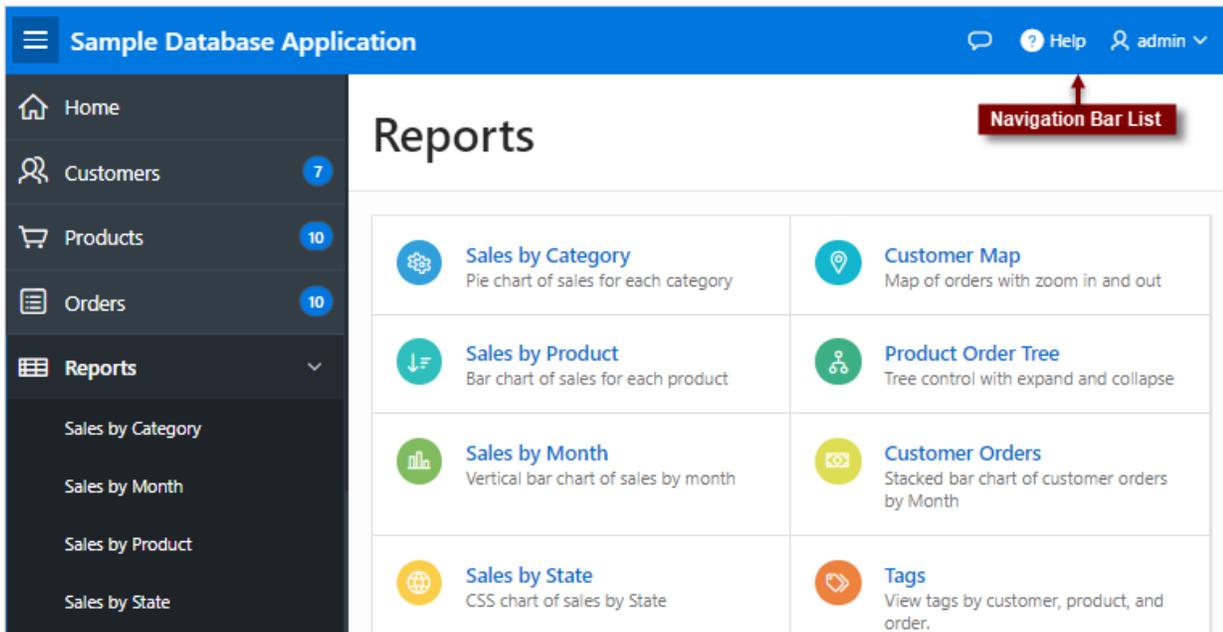
Applications using newer themes, such as *Universal Theme - 42*, include navigation bar lists.

- [About Navigation Bars](#)
A navigation bar list displays with a list template in the #NAVIGATION_BAR# position on your page template.
- [Editing Navigation Bar Lists](#)
Since a navigation bar is a list, you create and edit in the same way as any other list.
- [Editing Navigation Bar Attributes](#)
Change how navigation bar displays by editing Navigation Menu attributes on the User Interface page.

16.12.9.1 About Navigation Bars

A navigation bar list displays with a list template in the #NAVIGATION_BAR# position on your page template.

The example below shows the *Sample Database Application* with a navigation bar displaying in the upper right corner.



The screenshot displays the 'Sample Database Application' interface. The top navigation bar is blue and contains a home icon, the application name 'Sample Database Application', a chat icon, a 'Help' icon, and a user profile 'admin'. Below the navigation bar is a dark sidebar with a list of menu items: Home, Customers (7), Products (10), Orders (10), and Reports (expanded). The main content area is titled 'Reports' and contains a grid of report cards. A red callout box with an arrow points to the top right corner of the main content area, labeled 'Navigation Bar List'.

Report Name	Description
Sales by Category	Pie chart of sales for each category
Customer Map	Map of orders with zoom in and out
Sales by Product	Bar chart of sales for each product
Product Order Tree	Tree control with expand and collapse
Sales by Month	Vertical bar chart of sales by month
Customer Orders	Stacked bar chart of customer orders by Month
Sales by State	CSS chart of sales by State
Tags	View tags by customer, product, and order.

16.12.9.2 Editing Navigation Bar Lists

Since a navigation bar is a list, you create and edit in the same way as any other list.

You can access navigation bars in Shared Components in the Navigation region in two ways:

- Select the application and then click **Shared Components**.
- Under **Navigation**, select one of the following:
 - **Navigation Bar List**
 - **Lists**

Once you select the navigation bar list, you edit it as you would any other list.

 **See Also:**
["Creating Lists"](#)

16.12.9.3 Editing Navigation Bar Attributes

Change how navigation bar displays by editing Navigation Menu attributes on the User Interface page.

Selecting the Implementation **Classic** uses tabs instead of a list.

1. To edit the navigation bar attributes:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.

The Application home page appears.

3. Access the User Interfaces page:

- a. Click **Shared Components**.
- b. Under User Interface, click **User Interface Attributes**.

The User Interfaces page appears.

4. Under **Navigation Bar**, edit the following attributes:

- **Implementation** - Select how to you wish to implement the navigation bar in this application. Options include:
 - **List** renders the navigation bar as a list, using the selected list and list template in the #NAVIGATION_BAR# position on your page template.
 - **Classic** renders the navigation bar as a classic navigation bar in the #NAVIGATION_BAR# position on your page template.
- **Navigation Bar List** - Select the list utilized for the navigation bar on this application.
- **List Template** - Select the List Template used to render the navigation menu for the application.
- **Template Options** - Set Template Options for the List Template used for the navigation menu list for the application.

5. Click **Apply Changes** to save your changes.
6. Run the application again to view your changes.

**Note:**

"Editing User Interface Attributes"

16.13 Managing Report Output

Learn how to print a report region by defining a report query and how to use a report layout to format a report region.

- [Printing a Report Region by Defining a Report Query](#)
Print a report region by defining a report query.
- [Formatting a Report Region or Report Query Using Report Layouts](#)
Create a report layout to format a report region or report layout.

16.13.1 Printing a Report Region by Defining a Report Query

Print a report region by defining a report query.

- [About Report Queries](#)
- [Creating a Report Query](#)
- [Editing a Report Query](#)
- [Copying a Report Query](#)

16.13.1.1 About Report Queries

You can print a report region by defining a report query as a Shared Component. A report query identifies the data to be extracted. Unlike SQL statements contained in regions, report queries contain SQL statements that are validated when you save the query. Note that report queries must be SQL statements, not functions returning SQL statements.

You can associate a report query with a report layout and download it as a formatted document. If no report layout is selected, a generic layout is used. The generic layout is intended to be used to test and verify a report query. When using the generic layout option and multiple source queries are defined, only the first result set is included in the print document. The reports can include session state of the current application.

To make these reports available to end users, you then integrate them with an application. For example, you can associate a report query with a button, list item, branch, or other navigational component that enables you to use URLs as targets. Selecting that item then initiates the printing process.

16.13.1.2 Creating a Report Query

Note that the availability of the report query options depends on how your service administrator configures report printing for your instance. All options described in these steps may not be available to you.

To create a report query:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Reports, click **Report Queries**.
3. Click **Create**.
4. For Query, specify the following information:
 - a. Report Query Name - Enter a name to identify the report query. When referencing a report query as a link target, the report query name is part of the request string.
 - b. Output Format - Select the report output format. Valid options include:
 - PDF - Adobe Portable Document Format.
 - Word - Microsoft Word Rich Text Format.
 - Excel - Microsoft Excel format. Note that this is not a true `.xls` file because the content is HTML-based.
 - HTML
 - XML - Extensible Markup Language.
 - c. Item - Select the item to hold the format value. You can use this item to determine the output format at runtime.
 - d. View File As - Select how the web browser opens the report query document. Options include:
 - **Attachment** - Displays a File Open/Save dialog box when the user clicks the report query download button.
 - **Inline** - Displays the report query document inside the Browser window.
 - e. Session State - Select this check box to reference session state values, such as the values of page items in the XML structure of your report.
 - f. Click **Next**.
5. For SQL Query, enter a SQL statement directly or click **Query Builder** to build a SQL statement by clicking and pointing.

To reference applications and page items in the SQL statement, reference them as bind variables. Click **Set Bind Variables** to be able to enter in values for each bind variable and test the query to ensure the expected output is returned.
6. For Download Definition, specify the following:
 - a. Data Source for Report Layout - Use this option to download a report definition export file.

 **Tip:**

The report query definition is what a developer would use as the source for tools like BI Publisher Desktop or Altova Stylevision to create the report layout. Some tools accept both an XML export of the data as well as an XML schema definitions as source, other tools may only accept one or the other. If the source query does not return data at design time, then XML schema provides a way to export the definition without data.

Select **XML Data** or **XML Schema** and click **Download**.

XML Schema creates XSD file (that is, a XML schema definition of your XML structure.)

- b.** Add Query - Click this button to add another query to the report query. Adding another query enables the production of complex reports with more than one output component (for example, a chart and a report based on two different queries).
 - c.** Create Report Query - Click this button to exit the wizard early. The Report Layout Source defaults to use the generic report layout.
 - d.** Click **Next**.
- 7.** For Upload Report Layout, specify the following:
 - a.** Report Layout Source - Specify how the report layout is derived. If you choose the report based file layout then the layout name and report layout file must be provided.
 - b.** Layout Name - Enter a layout name (optional). The default is the report query name.
 - c.** Report Layout File - Click **Browse** and select a Rich Text Format (RTF).
 - d.** Click **Next**.
- 8.** For Confirm:
 - a.** Query Name - Identifies the query.
 - b.** Report Layout - Identifies the report layout you selected.
 - c.** Output Format - Identifies the format for this report query.
 - d.** Derive from Item - Identifies the item to hold the format information.
 - e.** URL - To integrate this report with your application, use the displayed URL as the target for a button, list item, link, or other navigational component. End users can click a button, for example, to start the printing process.
 - f.** Test Report - Click this to preview your report. If you have chosen to use a generic report layout then the Test Report does not produce an output.
 - g.** Click **Finish**.

The Report Query is created and saved to Shared Components.



See Also:

["About Report Printing "](#)

16.13.1.3 Editing a Report Query

To edit a report query:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Reports, click **Report Queries**.
3. Select the appropriate report query.
4. On the Edit page, edit the appropriate attributes.
5. Click **Apply Changes**.

16.13.1.4 Copying a Report Query

To copy a report query:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Reports, click **Report Queries**.
3. On the Report Queries page, click **Copy**.
4. On the Copy Report Query, select the query you want to copy, enter a name for the report query, and click **Copy**.
The copy appears in the query list.

16.13.2 Formatting a Report Region or Report Query Using Report Layouts

Create a report layout to format a report region or report layout.

- [About Report Layouts](#)
- [About Report Layout Options](#)
- [Creating a Report Layout](#)
- [Editing a Report Layout](#)
- [Copying a Report Layout](#)

16.13.2.1 About Report Layouts

To format either a classic report region or report query, you associate it with a report layout. Using report layouts renders the data in a printer-friendly format. If you do not select a report layout, a default XSL-FO layout is used. The default XSL-FO layout is always used for rendering Interactive Report regions.

When creating and using report layouts, you can:

- Take advantage of the default layouts for report regions and generic layouts for report queries provided with Oracle Application Express.
- Utilize the built-in XSL-FO-based layouts for report regions by copying and customizing the code. You can edit several attributes for report regions that control page size, fonts, colors, and so on.
- Create RTF or XSL-FO report layouts to customize the report look and feel. To use RTF report layouts, your Oracle Application Express service administrator must select the Advanced setting for your site.



Note:

Interactive reports do not support a custom report layout.



See Also:

"Configuring Report Printing" in *Oracle Application Express Administration Guide*

16.13.2.2 About Report Layout Options

You can create a report layout based on one of these options:

- **Generic Columns** - A generic report layout works with most query result sets. With this layout, the number of columns is automatically adjusted when generating the printable document.

Many report layout attributes can be defined declaratively for report regions using the built-in XSL-FO default layout. This step allows for creating customizable copies of the built-in default XSL-FO layout, if additional control over the report layout is needed.
- **Named Columns** - A named column report layout is a query-specific report layout designed to work with a defined list of columns in the query result set. This type of layout is used for custom-designed layouts when precise control of the positioning of page items and query columns is required.

Note that the availability of the Report Layout options depends on how your site administrator configured the report printing settings at your site. All options described in these steps may not be available to you.

**See Also:**

"Configuring Report Printing" in *Oracle Application Express Administration Guide*.

16.13.2.3 Creating a Report Layout

To create a report layout:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Reports, click **Report Layouts**.
3. Click **Create**.
The Create Report Layout wizard appears.
4. For Report Layout Type, select an option and click **Next**:
 - Generic Columns (XSL-FO) - Uses the default template to populate the report. In the next step, you can customize the default code.
 - Named Columns (XSL-FO) - Requires that you upload an XSL-FO or RTF file in the next step.
5. For Layout Source, review and edit the appropriate information. The options that appear on this page depend on the layout type you select:
 - If you selected **Generic Columns**:
 - a. Report Layout Name - Enter a name to identify the report layout when associating it with a report query or report region.
 - b. Report Layout - The report layout is the XSL-FO based definition of the page formatting. All attributes defining page size, orientation, fonts, styles, and so on, are defined in this section.
 - c. Report Column Heading - Defines the look of each cell in the report heading row.
 - d. Report Column - Defines the look of each cell for all report rows.
 - e. Report Column Width - This width is computed at runtime or can be derived from the report column definition of a report region.
 - If you selected Named Columns:
 - a. Layout Name - Enter a name to identify the report layout when associating it with a report query or report region.
 - b. Report Layout File - Upload the file containing the report layout.
6. Click **Create Layout**.

16.13.2.4 Editing a Report Layout

You can edit a generic column report layout directly in Application Express. However, to edit a named column report layout, you must download the current file, edit it, and then upload it again.

To edit a report layout:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Reports, click **Report Layouts**.
3. On the Report Layouts page, select the layout you want to edit.
4. For generic column layouts, edit the layout directly on the Edit Report Layout page and click **Apply Changes**.
5. For named column layouts, click **Download** and save the file to your computer.
Edit the file and then upload the updated version as a new report layout.

16.13.2.5 Copying a Report Layout

You can copy a report layout to edit and save.

To copy a report layout:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Reports, click **Report Layouts**.
3. On the Report Layouts page, click **Copy**.
4. On the Copy Report Layout page, select the layout you want to copy, enter a name for the copy, and click **Copy**.
The copy appears in the layout list.
5. On Copy Report Layout:
 - a. Copy Report Layout - Select the layout you want to copy.
 - b. Report Layout Name - Enter a name for the copy.
 - c. Click **Copy**.

Managing Application Data

Learn how to manage application data such as adding data loading capability to applications, using collections to temporarily store information, using REST Enabled SQL references to execute SQL or PL/SQL defined at the component-level on a remote database, use REST Data Sources to manage external web services, store REST Data Source server information as a Remote Server object, and store authentication credentials using Web Credentials, manage legacy Web services, access data with database links, and utilize DML to update or delete rows of a table.

- [Creating Applications with Data Loading Capability](#)
Create applications with data loading capability to enable end users to dynamically import data into a table within any schema to which they have access.
- [About Using Collections](#)
Use collections to temporarily capture one or more nonscalar values. Collections enable you to store rows and columns currently in session state so they can be accessed, manipulated, or processed during a user's specific session.
- [Managing REST Enabled SQL References](#)
Execute SQL queries or PL/SQL defined at the component-level on a remote database using REST Enabled SQL references.
- [Managing REST Data Sources](#)
REST Data Sources enable developers to access REST services or generic JSON data feeds in applications.
- [Managing Remote Servers](#)
Store REST Data Source server information as a Remote Server object.
- [Managing Web Credentials](#)
Store authentication credentials for external REST services or REST Enabled SQL services.
- [Accessing Data with Database Links](#)
Access data remotely by creating a database link.

17.1 Creating Applications with Data Loading Capability

Create applications with data loading capability to enable end users to dynamically import data into a table within any schema to which they have access.

- [About Creating a Page with Data Loading Capability](#)
Add data loading capability to an application by creating a Data Load Definition and then a Data Load page.
- [Creating a Data Load Definition](#)
Create a Data Load Definition in Shared Components.
- [Creating a Data Loading Page Manually](#)
If a Data Load Definition exists, run the Create Page Wizard to add a Data Loading page.

- [Editing a Data Load Definition](#)
Edit a Data Load Definition in Shared Components.
- [Example: Log Errors to a DML Error Log](#)
Edit the Data Load Definition so that errors are logged into a DML error log.



See Also:

["Managing Applications with Legacy Data Loading Capability"](#)

17.1.1 About Creating a Page with Data Loading Capability

Add data loading capability to an application by creating a Data Load Definition and then a Data Load page.

A Data Load Definition is comprised of a Data Load Definition, Data Profile, and Data Profile Columns. Data can be loaded either to an existing table in your schema or to a collection. You can define SQL Expression, SQL Query, Lookups, or Transformation Rules for each data profile column. These definitions are used in the Native Data Loading page process type.

When you create a Data Load Definition, the wizard prompts you to add a Data Loading page in your application. However, if a Data Load definition exists, you can also add a Data Loading page later by running the Create Page Wizard. A Data Loading page consists of a single page with a Native Data Loading page process which enables users to upload data from a file or by copy and paste, preview the data, and then upload the data.

Key features of application new data loading include:

- New application data loading supports CSV, XLSX, XML, and JSON formats.
- Column mapping occurs at design time, removing the burden for end users.
- Flexible column mappings based on simple names or regular expressions.
- Data conversion with transformation rules or lookup queries.
- Easy work flow for end users: upload the file, verify the preview, and load data.
- CSV, XLSX, XML, and JSON data formats can be loaded to tables or collections.
- Configure data loading to Append, Merge or Replace data, with or without Error Handling.
- Simple new Process Type Data Loading: Customize Data Loading pages as you wish.
- APEX_DATA_LOADING PL/SQL API available for custom processing.
- Maximum number of columns to load is 300. Note that Legacy data load supports up to 45.

 **Note:**

A Data Load Wizard is not designed or intended to load hundreds of thousands of rows of data. While it is possible to use a Data Load Wizard to load this high volume of data, you may encounter performance issues with both transmitting and loading large data files. Tools like Oracle SQL Developer and Oracle SQL*Loader are better suited to loading large volumes of data.

Supported Data Types

New Data Load supported data types:

- VARCHAR2
- NUMBER
- DATE
- TIMESTAMP
- TIMESTAMP WITH LOCAL TIMEZONE
- TIMESTAMP WITH TIMEZONE
- CLOB

 **See Also:**

["Creating a Legacy Data Load Page"](#)

17.1.2 Creating a Data Load Definition

Create a Data Load Definition in Shared Components.

When you create a Data Load Definition, the wizard prompts you create Data Loading page. You can also create it later by running the Create Page Wizard later as described in ["Creating a Data Loading Page Manually."](#)

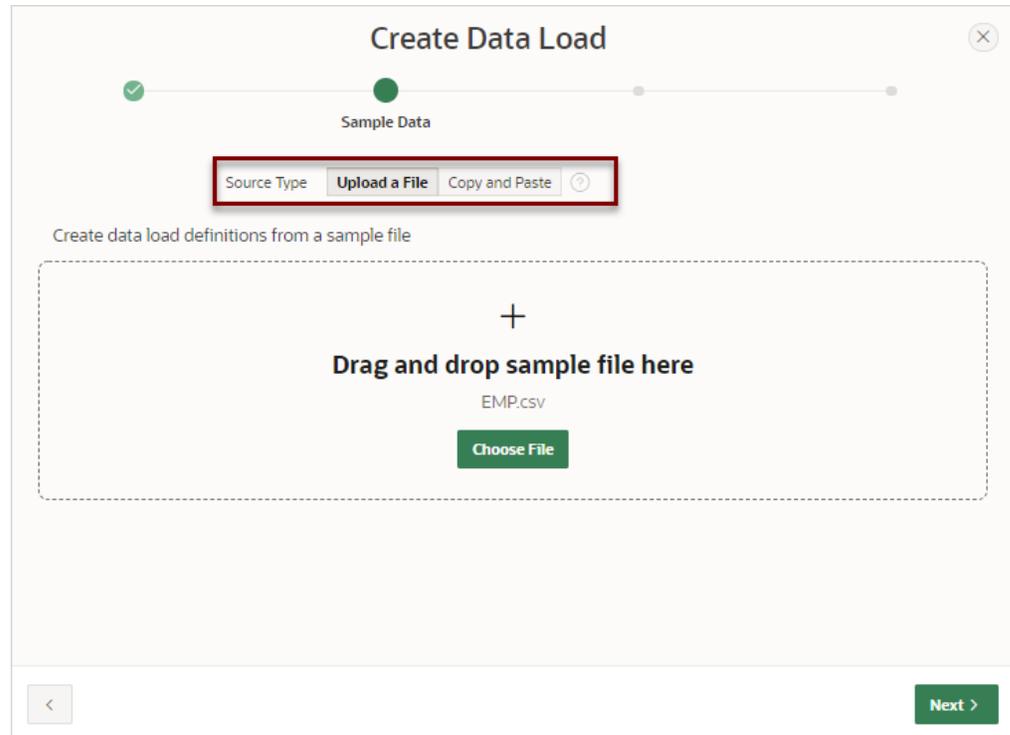
The Create Data Load definition wizard supports uploading of the following sample file formats: CSV, XLSX, XML or JSON. The uploaded file format is saved as data load definition data profile format. This format dictates the type of file end users can upload. For example, if you create a data load definition using a CSV sample file, only TXT or CSV file types can be uploaded from a page using the data load definition. Similarly, if you create a data load definition using a XLSX sample file, only XLSX file types can be uploaded from a page using the data load definition. The following task includes sample images in which the Data Load Definition is created on the EMP table using EMP .csv file.

 **Note:**

You can load this sample table by installing the EMP/ DEPT Sample Dataset. See ["Using Sample Datasets"](#) in *Oracle Application Express SQL Workshop Guide*

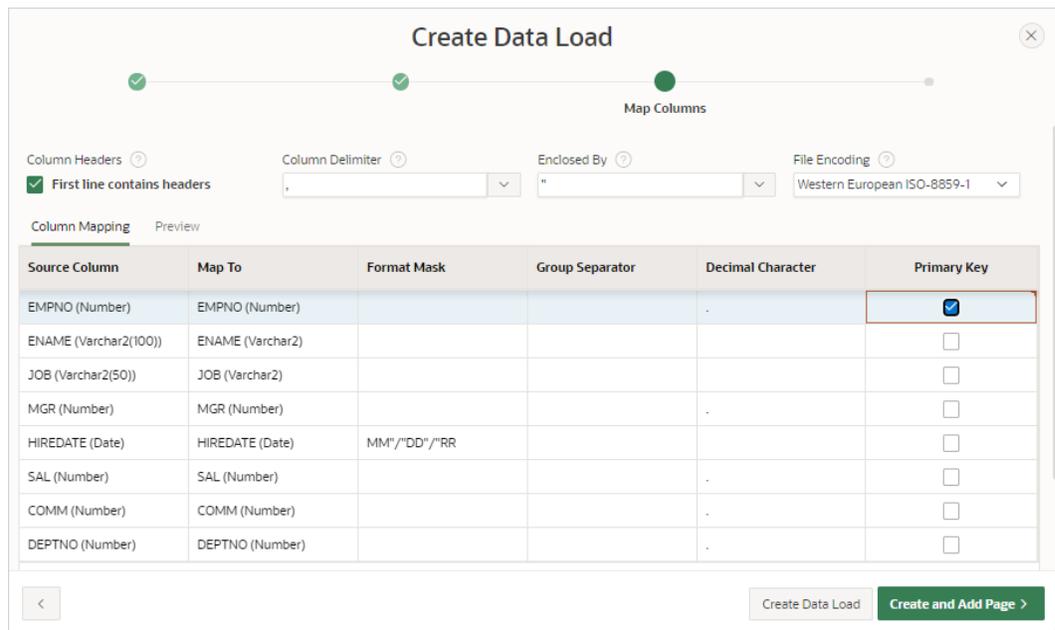
To create a Data Load Definition:

1. Create a new application.
2. Navigate to the Data Load Definitions page:
 - a. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 - b. Under Data References, click **Data Load Definitions**.
3. Click **Create**.
4. On Method:
 - a. Create Data Load - Select the method by which you would like to create the Data Load Definition. Options include: **From Scratch** and **As a copy of an existing Data Load Definition**.
This task assumes you select **From Scratch**.
 - b. Click **Next**.
5. On Target:
 - a. Name - Enter a name for the Data Load Definition.
 - b. Target Type - Specify whether the data will be uploaded to a table or an Application Express collection (for example, select **Table**).
 - c. Table Owner - Specify the owner of the table to load data. If nothing is selected, the application parsing schema is used.
 - d. Table Name - Select the table to which the data will be loaded (for example, select `EMP`).
If entering the table name manually, the table name is case sensitive.
 - e. Click **Next**.
6. On Sample Data:
 - a. Source Type - Select how the sample data will be uploaded from a file. The Source Type you select determines what appears next.
Options include:
 - If **Upload a File** - Drag and drop or click Choose File to navigate to the file. Supported formats include CSV, XLSX, XML or JSON.
 - If **Copy and Paste** - Copy and paste delimited text data.



Note that `EMP.csv` displays in the center of region indicating the `EMP.csv` sample file has been uploaded.

- b. Click **Next**.
7. On Map Columns - Column mapping is done automatically by matching the Sample Data columns with the table column. Accept the defaults.



In the previous example, note that **Primary Key** is selected for the `EMPNO` column.

Determine whether to create just the Data Load Definition or the Data Load Definition and the Data Load page. Click one of the following buttons:

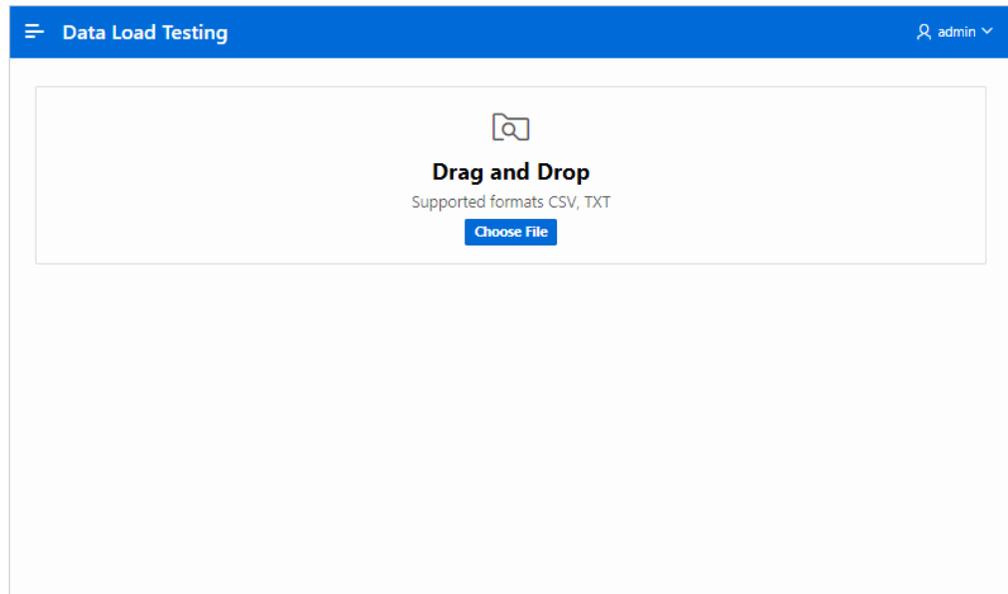
- **Create Data Load** - Creates just the Data Load Definition. If you select this option, you can create a Data Load page later by running the Create Page Wizard.
- **Create and Add Pages** - Creates the Data Load Definition and then prompts you to create the Data Load page.

This task assumes you select **Create and Add Pages**.

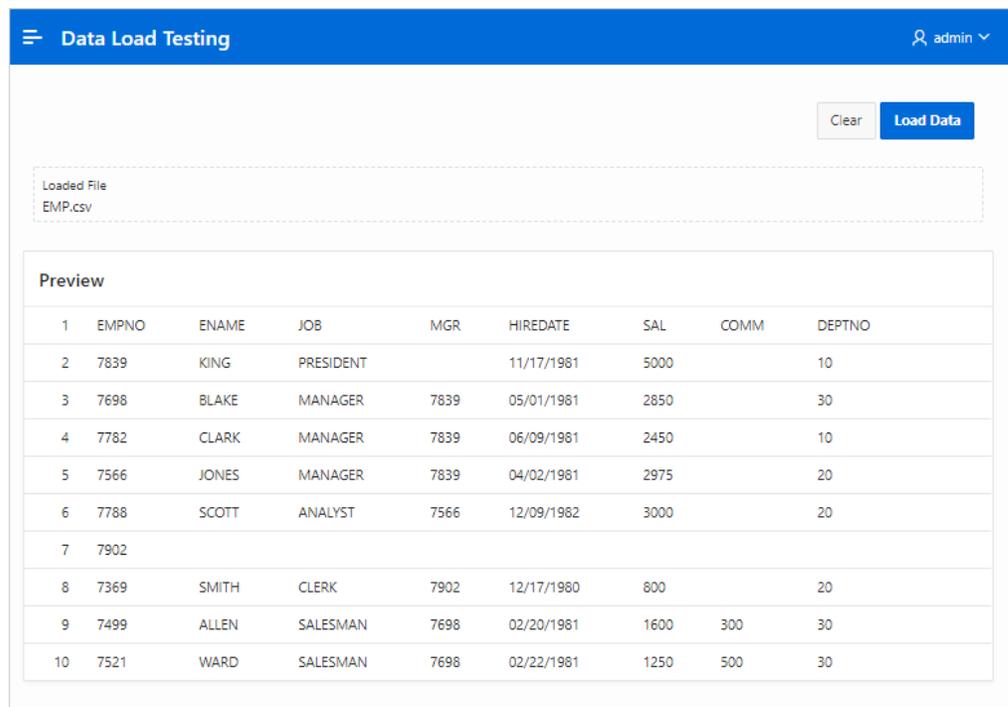
8. For Load Page:
 - a. Page Number - Displays the page number which is an integer value that identifies a page within an application.
 - b. Name - Specify a text name for this page. This name is visible only during the application development process.
 - c. Page Mode - Identify the page mode. To learn more, see field-level Help.
 - d. Page Group - Select the name of the page group you would like to associate with this page. Page groups help developers identify and manage the pages within an application.
 - e. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page and which breadcrumb navigation control you want to use.
 - f. Click **Next**.
9. On Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
10. On Data Source:
 - a. Data Load - Select the data load definition to use.
 - b. Upload Data From - Select if application users will provide data by uploading files or by using copy and paste of delimited text data.
 - c. Maximum File Size (MB) - Enter the maximum file size (in MB) that should be accepted for the file upload.
 - d. Click **Create**.

Page Designer appears displaying the new page.
11. Test the new page:
 - a. Click **Save and Run Page**.

The new Data Load page appears.



- b. Upload a sample file. Drag and Drop a file or click **Choose File**.
 A Preview page appears.



- c. Click **Load Data**. The sample data is loaded into the target table with Merge loading method.



See Also:

"Creating Database Applications"

17.1.3 Creating a Data Loading Page Manually

If a Data Load Definition exists, run the Create Page Wizard to add a Data Loading page.

When you create a Data Load Definition, the wizard prompts you create Data Loading page. You can also create it later by running the Create Page Wizard.

The Create Page Wizard creates a single page with a Native Data Loading page process to provide the ability to upload data from a file or copy and paste. The copy and paste option is available only if selected data load definition data profile format is CSV. The type of file users can upload depends on the data load definition data profile format.

To create a Data Loading page by running the Create Page Wizard:

1. Create a Data Load Definition as described in [Creating a Data Load Definition](#).
 2. Run the Create Page Wizard:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select the application.
 - c. Click **Create Page**.
 3. On Create a Page, select **Data Loading**.
 4. On Load Page:
 - a. Page Number - Displays the page number which is an integer value that identifies a page within an application.
 - b. Name - Specify a text name for this page. This name is visible only during the application development process.
 - c. Page Mode - Identify the page mode. To learn more, see field-level Help.
 - d. Page Group - Select the name of the page group you would like to associate with this page. Page groups help developers identify and manage the pages within an application.
 - e. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page and which breadcrumb navigation control you want to use.
 - f. Click **Next**.
 5. On Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
 6. On Data Source:
 - a. Data Load - Select the data load definition to use.
 - b. Upload Data From - Select if application users will provide data by uploading files or by using copy and paste of delimited text data.
 - c. Maximum File Size (MB) - Enter the maximum file size (in MB) that should be accepted for the file upload.
 - d. Click **Create**.
- Page Designer appears displaying the new page.

7. Test the new page:
 - a. Click **Save and Run Page**.
The new Data Load page appears.
 - b. Upload a sample file. Drag and Drop a file or click **Choose File**.
A Preview page appears.
 - c. Click **Load Data**. The sample data is loaded into the target table with Merge loading method.

17.1.4 Editing a Data Load Definition

Edit a Data Load Definition in Shared Components.

A Data Load Definition is comprised of a target data load table, loading method, error handling attributes, and data profile.

To edit a Data Load Definition:

1. Select the application associated with the Data Load Definition.
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select the application.
2. Navigate to the Data Load Definitions page:
 - a. Click the **App Builder** drop-down menu in the header region and select **Database Applications**.
 - b. Select the application associated with the Data Load Definition.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 - d. Under Data References, click **Data Load Definitions**.
3. Click the Data Load Definition you want to edit.
The Data Load Definition Details page appears.
4. For Data Load:
 - a. Name - Defines the name for the data load definition.
 - b. Static ID - Use the Static ID to reference the Data Load definition in API Calls.
5. For Target:
 - a. Target Type - Select whether data is to be loaded into a table or an Application Express collection.
 - b. Table Owner - Defines the owner of the table into which the data is loaded.
 - c. Table Name - Defines the name of the table into which the data is loaded.
6. For Settings:
 - a. Loading Method - Specifies the loading method to use. Options include:
 - **Append** - Append rows to the table or collection. If one or more primary key columns are defined in the Data Profile, existing rows are not changed and new rows are appended. If the data profile has no primary key definition, all rows will be simply appended.

- **Merge** - Merge rows into the table. To use this option, the data profile must have a Primary Key defined. If a row for the given primary key value exists, the row is updated. Otherwise the row will be created. This option is only available for loading data into tables.
 - **Replace** - Existing data in the target table or collection is removed before new data is loaded.
- b. **Commit Interval** - Specify the commit interval to use during data load. If no commit interval is specified, the whole data load is one transaction, with a commit after the last row. If an interval is specified, Application Express commits each time after the specified amount of rows have been processed.
7. **For Error Handling:**
- **When on Error** - Specify how to handle errors during data load. Options include:
 - **Ignore** - The error rows are silently ignored and Data Loading simply continues.
 - **Stop** - Data loading stops on the first error and raises an error message.
 - **Log into Collection** - Error rows are logged into an Application Express collection.
 - **Log into Error Log** - Error rows are logged into a DML error logging table using the DML Error Logging database functionality. This is only available when loading into a table and only if the Append method is used without a primary key.
8. **Data Profile** - Displays the Data Profile format and number of columns. Click **Edit Profile** to view and edit the Data Profile.
- Data Profiles describe how Data Source format are being parsed and converted to rows and columns. For XML or JSON data format, the Row Selector attribute stores an XML or JSON path expression pointing to the node containing the collection of rows. Data Profile Columns determine how one row is parsed and converted to multiple columns.
9. **Comments** - Add comments that describe this Data Load Definition. Comments only display within App Builder and never display when running the application.
10. Click **Apply Changes**.

17.1.5 Example: Log Errors to a DML Error Log

Edit the Data Load Definition so that errors are logged into a DML error log.

The following example demonstrates how to edit a Data Load Definition that loads data into the `EMP` table. If the data load fails, errors are logged into a DML error log named `ERR$_EMP`.

To edit the Data Load Definition and log errors are logged into a DML error log:

1. Create a DML error log:
1. Create a DML error log table in SQL commands:
 - a. On the Workspace home page, click **SQL Workshop** and then **SQL Commands**.

- b. In the Command Editor, enter the SQL command to create a DML error log named `ERR$_EMP`. For example:

```
begin
  dbms_errlog.create_error_log( dml_table_name => 'EMP' );
end;
```

- c. Click **Run** (Ctrl+Enter) to execute the command.

The results appear in the Results pane.

 **Tip:**

The table `ERR$_EMP` now appears in Object Browser.

2. Edit the Data Load Definition and change the Loading Method and define the Error Handling:
2. Navigate to the Data Load Definitions page:
 - a. Select the application associated with the Data Load Definition.
 - b. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 - c. Under Data References, click **Data Load Definitions**.
3. Click the Data Load Definition you want to edit.
Data Load Definition Details page appears.
4. Change the Loading Method and specify the Error Handling:
 - a. Settings, Loading Method - Click **Replace**.
 - b. Error Handling, When on Error - Select **Log into Error Log**.
 - c. Error Handling, Error Log Table - Select the DML error log table (for example, `ERR$_EMP (TABLE)`).
 - d. Click **Apply Changes**.
3. Create another Data Loading page:
5. Run the Create Page Wizard:
 - a. Click **Edit Page X** in the toolbar in the header region (where **X** represents the page number).
Page Designer appears.
 - b. Select the **Create** menu in the Page Designer toolbar and select **Page**.
The Create Page Wizard appears.
6. On Create a Page, select **Data Loading**.
7. On Create Data Load:
 - a. Page Number - Displays the page number is an integer value that identifies a page within an application.
 - b. Name - Specify a text name for this page. This name is visible only during the application development process.

- c. Page Mode - Identify the page mode. To learn more, see field-level Help.
 - d. Page Group - Select the name of the page group you would like to associate with this page. Page groups help developers identify and manage the pages within an application.
 - e. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page and which breadcrumb navigation control you want to use.
 - f. Click **Next**.
8. On Navigation Preference:
- a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
9. On Create Data Load:
- a. Data Load - Select the data load definition you edited previously.
 - b. Upload Data From - Select if users will provide data by uploading a file, or by using copy and paste of delimited text data. For this example, select **File**.
 - c. Maximum File Size (MB) - Enter the maximum file size (in MB) that should be accepted for the file upload.
 - d. Click **Create**.

Page Designer appears displaying the new page.

10. Test the new page:
- a. Click **Save and Run Page**.
The new Data Load page appears.
 - b. Upload a sample file that fails loading to see the error log report. For example, load string value for the `SAL` column where a `NUMBER` column type is expected. Drag and drop a file, or click **Choose File**.
A Preview page appears.
 - c. Click **Load Data**.

An error message appears and the errors display at the bottom of the page as shown in the following example.

Data Load Testing 2												
Data loading finished: 14 rows processed with 6 errors.												
Preview												
1	EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO				
2	7839	KING	PRESIDENT		11/17/81	5000		10				
3	7698	BLAKE	MANAGER	7839	5/1/81	xx		30				
4	7782	CLARK	MANAGER	7839	6/9/81	2450		10				
5	7566	JONES	MANAGER	7839	4/2/81	2975		20				
6	7788	SCOTT	ANALYST	7566	12/9/82	3000		20				
7	7902											
8	7369	SMITH	CLERK	7902	12/17/80	800		20				
9	7499	ALLEN	SALESMAN	7698	2/20/81	1600	300	30				
10	7521	WARD	SALESMAN	7698	2/22/81	1250	500	30				
Errors												
Ora Err Number\$	Ora Err Mesg\$	Ora Err Rowid\$	Ora Err Optyp\$	Ora Err Tag\$	Empno	Ename	Job	Mgr	Hiredate	Sal	Comm	Deptno
1722	ORA-01722: invalid number		I		7698	BLAKE	MANAGER	7839	5/1/1981	xx		30
1722	ORA-01722: invalid number		I		7698	BLAKE	MANAGER	7839	5/1/1981	xx		30
2291	ORA-02291: integrity constraint (EXAMPLE.EMP_MGR_FK) violated - parent key not found		I		7654	MARTIN	SALESMAN	7698	9/28/1981	1250	1400	30
2291	ORA-02291: integrity constraint (EXAMPLE.EMP_MGR_FK) violated - parent key not found		I		7844	TURNER	SALESMAN	7698	9/8/1981	1500	0	30

17.2 About Using Collections

Use collections to temporarily capture one or more nonscalar values. Collections enable you to store rows and columns currently in session state so they can be accessed, manipulated, or processed during a user's specific session.

Think of a collection as a bucket in which you temporarily store and name rows of information.

The following are examples of when you might use collections:

- When you are creating a data-entry wizard in which multiple rows of information first need to be collected within a logical transaction. You can use collections to temporarily store the contents of the multiple rows of information, before performing the final step in the wizard when both the physical and logical transactions are completed.
- When your application includes an update page on which a user updates multiple detail rows on one page. The user can make many updates, apply these updates to a collection and then call a final process to apply the changes to the database.
- When you are building a wizard where you are collecting an arbitrary number of attributes. At the end of the wizard, the user then performs a task that takes the information temporarily stored in the collection and applies it to the database.

You insert, update, and delete collection information using the PL/SQL API `APEX_COLLECTION`.

 **See Also:**

- "APEX_COLLECTION" in *Oracle Application Express API Reference*
- To view an example, install the sample app, *Sample Collections*. To learn more, see [Sample Apps](#).

17.3 Managing REST Enabled SQL References

Execute SQL queries or PL/SQL defined at the component-level on a remote database using REST Enabled SQL references.

- [About REST Enabled SQL Service References](#)
Create REST Enabled SQL Service references to execute SQL or PL/SQL defined on a remote Oracle database.
- [Before You Begin: REST Enabled SQL Service Requirements](#)
Prior to creating a REST enabled SQL reference, developers must complete these requirements.
- [Creating a REST Enabled SQL Service Reference](#)
Create REST Enabled SQL service references on the REST Enabled SQL page.
- [Example: Creating a REST Enabled SQL Service Reference](#)
Review an example of creating REST Enabled SQL service reference on a remote database.
- [Editing a REST Enabled SQL Service Reference](#)
Edit existing REST Enabled SQL references on the Edit page.
- [Deleting a REST Enabled SQL Service Reference](#)
Delete REST Enabled SQL references on the Edit page by clicking **Delete**.
- [Creating or Updating Components to Use a REST Enabled SQL](#)
Create or update reports (classic reports, interactive reports, interactive grids, List View report, Toggle Column reports, and Reflow Reports), forms, CSS calendars, JET charts, and Tree regions to point to data on a remote database using a REST Enabled SQL reference.

17.3.1 About REST Enabled SQL Service References

Create REST Enabled SQL Service references to execute SQL or PL/SQL defined on a remote Oracle database.

Oracle Application Express installations that meet the minimum Oracle REST Data Services (ORDS) requirements can execute any SQL through a REST endpoint.

Developers create REST Enabled SQL references by defining a name, the endpoint URL, and authentication information within Shared Components. Oracle Application Express passes the SQL or PL/SQL query to ORDS over REST, and a self-describing JSON response is returned. The JSON object contains result set meta data, the result data, and pagination details.

Because REST Enabled SQL services are stored at the workspace-level within Application Express components, they are available to all applications within a workspace. Developers can utilize REST Enabled SQL references for interactive

reports, interactive grids, classic reports, forms, master detail forms, calendars, JET charts, trees, and PL/SQL processes. References can also be used with Calendars, JET Charts, Trees, and PL/SQL processes.

REST Enabled SQL Service Reference Requirements

Requirements for using REST Enabled SQL Service references include:

- A remote database that includes Oracle REST Data Services (ORDS) 19.x or later on the front-end.
- An administrator must enable RESTful Services either at the workspace or instance-level as described in "Enabling RESTful Services and Defining a Path Prefix for a Workspace" and "Enabling RESTful Services for an Instance" in *Oracle Application Express Administration Guide*

How Do REST Enabled SQL Service References Differ from Database Links?

Both REST Enabled SQL Service references and database links enable developers to access data remotely. However, these features access remote data differently. Key differences between database links and REST Enabled SQL Service references include:

- Database Link:
 - Functions at the SQL-level which enables developers to use remote tables and local tables in the same SQL query.
 - Works over SQL*Net, which can be problematic when connecting to a Cloud instance over the internet.
- REST Enabled SQL Service References:
 - Functions at the workspace-level. Developers can create an Application Express component with a query on a REST enabled SQL Service but cannot join it to a local table.
 - Works with JSON over HTTP(s) which makes it easy-to-use it in Cloud environments or over the internet.

Both Database Links and REST Enabled SQL fetch data over the network which is significantly slower than fetching data from a table in the local database. When evaluating the best approach for your environment, be sure to evaluate the impact on page view performance and always consider replicating remote data in local tables, with an appropriate refresh algorithm.

Exporting and Importing REST Enabled SQL Services

When you export an application, used REST Enabled SQL references are added to the export file. If you export an application and import it into another workspace, Application Express checks whether the target workspace already contains REST Enabled SQL references with the same static ID. If a REST Enabled SQL reference already exists, the application uses the existing reference. If the reference does not exist, it is created in the target workspace.

17.3.2 Before You Begin: REST Enabled SQL Service Requirements

Prior to creating a REST enabled SQL reference, developers must complete these requirements.

Complete the following requirements before creating REST enabled SQL reference:

1. Set up a remote Oracle database.
2. On the remote Oracle database, install Oracle REST Data Services (ORDS) 19.x or later.

 **Tip:**

This ORDS installation is completely independent from the Oracle REST Data Services used as the Oracle Application Express web server

3. Configure and enable the REST Enabled SQL service feature. See “Configuring REST-Enabled SQL Service Settings” in *Oracle REST Data Services Installation, Configuration, and Development Guide*.
4. Activate REST Enabled SQL for the target schema on the remote database to be accessed by running `ORDS.ENABLE_SCHEMA`.

Log in to the database schema to be enabled for REST Enabled SQL using a "classic" client and execute the following:

```
begin
  ords.enable_schema;
end;
/

commit
/
```

The REST Enabled SQL service is then available with a URL in the following format:

`http://host:port/ords/schema`

Where:

- `host` is the name of the system where Oracle REST Data Services is installed.
- `port` is the port number assigned when configuring Oracle REST Data Services. In a default installation, this number is 8080.
- `ords` is the service name defined when configuring Oracle REST Data Services.
- `schema` is the target schema.

 **Tip:**

When providing the URL for the target schema in Oracle Application Express, do not append `/_/sql`.

You will use a URL using the above format when creating the REST Enabled SQL service reference in Oracle Application Express.

For example, the following is a REST Enabled SQL service for the `scott_obe` schema with ORDS running in standalone mode:

`http://server.example.com:8080/ords/scott_obe`

17.3.3 Creating a REST Enabled SQL Service Reference

Create REST Enabled SQL service references on the REST Enabled SQL page.

 **Tip:**

Before creating a REST enabled SQL reference, developers must complete the requirements described in "[Before You Begin: REST Enabled SQL Service Requirements](#)".

1. To create a REST Enabled SQL service reference:
 1. Navigate to the REST Enabled SQL page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an existing application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **REST Enabled SQL**.

 **Tip:**

You can also access the REST Enabled SQL page from Workspace Utilities. Select the application and then click **Workspace Utilities** and then **REST Enabled SQL Services**.

2. On the REST Enabled SQL page, click **Create**.
3. On General, specify:
 - a. Name - Enter a descriptive name for this REST Enabled SQL service.
 - b. Endpoint URL - Enter the base URL for this REST Enabled SQL service.

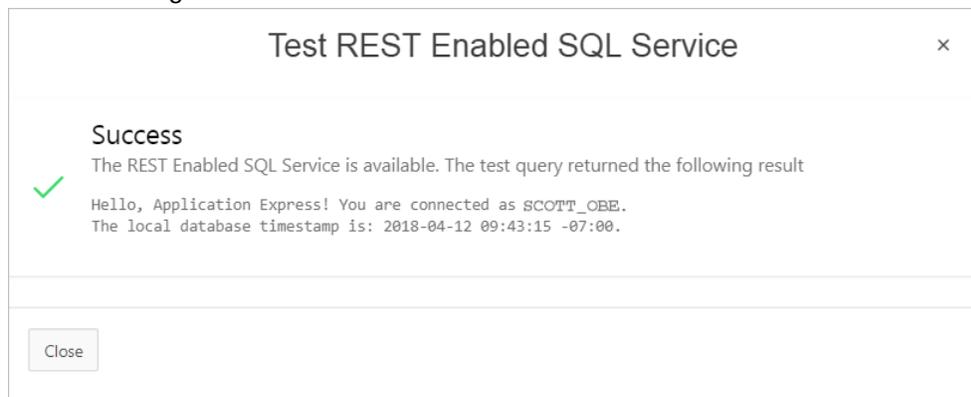
 **Tip:**

The URL must be in the format `http://host:port/ords/schema`. You obtain the URL by enabling the target schema on the remote database to be accessed by running `ORDS.ENABLE_SCHEMA`. To learn more, see "[Before You Begin: REST Enabled SQL Service Requirements](#)".

- c. Click **Next**.
 4. For Authentication, specify the appropriate credentials:
 - a. Credentials - Select an existing credential to authenticate against, or select **Enter new** and complete the remaining steps.
 - b. Credential Name - Enter a descriptive name for the credentials.
 - c. Authentication Type - Specify the Authentication type. Select either **Basic Authentication** or **OAuth2 Client**.

- d. Client ID:
 - For **Basic Authentication**, enter the database user name. User names for Basic Authentication are converted to upper case. To include a case-sensitive user name, prefix it with the exclamation mark (!).
 - For **OAuth2**, enter the client ID. This information will not be encrypted.
 - e. Client Secret - Enter the password, or OAuth2 Client Secret. This information is stored encrypted and cannot be retrieved in clear text.
 - f. Verify Client Secret - Enter the password or client secret again to verify your input. When the two values are not identical, an error message displays.
5. Click **Create**.

Oracle Application Express tests the REST Enabled SQL service. If everything has been done correctly (that is, you have included the correct URL, schema name, and password), the Test REST Enabled SQL Service message appears as shown in the following illustration.



6. Click **Close**.

The REST Enabled SQL service appears on the REST Enabled SQL page.

17.3.4 Example: Creating a REST Enabled SQL Service Reference

Review an example of creating REST Enabled SQL service reference on a remote database.

The following example builds a fictional REST Enabled SQL service reference named SCOTT_OBE Example using the Base URL `http://server.example.com:8080/ords/scott_obe`.

Tip:

Before creating a REST enabled SQL reference, developers must complete the requirements described in "[Before You Begin: REST Enabled SQL Service Requirements](#)".

1. To create a REST Enabled SQL service reference:
 1. Navigate to the REST Enabled SQL page:
 - a. On the Workspace home page, click **App Builder**.

5. Click **Create**.

Oracle Application Express tests the REST Enabled SQL service. If everything has been done correctly (that is, you have included the correct URL, schema name, and password), the Test REST Enabled SQL Service message appears as shown in the following illustration.

6. Click **Close**.

The REST Enabled SQL service appears on the REST Enabled SQL page.

17.3.5 Editing a REST Enabled SQL Service Reference

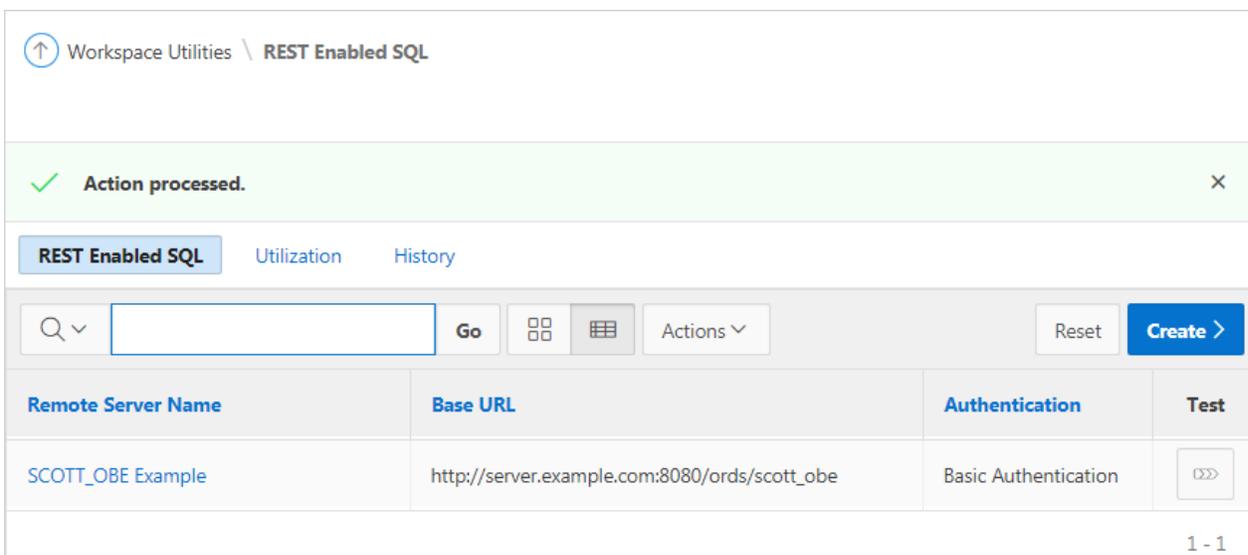
Edit existing REST Enabled SQL references on the Edit page.

1. To edit a REST Enabled SQL service:
 1. Navigate to the REST Enabled SQL page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select a existing application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **REST Enabled SQL**.

 **Tip:**

You can also access the REST Enabled SQL page from Workspace Utilities. Select the application and then click **Workspace Utilities** and then click **REST Enabled SQL Services**.

The REST Enabled SQL page appears listing the Remote Server Name, Base URL, and Authentication.



Workspace Utilities \ REST Enabled SQL

✓ Action processed. ×

REST Enabled SQL Utilization History

Q ▾ Go   Actions ▾

Remote Server Name	Base URL	Authentication	Test
SCOTT_OBE Example	http://server.example.com:8080/ords/scott_obe	Basic Authentication	<input type="button" value="Test"/>

1 - 1

2. Click the remote server name.
The Edit page appears. Edit the attributes.
3. REST Enabled SQL attributes:
 - a. Name - Enter a descriptive name for this REST Enabled SQL service.
 - b. Endpoint URL - Enter the base URL for this REST Enabled SQL service.
 - c. Prompt on Install - Choose whether prompts for this REST Enabled SQL service should display when the application is being imported on another Application Express instance.
 - d. Authentication Required - Choose whether this REST Enabled SQL service requires authentication.
 - e. Credential - Select the credential to authenticate against.

 **Tip:**

To edit credentials, go to **Shared Components, Credentials**.

4. Session attributes:
 - a. Initialization Code - Enter code to be executed immediately after connecting to the REST Enabled SQL service and before the component SQL is being executed.

Workspace Utilities \ REST Enabled SQL

✓ Action processed. ×

REST Enabled SQL Utilization History

Q Go Actions Reset Create >

Remote Server Name	Base URL	Authentication	Test
SCOTT_OBE Example	http://server.example.com:8080/ords/scott_obe	Basic Authentication	Test

1 - 1

- Click the remote server name.
The Edit page appears.
- Click **Delete**.

17.3.7 Creating or Updating Components to Use a REST Enabled SQL

Create or update reports (classic reports, interactive reports, interactive grids, List View report, Toggle Column reports, and Reflow Reports), forms, CSS calendars, JET charts, and Tree regions to point to data on a remote database using a REST Enabled SQL reference.

- [Creating a Report Using a REST Enabled SQL Reference](#)
Create a report on a remote database using a REST Enabled SQL reference.
- [Creating a Chart Using a REST Enabled SQL Reference](#)
Create a chart on a remote database using a REST Enabled SQL reference.
- [Creating a Calendar Using a REST Enabled SQL Reference](#)
Create a calendar on a remote database using a REST Enabled SQL reference.
- [Specifying a REST Enabled SQL Reference in an Existing Component](#)
Configure existing components to point to a remote database using a REST Enabled SQL service reference.

17.3.7.1 Creating a Report Using a REST Enabled SQL Reference

Create a report on a remote database using a REST Enabled SQL reference.

The following example demonstrates how to create interactive report based on a table using a REST Enabled SQL reference. The procedures for creating other report types is similar.



Tip:

Before creating a report using a REST Enabled SQL reference, you must complete the tasks described in "[Before You Begin: REST Enabled SQL Service Requirements](#)" and create the reference as described in "[Creating a REST Enabled SQL Service Reference](#)."

1. To create an interactive report using a REST Enabled SQL reference:
 1. Create a REST Enabled SQL reference.
 2. Run the Create Page Wizard:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Create Page**.
The Create Page Wizard appears.
 3. On Create a Page:
 - a. Page Type - Select **Component**.
 - b. Click **Report**.
 4. On Create Page, select **Interactive Report**.
 5. For Page Attributes:
 - a. Page Number - Enter a page number. If you identify a new page number, the wizard creates a new page. If you identify an existing page number, the wizard adds the component to that page.
 - b. Page Name - Specify a name for the page.
 - c. Page Mode - Select a page mode. **Normal** presents the page as a normal Application Express application page. **Modal Dialog** presents the page as an overlay window positioned which remains active and focused until the end user dismisses (closes) it. The underlying page is grayed out and the end user is prevented from interacting with the rest of the page until the dialog is closed.
 - d. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page, and which breadcrumb navigation control you want to use.
 - e. Click **Next**.
 6. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
 7. On Report Source:
 - a. Data Source - Select **REST Enabled SQL Service**.
 - b. REST Enabled SQL Service - Select a previously defined reference.
 - c. Source Type - Specify the source of the new page. Reports can be based on tables or SQL queries. Select either **Table** or **SQL Query**. In the illustration that follows, the Source Type is **Table**.

- d. Table/View Owner - Select the owner of the table on which you are building a report.
- e. Table/View Name - Select the table on which you are building a report.
- f. Select Columns - Select one or more columns to be included in the region. Selected columns will display in the report.

For example, the next illustration shows a Report Source which uses a REST Enabled SQL Service called **My REST Enabled SQL**, which includes all columns in the EMP table.

The screenshot shows the 'Create Interactive Report' dialog box. At the top, there are three progress indicators: a green checkmark, another green checkmark, and a blue circle labeled 'Report Source'. Below the progress indicators, there are several configuration options:

- Data Source:** Local Database, REST Enabled SQL Service (selected), Web Source
- REST Enabled SQL Service:** My REST Enabled SQL
- Source Type:** Table (selected), SQL Query
- Table / View Owner:** Current Schema
- Table / View Name:** EMP
- Select Columns:** A list of columns from the EMP table: EMPNO (Number), ENAME (Varchar2), JOB (Varchar2), MGR (Number), HIREDATE (Date), SAL (Number), COMM (Number), and DEPTNO (Number).

At the bottom, there are 'Cancel' and 'Create' buttons.

- 8. Click **Create**.
Page Designer appears.
- 9. Click **Save and Run Page** to view the report.

17.3.7.2 Creating a Chart Using a REST Enabled SQL Reference

Create a chart on a remote database using a REST Enabled SQL reference.

Tip:

Before creating a report using a using a REST Enabled SQL reference, you must complete the tasks described in "[Before You Begin: REST Enabled SQL Service Requirements](#)" and create the reference as described in "[Creating a REST Enabled SQL Service Reference](#)."

- 1. To create a chart using a REST Enabled SQL reference:
- 1. Create a REST Enabled SQL reference.

2. Run the Create Page Wizard:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.
 - c. Select an application.
 - d. On the Application home page, click **Create Page**.
The Create Page Wizard appears.
3. On Create a Page:
 - a. Page Type - Select **Component**.
 - b. Click **Chart**.
4. For Chart Type, select a chart type (for example, **Pie**) and click **Next**.
5. For Page and Region Attributes:
 - a. Page Number - Select a page in which the chart object is to appear.
 - b. Page Name - Specify a name for the page.
 - c. Page Mode - Select a page mode. **Normal** presents the page as a normal Application Express application page. **Modal Dialog** presents the page as an overlay window positioned which remains active and focused until the end user dismisses (closes) it. The underlying page is grayed out and the end user is prevented from interacting with the rest of the page until the dialog is closed.
 - d. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page, and which breadcrumb navigation control you want to use.
 - e. Click **Next**.
6. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
7. On Source:
 - a. Location - Select **REST Enabled SQL Service**.
 - b. REST Enabled SQL Service - Select a previously defined reference.
 - c. Source Type - Specify the source of the new page. Select either **Table** or **SQL Query**.
The UI changes based on your selection. In the illustration that follows, the Source Type is **Table**. If you select, **SQL Query** follow the on-screen instructions.
 - d. Table/View Owner - Select the owner of the table on which you are building the chart.
 - e. Table/View Name - Select the table on which you are building the chart.
 - f. Page Items to Submit - (Optional) Enter a comma separated list of page items on the current page to be set into session state when the chart data gets read with a separate request.
 - g. Maximum Rows - (Optional) Enter the maximum number of rows you want to use to display the chart.

For example, the next illustration shows a Source page uses a REST Enabled SQL Service reference called **Example REST Enabled SQL Service Reference** to define a chart on the `EMP` table.

- h. Click **Next**.
- 8. On Column Mapping:

 **Tip:**

The UI that appears depends upon the selected chart type.

- a. Label Column - Select the column name to be used for defining the label(s) of the x-axis on the chart.
- b. Value Aggregation - (Optional) Select how to aggregate the chart Value Column.
- c. Value Column - Select the column name to be used for defining the value on this chart.

For example, the next illustration shows a Column Mapping based on the Label Column, `JOB`, and the Value Column, `SAL`.

The screenshot shows a 'Create Chart' dialog box with a progress bar at the top. The progress bar has four green checkmarks and one blue circle labeled 'Column Mapping'. Below the progress bar, the 'Chart Type' is set to 'Pie'. The 'Label Column' is 'JOB', 'Value Aggregation' is '- No Aggregation -', and 'Value Column' is 'SAL'. There are 'Cancel' and 'Create' buttons at the bottom.

9. Click **Create**.
Page Designer appears.
10. Click **Save and Run Page** to view the chart.



See Also:

["Creating Charts"](#)

17.3.7.3 Creating a Calendar Using a REST Enabled SQL Reference

Create a calendar on a remote database using a REST Enabled SQL reference.



Tip:

Before creating a report using a using a REST Enabled SQL reference, you must complete the tasks described in ["Before You Begin: REST Enabled SQL Service Requirements"](#) and create the reference as described in ["Creating a REST Enabled SQL Service Reference."](#)

1. To create a calendar un REST Enabled SQL reference:
 1. Create a REST Enabled SQL reference.
 2. Run the Create Page Wizard:
 - a. Navigate to the Workspace home page.
 - b. Click the **App Builder** icon.

- c. Select an application.
 - d. On the Application home page, click **Create Page**.
The Create Page Wizard appears.
3. On Create a Page:
 - a. Page Type - Select **Component**.
 - b. Click **Calendar**.
4. For Page Attributes:
 - a. Page Number - Enter a page number. If you identify a new page number, the wizard creates a new page. If you identify an existing page number, the wizard adds the component to that page.
 - b. Page Name - Specify a name for the page.
 - c. Page Mode - Select a page mode. **Normal** presents the page as a normal Application Express application page. **Modal Dialog** presents the page as an overlay window positioned which remains active and focused until the end user dismisses (closes) it. The underlying page is grayed out and the end user is prevented from interacting with the rest of the page until the dialog is closed.
 - d. Page Group - Identify the name of the page group you would like to associate with this page.
 - e. Breadcrumb - Select whether you want to use a breadcrumb navigation control on your page, and which breadcrumb navigation control you want to use.
 - f. Click **Next**.
5. For Navigation Menu:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
6. On Source:
 - a. Data Source - Select **REST Enabled SQL Service**.
 - b. REST Enabled SQL Service - Select a previously defined reference.
 - c. Source Type - Specify the source of the new page. Reports can be based on tables or SQL queries. Select either **Table** or **SQL Query**. In the illustration that follows, the Source Type is **Table**.
 - d. Table/View Owner - Select the owner of the table on which you are building a report.
 - e. Table/View Name - Select the table on which you are building a report.
 - f. Select Columns - Select one or more columns to be included in the region. Selected columns will display in the report.
7. For Settings:
 - a. Display Column - Select the column which holds the text displayed for events on this calendar.
 - b. Start Column - Select the column which holds the start date for events displayed on this calendar.
 - c. End Date Column - Select the column which holds the end date for events displayed on this calendar. If this attribute is specified, then the calendar displays duration based events

- d. Show Time - Select whether the time portion of the date should be displayed. The Week and Day views only be display when Show Time is set to **Yes**. If the start date or end date columns do not include time components they will be shown as 12:00 am.

For example, the next illustration shows Settings in which the Display Colum is Name, the Label Column, `START_DATE`, and the End Date Column is `END_DATE`.

- e. Click **Create**.
Page Designer appears.
8. Click **Save and Run Page** to view the report.



See Also:

["Understanding Page Types in the Create Page Wizard"](#)

17.3.7.4 Specifying a REST Enabled SQL Reference in an Existing Component

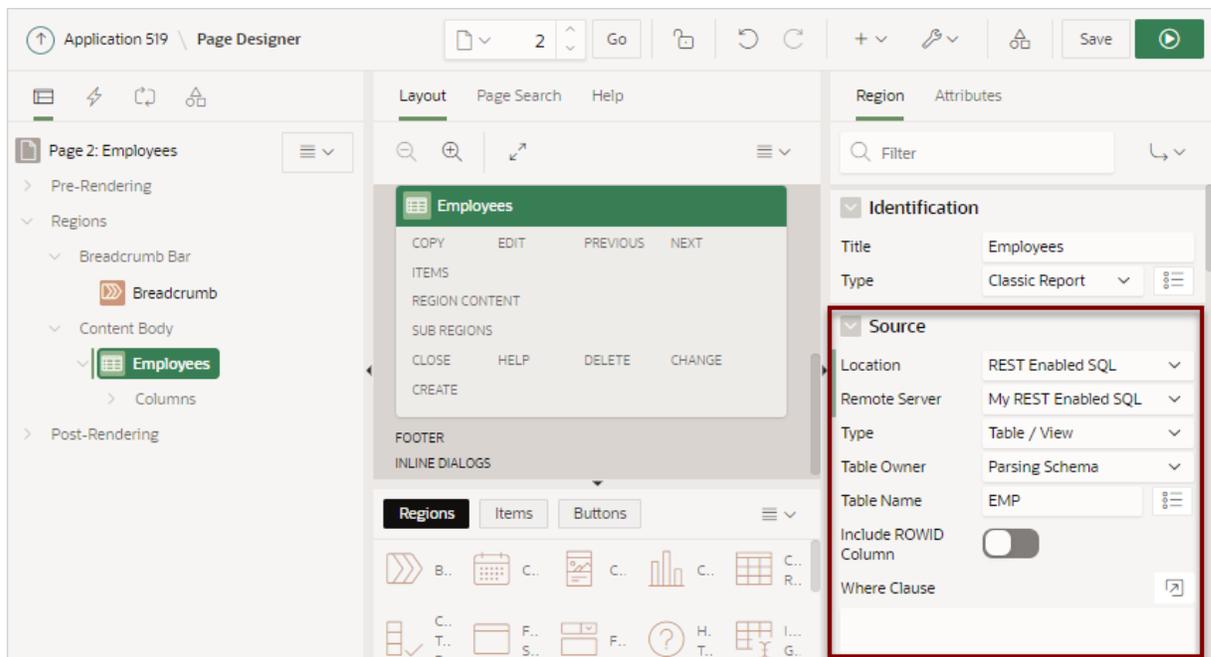
Configure existing components to point to a remote database using a REST Enabled SQL service reference.

Before configuring a component to use a REST Enabled SQL service reference, you must complete the tasks described in ["Before You Begin: REST Enabled SQL Service Requirements"](#) and create the reference as described in ["Creating a REST Enabled SQL Service Reference."](#)

1. To configure existing components to point to a remote database using a REST Enabled SQL service reference:
 1. View the page containing the components to be reconfigured in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.

- c. Select a page.
Page Designer appears.
2. In Page Designer, select the region containing the component (if not already selected) and edit the Source attributes.
3. To specify a remote database for a report:
 - a. In the Rendering tab (left pane), select the region (for example, **Classic Report**).
 - b. In the Property Editor under Source, edit the following:
 - Location - Select **REST Enabled SQL**.
 - Remote Server - Select the defined REST Enabled SQL Service reference (for example, **My REST Enabled SQL**).
 - Type - Select how the data is queried. Select **Table/View** or **SQL Query**.
 - Configure the table or provide a SQL Query.
 - Configure the remaining attributes as needed.

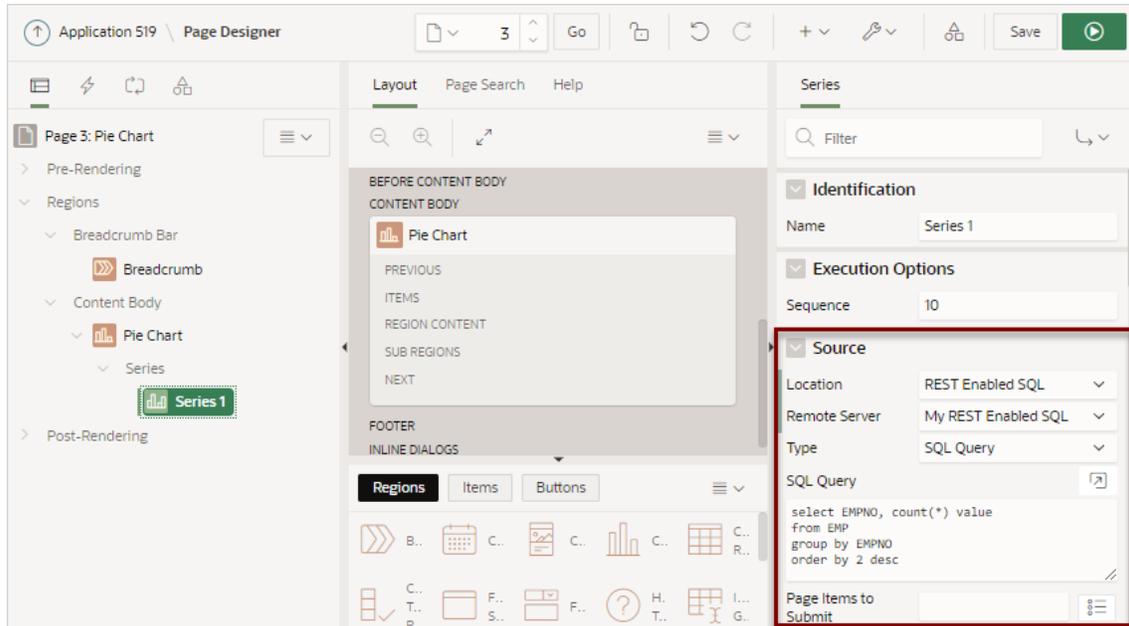
In the following example, **Classic Report** is selected and the Source points to a Remote Server called **My REST Enabled SQL**.



4. To specify a remote database for chart:
 - a. In the Rendering tab (left pane), find and expand the region containing the chart.
 - b. Expand **Series** and select the Series that defines the chart.
 - c. In the Property Editor under Source, edit the following:
 - Location - Select **REST Enabled SQL**.
 - Remote Server - Select the defined REST Enabled SQL Service reference (for example, **My REST Enabled SQL**).
 - Type - Select how the data is queried. Select **Table/View** or **SQL Query**.

- Configure the table or provide a SQL Query.
- Configure the remaining attributes as needed.

In the following example, **Series 1** is selected and the Source points to a Remote Server called **My REST Enabled SQL**.



5. Click **Save** or **Save and Run Page**.

17.4 Managing REST Data Sources

REST Data Sources enable developers to access to REST services or generic JSON data feeds in applications.

- [About REST Data Sources](#)
REST Data Sources enable developers to access to Representational State Transfer (REST) services or generic JSON data feeds in applications and use the data in Application Express components such as reports, interactive reports, and interactive grids.
- [Creating a REST Data Source](#)
Create a REST Data Source from Shared Components.
- [Editing or Deleting a REST Data Source](#)
Edt or delete a REST Data Source from Shared Components.
- [Copying a REST Data Source](#)
Copy a REST Data Source by selecting Copy on the REST Data Sources page.
- [Managing Data Synchronization](#)
Enable Data Synchronization to keep the contents of a local table automatically in sync with the data from a REST service.
- [Viewing REST Data Source Utilization](#)
View the REST Data Sources Utilization report.
- [Viewing REST Data Sources History](#)
View the REST Data Sources History report.

17.4.1 About REST Data Sources

REST Data Sources enable developers to access to Representational State Transfer (REST) services or generic JSON data feeds in applications and use the data in Application Express components such as reports, interactive reports, and interactive grids.

A REST Data Source can contain one or many Operations which are the references to a concrete external web service. Configurations at the REST source level are shared across all contained operations.

How REST Data Sources Differ from Legacy Web Service References

Unlike Legacy Web Service References, a REST Data Source contains metadata about the Web service which can be used by Application Express Components or PL/SQL processes to invoke the service and to process the responses.

REST Data Sources contain multiple operators that differ depending upon the Web service target. For a REST services, an operation is a specific service handler (such as, GET, PUT, POST, or DELETE). Developers assign Operation a Database Action such as `Fetch Multiple Rows`, `Fetch Single Row`, `Insert Row`, `Update Row`, and `Delete Row`. However, you can assign each Database Operation only once to a REST Data Source Operation.

Integration with Application Express Components

Oracle Application Express provides direct integration of REST Data Sources in classic reports, interactive reports, CSS Calendar, and JET Charts.

About Remote Servers

Oracle Application Express splits the endpoint URL of a Web Service into two parts. The server-specific part is stored as a separate entity called the **Remote Server**. You can reuse a Remote Server with multiple REST Data Sources if it uses the same server, port and URL Path Prefix (context root).

If you change the attributes of a Remote Server, the change impacts all REST Data Sources using the Remote Server. Remote Servers make it easy to move a collection of REST Data Sources. For example, you can move from test system to a production system by changing the URL within the Remote Server object.

About Authentication and Credentials

REST Data Sources supports various authentication types. Authentication credentials can be specified at the Remote Server-level for all REST Data Sources using the Remote Server). If credentials are set at the REST Data Source-level, that setting supersedes credentials stored at the Remote Server level.

A Credential denotes the Authentication method, a Client ID (or user name) and a Client Secret (or password). Credentials are stored as a named entity within Shared Components and can be re-used across multiple REST Data Sources or Remote Servers.

 **See Also:**

- ["Managing Remote Servers"](#)
- ["Managing Web Credentials"](#)
- ["About Supported Authentication Types"](#) in ["About Credentials"](#)
- ["Managing Legacy Web Services"](#)

17.4.2 Creating a REST Data Source

Create a REST Data Source from Shared Components.

1. To create a REST Data Source:
 1. Navigate to the REST Data Sources page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **REST Data Sources**.
 2. On the REST Data Sources page, click **Create**.
 3. For **Method** - Select **From Scratch** and click **Next**.

 **Tip:**

If you select, **As copy of an existing REST Data Source** select the application to copy from and follow the on-screen instructions.

4. For **General**:
 - a. REST Data Source Type - Select one of the following:
 - **Simple HTTP** - Denotes a simple HTTP data feed. Application Express assumes that all data is returned with the first request and that the server does not support server-side filtering, ordering or other advanced REST service feature. All invocation details and parameters must be configured manually. Use this type if the REST service is neither an ORDS or Oracle Cloud SaaS service (see below).
 - **Oracle REST Data Services** - Denotes ORDS (Oracle REST Data Services) REST Services. These REST services follow the Oracle REST standard, which means that GET, POST, PUT or DELETE operations are standardized. Server-side filtering and ordering are supported. Application Express can leverage these features by delegating report order-bys and filters to the REST service.
 - **Oracle Cloud Applications (SaaS) REST Service** - Denotes RESTful web services provided by Oracle Cloud SaaS Applications. Use this web service type to integrate Oracle SaaS REST Services into your Application Express Application. Application Express supports pagination for these Services.

- **Oracle Cloud Infrastructure (OCI) REST Service** - Denotes RESTful web services provided by Oracle Cloud Infrastructure. Use this web service type to integrate OCI REST Services (for example, accessing the Object Store) into your Application Express application. Application Express supports pagination for these Services. This Type requires Oracle Application Express is installed in Oracle Database 18c or later.
- b. **Name** - Enter a descriptive name for this REST Data Source.
 - c. **URL Endpoint** - Enter the Endpoint URL (starting with `http://` or `https://`) for this REST Data Source.

 **Tip:**

Do not add query string parameters by appending `? name1=value&name2=value`. These are configured on the Advanced wizard page after you configure Authentication.

- d. **HTTPS Host Name** - The host name to be matched against the common name (CN) of the remote server's certificate for an HTTPS request. It can also be a domain name like `*.example.com`. If NULL, the host name in the given URL is used.
 - e. Click **Next**.
5. **Remote Server:**
- a. **Remote Server** - Choose an existing Remote Server object. The HTTP Endpoint URL of a REST Data Source consists of the remote server (Base URL) and the service specific part. Remote Servers are stored as separate Entities. When multiple REST Data Sources share the same remote server, they can easily be redirected to another physical location (for example, from test to production) by just changing the base URL within the Remote Server definition..
 - b. **Base URL** - This is the Base URL of the chosen Remote Server object. The HTTP Endpoint URL of this REST Data Source is made up from the Base URL and the service-specific path suffix below..
 - c. **Service URL Path** - Enter the service-specific URL Path for this REST Data Source. The HTTP Endpoint URL is built by appending this to the Base URL specified in the Remote Server object.
For example:
 - `/services/customers/`
 - `/products/4711/details`
 - d. Click **Next**.
6. For **Authentication Required**, choose whether the new REST Data Source requires Authentication.

 **Tip:**

To learn more about authentication, see "About Supported Authentication Types" in "[About Credentials](#)"

7. To proceed, select one of the following:

- **Create REST Source Manually** - This option does not include Discovery mode. Based on the previously entered information, a REST Data Source is created with a few sample operations and a sample data profile. This option creates an *incomplete* REST Data Source that is unusable with an Oracle Application Express component. To correctly reflect the external web service, you will need to edit the operations and the data profile.
 - **Advanced** - Presents advanced parameters for the Data Profile. Use **Response Sample** to upload a sample JSON (or XML) response. Once a file is uploaded, Oracle Application Express performs a Data Profile Discovery on the uploaded file.
 - **Discover** - Starts Discovery mode. Oracle Application Express executes multiple HTTP requests in order to get information about the external Web service. Application Express samples the data (JSON or XML) returned by the Web service and derives a Data Profile (consisting of metadata about the JSON attributes). Discovery results then display and confirms whether to create the REST Data Source.
8. If you click **Advanced**, the Parameter page appears.
- Use the Parameters page to configure initial REST Data Source parameters which might be required for discovery. Some REST Data Sources may require you set specific HTTP Headers (for example, `User-Agent`). After setting advanced parameters, select either **Create REST Source Manually** or **Discover**.
9. If you select **Discover**, Application Express invokes the REST service URL and a Preview appears. From the JSON response, Application Express derives attributes and their data types and uses this to create a Data Profile.
- The information that displays depends upon the complexity of the target service. For simple HTTP services or ORDS services which do not provide metadata about their JSON response attributes, Application Express investigates the JSON or XML response, samples the data, and creates a proposal for a data profile. The Data tab displays the sample response data, formatted as a report.
- The columns tab shows information about the data profile columns Application Express has found during discovery. Use this tab to verify whether the column data types are correct.
- Click **Server Response** to view additional detailed information about the REST Data Source response, such as the response body, response headers and the REST Data Source operations.
10. Click **Create REST Data Source**.
- The REST Data Source is created.

17.4.3 Editing or Deleting a REST Data Source

Edit or delete a REST Data Source from Shared Components.

1. To edit or delete a REST Data Source:
 1. Navigate to the REST Data Sources page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.

- d. Under Data Sources, select **REST Data Sources**.
2. On the REST Data Sources page, click the **REST Source Name**.
The REST Data Sources page appears.
3. To delete the REST Data Sources, click **Delete**.

 **Tip:**

A REST Data Source can only be deleted, if no Oracle Application Express component is referencing it.

4. To edit the REST Data Source, edit the attributes.
5. Under **REST Data Source**:
 - a. Name - Defines descriptive name for this REST Data Source.
 - b. REST Data Source Type - Determines the REST Data Source type:
 - **Simple HTTP** - Select this option for a simple HTTP data feed. Application Express assumes that all data is returned with the first request and that the server does not support server-side filtering, ordering or other advanced REST service feature. All invocation details and parameters must be configured manually.
 - **Oracle REST Data Services** - Select this option for Oracle REST Data Services (ORDS) REST Services. These REST services follow the Oracle REST standard, which means that `GET`, `POST`, `PUT` or `DELETE` operations are standardized. Server-side filtering and ordering are supported. Application Express can leverage these features by delegating report
 - **Oracle REST Data Services (Legacy Syntax)** - Select this option for services running on older versions of Oracle REST Data Services (ORDS). These services are not completely compliant to the Oracle REST Standard.
 - **Oracle Cloud Applications (SaaS) REST Service** - Select this option for RESTful services provided by Oracle Cloud Applications (SaaS). Use this web service type to integrate Oracle SaaS REST Services into your Application Express Application. Application Express supports pagination for these Services.
 - **Oracle Cloud Infrastructure (OCI) REST Service** - Select this option for RESTful web services provided by Oracle Cloud Infrastructure. Use this web service type to integrate OCI REST Services (for example, accessing the Object Store) into your Application Express application. Application Express supports pagination for these Services.
 - c. Remote Server - Choose a Remote Server object for this REST Data Source. To learn more, see field-level Help.
 - d. Base URL - Lists the Base URL.
 - e. URL Path Prefix - The URL Path Prefix is specific to this REST Data Source. The URL Endpoints of all operations within the REST Data Source share the same URL Path Prefix. To learn more, see field-level Help.
6. Under **Authentication**:
 - Credentials - Select stored credentials for authentication.
7. **Subscription** lists REST Data Sources that subscribe to this module.

8. Under **Data Profile**:

- a. Click **Edit Data Profile** to change how REST Data Source responses (in XML or JSON) format are being parsed and converted to rows and columns.

The Data Profile page appears.

- b. Under **Data Profile** and **Columns**, edit the attributes.

Row Selector stores an XML or JSON path expression pointing to the node containing the collection of rows. **Columns** determine how one row is parsed and converted to multiple columns.

- c. Click **Apply Change** to save your changes.

9. Under **Operations**:

Operations contains the actual information about the external web service handler. Operations can be mapped to Database Operations which enables Application Express components to pick up the correct operation.

- a. Click **Add Operation** to add a REST Data Source Operation.

The REST Source Operation page appears.

- b. Under **Operation**:

- **URL Pattern** - The **URL Pattern** is the last part of the Web Service endpoint URL. The combination of URL pattern and HTTP Operation (GET, POST, PUT, DELETE) identifies the operation within a REST Data Source.
- **HTTP Method** - Defines the HTTP Operation or **Method** (GET, POST, PUT, DELETE) to be executed on the REST Web Service.
- **Database Operation** - Assign a Database Operation to this HTTP operation. The database operation is important for Application Express components to work with the REST Data Source.

To learn more about these attributes and see examples, see field-level Help.

- c. Under **Caching**:

- **Caching** - Select how the Application Express engine can cache REST Source responses on the server side. If caching can be used, the component is rendered based on cached results instead of fetching from the web service again. Only HTTP "GET" requests will be cached, which will cut down expensive HTTP requests. This feature is unrelated to the browser's caching capabilities.
- **Invalidate When** - Specify when cached content is to be invalidated. Provide either the amount of minutes or a "DBMS_SCHEDULER Calendaring String". With the latter, you determine cached content to be invalidated at the top of the hour, at midnight, or another specific recurring point in time.

To learn more about these attributes and see examples, see field-level Help.

- d. Under **Advanced**:

- **Fixed Page Size** - Enter the size of the REST service's pagination window.
- **Allow Fetching All Rows** - Specify whether Application Express components are allowed to fetch all rows and executing multiple HTTP requests from the REST source operation.

- Operation Comment - Enter any developer comments

To learn more about these attributes, see field-level Help.

- e. Click **Apply Changes**.

10. Under Parameters:

Use the parameters to pass HTTP Request Headers, use dynamic URLs, or request bodies. When a parameter, its type, default value, and direction is declared on the Edit REST Data Source Parameter page, Application Express components can reference it.

- a. Click **Add Parameter** to configure a REST Data Source Parameters.
- b. Click **Add Parameter**.

11. Subscription indicates if this REST Data Source is copy.

12. Under Advanced:

- a. Static ID - Use the Static ID to reference the REST Data Source in API Calls.
- b. Pass ECID - Indicates whether to pass the Execution Context ID (ECID) to the external web services for end-to-end tracing.
- c. HTTP Transfer Timeout - Specify a timeout value in seconds. When an HTTP request for this REST Data Source value exceeds the timeout value, the end user sees an error message. This is to prevent non-responding pages due to an unresponsive web service.
- d. Comments - Enter Comments or notes.

13. To save your changes, click **Apply Changes.**

17.4.4 Copying a REST Data Source

Copy a REST Data Source by selecting Copy on the REST Data Sources page.

To copy a REST Data Source:

1. Navigate to the REST Data Sources page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **REST Data Sources**.
2. On the REST Data Sources page, click **Copy**.
3. On Copy REST Data Source:
 - a. Copy REST Data Source - Select an existing REST Data Source.
 - b. New REST Data Source Name - Enter a new name.
 - c. Click **Copy**.

17.4.5 Managing Data Synchronization

Enable Data Synchronization to keep the contents of a local table automatically in sync with the data from a REST service.

- [About Data Synchronization](#)
Data Synchronization enables developers to automatically sync the contents of a local table with the data from a REST service.
- [Accessing the Data Synchronization Page](#)
Access the the Data Synchronization page by selecting a REST Data Source and then selecting Manage Synchronization on the right side of the page.
- [Configuring Data Synchronization](#)
Configure Data Synchronization to automataically sync a local table with data from a REST service.
- [Clearing Synchronization Settings](#)
Clear synchronization settings.
- [Viewing Synchronize Usage](#)
View a report of application components currently using the local synchronization table as their data source.
- [Managing the REST Data Source Synchronization Log](#)
Learn about the REST Data Source Synchronization log.



See Also:

"Configuring Background Jobs" in *Oracle Application Express Administration Guide*

17.4.5.1 About Data Synchronization

Data Synchronization enables developers to automatically sync the contents of a local table with the data from a REST service.

You can trigger **Data Synchronization** manually or on a regular schedule, using a scheduler job. Note that the `CREATE JOB` privilege must be granted to the application's parsing schema in order to execute REST source synchronizations on schedule.

Application Express can create the local table based on the visible columns in the REST Data Source **Data Profile**. Since the table is a visible object in the database schema, developers can add indexes, change physical properties, or even add more columns.

If the table is not in sync with the Data Profile, Data Synchronization continues to work for columns present in both the table and the Data Profile (other columns are ignored). However, Application Express generates SQL DDL statements to sync table columns back to the Data Profile. These statements can be added to the application as supporting objects.

Data Synchronization Uses Cases

Common use cases using REST Data Source Data Synchronization include:

- **Provide efficient reporting on large data sets coming from a REST service**
Some REST Services can return large amounts of result data that includes pagination. If a reporting requirement needs larger data sets, this could result to multiple HTTP requests and poorer response times. Also no indexes or other database features can be used to speed up reporting queries. In this case, Oracle

recommends enabling Data Synchronization to sync the remote data to a local tables and have any reports based on local tables.

- **Collect data from REST Services for consumption by PL/SQL packages or other logic**

Having data from the REST service replicated in a local table enables developers to perform all sorts of processing and create a wider variety of reports on local tables.

- **Collect data from a REST API over a longer period of time**

Some REST APIs only provide data for a recent time frame. For reporting on a larger time frame, Data Synchronization enables developers to fetch REST data and store it in a local table. Note that this use case also requires a "merge by primary key" capability since two subsequent REST requests will return an overlapping data set.

- **Utilize Intelligent caching for Application Express components**

REST Data Sources already provide a caching mechanism: Application Express caches the JSON response (or responses) as CLOBs in a caching table. If an Application Express component uses the REST Data Source and the cache is not stale, the HTTP request is saved and the cached JSON is used. However, JSON needs still to be parse (that is, large data sets lead to a lot of JSON parsing overhead. Also, indexes or other database technology cannot be used to speed up queries. Caching within a named local table creates a better level of caching since no JSON is no longer parsed and the table can be optimized to support reporting queries.

17.4.5.2 Accessing the Data Synchronization Page

Access the the Data Synchronization page by selecting a REST Data Source and then selecting Manage Synchronization on the right side of the page.

1. To access the Data Synchronization page:
 1. Navigate to the REST Data Sources page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **REST Data Sources**.
 2. On the REST Data Sources page, click the **REST Source Name**.
 3. Click **Manage Synchronization** on the right side of the REST Data Source page.

The Data Synchronization page appears.

17.4.5.3 Configuring Data Synchronization

Configure Data Synchronization to automataically sync a local table with data from a REST service.

You can tigger synchronization manually or on a regular schedule using a scheduler job.

1. To configure Data Synchronization:
 1. Navigate to the Data Synchronization page.

The Data Synchronization page appears.
 2. Under Details:

- a. Local Table Owner - Select the schema of the local table to synchronize data to. By default, the application Parsing Schema is used.
- b. Synchronize to - Select either **New Table** or **Existing Table** and click **Apply Changes**.
If creating a new table, the message `Table does not exist` appears. Click **Create Table**.
- c. Synchronization Type - Select a synchronization type:
 - Append - Append rows to the local table. This is typically used when no primary key has been defined in the data profile.
 - Merge - Merge rows into the local table. To use this option, the data profile must have a Primary Key defined. If a row for the given Primary Key value exists, the row is updated.. Otherwise the row is created.
 - Replace - Empty the local table before loading new data.
- d. Job Execution Interval - Use the Database **Scheduler Calendaring Syntax** to define repeating synchronization schedules, such as "every Tuesday and Friday at 4:00 p.m." or "the second Wednesday of every month.". This calendaring syntax can either be provided manually using simple expressions can be built using the Interval Builder by clicking the Hammer icon adjacent to the input field.

 **Note:**

To learn more about **Scheduler Calendaring Syntax**, see "DBMS_SCHEDULER Operational Notes" in *Oracle Database PL/SQL Packages and Types Reference*

3. Under Steps - Use **Steps** to pass parameter values or specific external filters to the REST Service.

If no step is defined, the REST Data Source will be invoked once, with default parameters. If steps are defined, Application Express will invoke the REST Data Source once for each step, and pass the configured parameters.

4. Under Advanced Settings:
 - a. Commit Interval - Specify the commit interval to use during data synchronization. If not specified, the whole synchronization will be one transaction, with a commit after the last row. If an interval is specified, Application Express will commit each time after the specified amount of rows have been processed.
 - b. HTTP Request Limit - If required, provide a maximum number of HTTP requests to make for each synchronization step. If this limit is exceeded, synchronization will stop and logged as `Incomplete`.
Note that due to the actual execution method, synchronization will exceed this limit by one request. So if you provide a limit of 10, synchronization will stop after the 11th request has been made.
 - c. Enable Simple Rate Limiting - When enabled, Application Express ensures that only a limited amount of HTTP requests is executed within the given time frame. This rate limiting is purely based on the number of HTTP requests

being executed within a time frame. It does not look into HTTP response headers returned by the REST service.

5. To save your changes, click **Save**.
6. To execute Data Synchronization, click **Save and Run**.

17.4.5.4 Clearing Synchronization Settings

Clear synchronization settings.

Clearing synchronization settings stops synchronization processing and resets all REST Data Source attributes related to synchronizations. If Application Express components are using the local synchronization table, they will be reset to use the REST Service directly.

1. To clear synchronization settings:
 1. Navigate to the Data Synchronization page.
The Data Synchronization page appears.
 2. Click **Clear Settings**.

17.4.5.5 Viewing Synchronize Usage

View a report of application components currently using the local synchronization table as their data source.

1. View the Synchronize Usage report:
 1. Navigate to the Data Synchronization page.
The Data Synchronization page appears.
 2. Under Details, click **Synchronize Usage**.

A report appears showing application components currently using the local synchronization table as their data source.

17.4.5.6 Managing the REST Data Source Synchronization Log

Learn about the REST Data Source Synchronization log.

- [About the REST Data Source Synchronization Log](#)
The REST Data Source Synchronization log records details of previously executed synchronizations.
- [Purging the Synchronization Log](#)
Purge the REST Data Source Synchronization log.



See Also:

"Managing the REST Source Synchronization Log" in *Oracle Application Express Administration Guide*

17.4.5.6.1 About the REST Data Source Synchronization Log

The REST Data Source Synchronization log records details of previously executed synchronizations.

Once you have successfully executed a synchronization, the REST Data Source Synchronization log displays under **Log** on the Data Synchronization page.

The REST Data Source Synchronization log contains details about previously executed synchronizations such as the status (that is, Success or Failure), the amount of processed rows, and the amount of HTTP requests being made. You can drill down from the Synchronization log to the Web Services log to review each individual HTTP request which was made for this synchronization.

17.4.5.6.2 Purging the Synchronization Log

Purge the REST Data Source Synchronization log.

1. To purge REST Data Source Synchronization log:

1. Navigate to the Data Synchronization page.

The Data Synchronization page appears.

The REST Data Source Synchronization log displays under **Log** at the bottom of the page.

2. Under Log, click **Purge Log**.

17.4.6 Viewing REST Data Source Utilization

View the REST Data Sources Utilization report.

To view REST Data Sources utilization:

1. Navigate to the REST Data Sources page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **REST Data Sources**.
2. On the REST Data Sources page, click **Utilization**.

The Utilization page displays where a REST Data Source is used within the application.

17.4.7 Viewing REST Data Sources History

View the REST Data Sources History report.

To view recent modifications to REST Data Sources:

1. Navigate to the REST Data Sources page:
 - a. On the Workspace home page, click **App Builder**.

- b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **REST Data Sources**.
 2. On the REST Data Sources page, click **History**.

The History page displays recent modifications made to Web Service Modules in the current workspace.

17.5 Managing Remote Servers

Store REST Data Source server information as a Remote Server object.

- [About Remote Servers](#)
Create a Remote Server object to store REST Data Source server information.
- [Creating a Remote Server](#)
Create a Remote Server from Shared Components.
- [Editing or Deleting a Remote Server](#)
Edit or delete a Remote Server from Shared Components.
- [Viewing Remote Server Utilization](#)
View the Remote Server Utilization report.
- [Viewing Remote Server History](#)
View the Remote Server History report.

17.5.1 About Remote Servers

Create a Remote Server object to store REST Data Source server information.

Oracle Application Express stores REST Data Source server information (for example, REST APIs) as a Remote Server object. Remote Servers can be shared among multiple REST Data Sources. Changing Remote Server properties affects all REST Sources referencing that object. For example, you can change a Remote Server's Base URL to move all associated REST Sources from a test to a production system. Since Remote Servers are stored at the workspace-level, Remote Servers are visible in all applications in a workspace.

Type of Remote Servers

When you create a Remote Server you select one of the following types:

- **REST Data Source** - Remote Server for consuming a remote REST API.
- **Authentication** - Remote Server for authentication.
- **Print Server** - Remote Server for an external print server.

How Application Express Stores REST Data Source Information

Oracle Application Express splits the endpoint URL of a REST Data Source into two parts. The first part is server-specific part and is stored as a separate entity called the **Remote Server**. You can reuse a Remote Server with multiple REST Data Sources if each one uses the same server, port, and URL Path Prefix (context root). Remote Servers are stored at the workspace-level and therefore visible in all applications.

The second part of the endpoint URL and is specific to the REST Data Source. Multiple REST Data Sources can share one Remote Server, thus sharing information such as the

Base URL and Authentication. If you change Remote Server attributes, the change impacts all REST Data Sources using the Remote Server. Remote Servers make it easy to move a collection of REST Data Source. For example, you can move from a test system to a production system by changing the URL within the Remote Server object.

Exporting and Importing Remote Server Information

When you export an application, referenced Remote Servers are added to the export file. When you import the application into another workspace, Application Express checks whether the target workspace already contains Remote Servers with the same **static ID**. If a Remote Server already exists, the application uses it. Otherwise the Remote Servers from the import file are created in the target workspace.



See Also:

["Managing REST Data Sources"](#)

17.5.2 Creating a Remote Server

Create a Remote Server from Shared Components.

1. To create a Remote Server object:
1. Navigate to the Remote Server page:
 - From Workspace Utilities:
 - a. On the Workspace home page, click **App Builder**.
 - b. Click **Workspace Utilities**.
 - c. Click **Remote Server**.
 - From Shared Components:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Workspace Objects, select **Remote Servers**.
2. On the Remote Servers page, click **Create**.
3. Name - Enter a name for the Remote Server object. Remote Server names must be unique within the application.
4. Static ID - Enter a static ID for the Remote Server.
5. Server Type - Select one of the following:
 - **REST Data Source** - Select this option if the server consumes a remote REST API.
 - **Authentication** - Select this option if you are using the server for authentication.

- **Print Server** - Select this option if you are using the server for an external print server.
- 6. Base URL - Enter the base URL of the Remote Server.
- 7. Prompt on Install - Select **On** to have Oracle Application Express prompt for the Base URL after the application installs into another workspace.
- 8. Comments - Enter any comments or notes here. These comments never display when running the application.
- 9. Click **Create**.

17.5.3 Editing or Deleting a Remote Server

Edit or delete a Remote Server from Shared Components.

To edit a Remote Server:

1. Navigate to the Credentials page:
 - From Workspace Utilities:
 - a. On the Workspace home page, click **App Builder**.
 - b. Click **Workspace Utilities**.
 - c. Click **Remote Server**.
 - From Shared Components:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Security, select **Remote Server**.
2. On the Remote Server page, click the name of the Remote Server.

The Edit Remote Server dialog appears.
3. To delete the current Remote Server, click **Delete**. Otherwise, edit the appropriate attributes.

 **Tip:**

Remote Servers which are referenced within an application cannot be deleted.

4. To edit the General attributes:
 - a. Name - Enter a descriptive name.
 - b. Static ID - Enter a name for the remote server object here. Remote Server names must be unique within the application.
 - c. Server Type - Select either:
 - **REST Data Source**
 - **Authentication**
 - d. Base URL - Enter the base URL of the remote server.

- e. Prompt on Install - If **On**, Application Express prompts for the Base URL after the application has been installed into another workspace.
- f. HTTPS Host Name - The host name to be matched against the common name (CN) of the remote server's certificate for an HTTPS request. It can also be a domain name like *.example.com. If NULL, the host name in the given URL is used.
HTTPS Host Name only displays if you are using Oracle Database 12.2 or higher.
- g. Comments - Enter any comments or notes. These comments only display within App Builder and never display when running the application.
- h. To save your changes, click **Apply Changes**.

17.5.4 Viewing Remote Server Utilization

View the Remote Server Utilization report.

To view Remote Server utilization:

1. Navigate to the Remove Server page:
 - From Workspace Utilities:
 - a. On the Workspace home page, click **App Builder**.
 - b. Click **Workspace Utilities**.
 - c. Click **Remote Server**.
 - From Shared Components:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Workspace Objects, select **Remote Servers**.
2. On the Remote Servers page, click **Utilization**.

The Utilization page displays where Remote Servers page used within the current workspace.

17.5.5 Viewing Remote Server History

View the Remote Server History report.

To view recent modifications to Remote Servers:

1. Navigate to the Remove Server page:
 - From Workspace Utilities:
 - a. On the Workspace home page, click **App Builder**.
 - b. Click **Workspace Utilities**.
 - c. Click **Remote Server**.
 - From Shared Components:

- a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Workspace Objects, select **Remote Servers**.
2. On the Remote Servers page, click **History**.

The History page displays recent modifications made to Remote Servers in the current workspace.

17.6 Managing Web Credentials

Store authentication credentials for external REST services or REST Enabled SQL services.

- [About Credentials](#)
Use Web credentials to connect to external REST services or REST Enabled SQL services.
- [Creating Web Credentials](#)
Create Web credentials from either Workspace Utilities or Shared Components.
- [Editing or Deleting Credentials](#)
Edit or delete Web credentials from either Workspace Utilities or Shared Components.
- [Viewing Credential Utilization](#)
View the Web credential Utilization report.
- [Viewing Credential History](#)
View the Web credential History report.

17.6.1 About Credentials

Use Web credentials to connect to external REST services or REST Enabled SQL services.

Creating Web credentials securely stores and encrypts authentication credentials for use by Application Express components and API's. Credentials cannot be retrieved back in clear text. Credentials are stored at the workspace-level and therefore are visible in all applications.

Protecting Web Credentials by Defining Valid URLs

You can protect Web credentials by adding valid URLs to the **Valid for URLs** attribute. Adding URLs to the **Valid for URLs** attribute prevents Application Express from accidentally sending a sensitive credentials to a different server. Whenever a Web credentials is used, Application Express checks whether the URL matches what is defined in defined in the **Valid for URLs** attribute.

When adding URLs to this attribute, place each URL into a new line. The URL endpoint being used must start with one of the URLs provided here. See field-level Help for examples.

Exporting and Importing Credentials

When you export an application, used credentials are added to the export file. When you import the application into another workspace, Application Express checks whether the target workspace already contains credentials with the same static ID. If a credential already exists,

the application uses it. Otherwise the credential from the import file is created in the target workspace.

About Supported Authentication Types

Web credentials support the following Authentication Types:

- **Basic Authentication** - Sends username and password in Base64-encoded form as the **Authorization** request header.
- **OAuth2 Client Credentials Flow** - Application Express exchanges the client ID and client secret for an **Access Token** using a token server URL. The access token is then used to perform the actual request. If the access token is expired, Application Express will transparently request a new one.
- **HTTP Header** - The credential is added to the REST Request as a HTTP Header. The name of the credential is the HTTP Header name, the **Secret** of the credential is the HTTP Header value. Application Express does not add these secrets to the Debug log or any other logs.
- **URL Query String** - The credential is added to the URL of the REST Request as a Query String Parameter (for example: `?name=value`). This option can be useful with API keys. Application Express does not add these secrets to the Debug log or any other logs. However, proxy or other intermediate servers will log these credentials in their log files.



See Also:

["Managing REST Enabled SQL References"](#)

17.6.2 Creating Web Credentials

Create Web credentials from either Workspace Utilities or Shared Components.

1. To create Web credentials:
1. Navigate to the Web Credentials page:
 - From Workspace Utilities:
 - a. On the Workspace home page, click **App Builder**.
 - b. Click **Workspace Utilities**.
 - c. Click **Web Credentials**.
 - From Shared Components:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Security, select **Web Credentials**.
2. On the Web Credentials page, click **Create**.
3. Configure the Attributes on the Web Credentials page.

4. **Name** - Enter a descriptive name.
5. **Authentication Type** - Select one of the following:
 - **Basic Authentication**
 - **OAuth2 Client Credentials Flow**
 - **HTTP Header**
 - **URL Query String**

To learn more about this attribute, see field level Help.

The options that display next depends upon the Authentication Type you select.

6. For the Authentication Type, **Basic Authentication**:
 - a. **Client ID or User Name** - Enter the Username. Application Express does not store this information encrypted.
 - b. **Client Secret or Password** - Enter the password.
 - c. **Verify Client Secret or Password** - Enter the password again to verify your input.
 - d. **Valid for URLs** - Application Express checks whether the URL a Web credentials uses matches the URLs in this attribute. When adding URLs to this attribute:
 - Place each URL on a new line.
 - The URL endpoint being used must start with one of the URLs provided here.See field-level Help for examples.
 - e. **Prompt On Install** - Choose whether prompts for this credential display when the application is imported on another Oracle Application Express instance.
 - f. **Comments** - Enter any comments or notes here. These comments never display when running the application.
7. For the Authentication Type, **OAuth2 Client Credentials Flow**:

- a. **OAuth Scope** - Permissions represented by the Access Token in OAuth 2.0 terms are known as scopes. The scope parameter allows the application to express the desired scope of the access request.

If your authentication server requires a scope to be specified for the access token request, provide it here. The OAuth2 access token will then be requested with the following request body:

```
grant_type=client_credentials&scope={scope}
```

- b. **Client ID or User Name** - Enter the Client ID. Application Express does not store this information encrypted.
- c. **Client Secret or Password** - Enter the Secret again, to verify your input.
- d. **Valid for URLs** - Application Express checks whether the URL a Web credentials uses matches the URLs in this attribute. When adding URLs to this attribute:
 - Place each URL on a new line.
 - The URL endpoint being used must start with one of the URLs provided here.See field-level Help for examples.
- e. **Prompt On Install** - Choose whether prompts for this credential display when the application is imported on another Oracle Application Express instance.

- c. Click **Web Credentials**.
 - From Shared Components:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Security, select **Web Credentials**.
 2. On the Web Credentials page, select the credential name.
The Create/Edit page appears.
 3. To edit a credential:
 - a. Edit the appropriate attributes. To learn more about an attribute, see field level Help.
 - b. To save your changes, click **Apply Changes**.
 4. To delete a credential:
 - a. To delete a credential, click **Delete**.
 - b. When prompted, click **OK**.

 **Tip:**

A credential cannot be deleted when it is being referenced somewhere in the workspace.

17.6.4 Viewing Credential Utilization

View the Web credential Utilization report.

1. To view Web credential Utilization report:
 1. Navigate to the Web Credentials page:
 - From Workspace Utilities:
 - a. On the Workspace home page, click **App Builder**.
 - b. Click **Workspace Utilities**.
 - c. Click **Web Credentials**.
 - From Shared Components:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Security, select **Web Credentials**.
 2. On the Web Credentials page, click **Utilization**.

The top of the Utilization page displays used credentials, the associated component type, and the component name. Unused credentials display at the bottom of the page.

3. To delete unused credentials, click **Delete Unused**.

17.6.5 Viewing Credential History

View the Web credential History report.

1. To view Web credential History report:
 1. Navigate to the Web Credentials page:
 - From Workspace Utilities:
 - a. On the Workspace home page, click **App Builder**.
 - b. Click **Workspace Utilities**.
 - c. Click **Web Credentials**.
 - From Shared Components:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Security, select **Web Credentials**.
 2. On the Web Credentials page, click **History**.

The History page displays recent modifications made to Credentials in the current workspace.

17.7 Accessing Data with Database Links

Access data remotely by creating a database link.

- [About Database Links](#)
A database link is a schema object in one database that enables you to access objects on another database.
- [Creating a Database Link](#)
Create a database link in Object Browser.
- [Viewing an Existing Database Link](#)
View existing database links in Object Browser.

See Also:

- "Managing Database Objects with Object Browser" in *Oracle Application Express SQL Workshop Guide*
- "Database Links" in *Oracle Database Administrator's Guide*

17.7.1 About Database Links

A database link is a schema object in one database that enables you to access objects on another database.

Note:

By default, the CREATE DATABASE LINK system privilege is not granted to a provisioned workspace or database user. To use this feature, a DBA or administrator must grant this specific privilege to the database user in the user's workspace. See "Creating Database Links" in *Oracle Database Administrator's Guide*.

Because Oracle Application Express runs in the Oracle database, you have access to all distributed Oracle database capabilities. Typically, you perform distributed database operations using database links.

Once you create a database link you can access the remote objects by appending @dblink to the table or view name where dblink is the Database Link Name you specify in the Create Database Object Wizard.

17.7.2 Creating a Database Link

Create a database link in Object Browser.

1. To create a database link:
1. On the Workspace home page, click **SQL Workshop** and then **Object Browser**.
Object Browser home page appears.
2. Click **Create**.
3. Select **Database Link** and click **Next**.
4. Follow the on-screen instructions.

Note that Database Link names must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore.

17.7.3 Viewing an Existing Database Link

View existing database links in Object Browser.

To view an existing a database link:

1. On the Workspace home page, click **SQL Workshop** and then **Object Browser**.
Object Browser appears.
2. Select the object type **Database Links** at the top of the page.

Upgrading Application Express Applications

Installing a new release of Oracle Application Express, updates existing applications to the latest release, but does not alter application user interface or application components.

Once you upgrade an Oracle Application Express instance from a previous release, existing applications will work without modification. However, to keep applications maintainable, up-to-date, and to leverage new functionality, perform the following steps after an upgrade or after an application has been imported which was exported from a previous release.

 **Tip:**

At the completion of each task described in this section, Oracle recommends running and thoroughly testing your application.

- [Reviewing Release Notes](#)
After you upgrade from a previous Oracle Application Express release, review the *Oracle Application Express Release Notes*.
- [Refreshing the Universal Theme](#)
Update an application to use the latest Universal Theme to take advantage of new features, enhancements, and bug fixes as well as styling for new Application Express components.
- [Updating App Compatibility Mode](#)
The Compatibility Mode attribute controls the backward compatibility of the Application Express runtime engine when executing an application.
- [Running Application Upgrade](#)
After upgrading to a new release, the Application Upgrade wizard can help you to bulk update your application to leverage new features instead of deprecated ones or to automatically enable new functionality for existing components.
- [Reviewing Old JavaScript](#)
For applications using jQuery Migrate or legacy JavaScript, review the User Interface, JavaScript settings.

 **See Also:**

Upgrading from a Previous Oracle Application Express Release in *Oracle Application Express Installation Guide*

18.1 Reviewing Release Notes

After you upgrade from a previous Oracle Application Express release, review the *Oracle Application Express Release Notes*.

Oracle Application Express Release Notes contain important information not included in the Oracle Application Express documentation. Key sections to review include:

- **Changed Behavior** - Describes changes in application and component behavior compared to previous releases.
- **Deprecated Features** - Lists features which Oracle plans to desupport or remove in a future Oracle Application Express release. If a feature is related to application metadata or an API, existing applications can still use the feature, but Oracle strongly recommends that developers start to modify their applications as described in this section. Use Application Express Advisor to scan existing applications for deprecated attributes.
- **Deprecated in Previous Releases** - Lists features which were deprecated in a previous release but have not been fully removed or desupported from Oracle Application Express. Oracle strongly recommends that developers start to modify their applications as described in this section. Run Oracle Application Express Advisor to scan existing applications for deprecated attributes.
- **Desupported Features** - Lists features that are no longer available. If a desupported feature is related to application metadata or APIs, then existing applications may not work as they did previously. Oracle recommends modifying the application to replace the feature.



See Also:

[Running Advisor to Check Application Integrity](#)

18.2 Refreshing the Universal Theme

Update an application to use the latest Universal Theme to take advantage of new features, enhancements, and bug fixes as well as styling for new Application Express components.



Tip:

Before starting this procedure, Oracle recommends backing up your application by either exporting it or creating a copy. See [Exporting an Application](#) and [Copying a Database Application](#).

1. To update an application to use the latest Universal Theme
1. Navigate to the Themes page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.

If the Universal Theme is not up-to-date, the Shared Components page displays a banner at the top of the page.

2. Click **Refresh Theme**.

3. Run and test your application.

**See Also:**

[Updating Universal Theme](#) page in the [Universal Theme application](#)

18.3 Updating App Compatibility Mode

The Compatibility Mode attribute controls the backward compatibility of the Application Express runtime engine when executing an application.

Certain runtime behaviors change from release to release. To not break or change the behavior of existing applications, this attribute is automatically set during upgrade if necessary.

To keep applications maintainable, set **Compatibility Mode** to the latest release after reviewing the changed behavior in the Release Notes and making the necessary changes.

To update the Compatibility Mode within an application:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.

The Application home page appears.

The screenshot displays the Oracle APEX App Builder interface for 'Application 489'. The top navigation bar includes 'APEX', 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery'. Below the navigation, the application name 'Application 489' is shown with a search icon and a 'Go' button. The main content area is titled 'Application 489 - Projects' and features a grid of icons for 'Run Application', 'Supporting Objects', 'Shared Components', 'Utilities', and 'Export / Import'. A red box highlights the 'Edit Application Properties' button in the top right corner of the main area. The right sidebar contains an 'About' section, a 'Tasks' section with links like 'Delete this Application', 'Copy this Application', 'Manage Backups', and 'Browse by Facets', and a 'Recently Edited Pages' section showing '1. Home'.

3. From Application home page, you can access the Edit Application Definition page in two ways:

- Click the **Edit Application Properties** button.
- From Shared Components:
 - Click **Shared Components**.
 - Under Application Logic, click **Application Definition Attributes**.

The Edit Application Definition page appears.

4. Click the **Definition** tab.
5. **Properties, Compatibility Mode** - To use standard behavior in an application, set the compatibility mode of the application to the current version.
6. Click **Apply Changes** to save your changes.
7. Run and test your application.



See Also:

Compatibility Mode in *Oracle Application Express Release Notes* to learn more about Compatibility Mode changes in various releases.

18.4 Running Application Upgrade

After upgrading to a new release, the Application Upgrade wizard can help you to bulk update your application to leverage new features instead of deprecated ones or to automatically enable new functionality for existing components.

The Upgrade Application page displays the available upgrade types and the number of objects that can be upgraded. Click on the number under **Candidate Object** to review the candidates and upgrade.

To upgrade an application to use new components:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
3. Select an application.

The Application home page appears.

4. Click **Utilities**.
5. Click **Upgrade Application**.

The Upgrade Application page appears displaying the available upgrade types and the number of objects that can be upgraded.

6. To review the candidate objects, click the number link under the **Candidate Objects** column.
7. On the Upgrade page, select the objects to upgrade and click **Upgrade**.
8. Run and test your application.

18.5 Reviewing Old JavaScript

For applications using jQuery Migrate or legacy JavaScript, review the User Interface, JavaScript settings.

If your application uses jQuery Migrate or legacy JavaScript, review this logic to determine if it is still necessary. Removing this dependency benefits the application by not only ensuring you are only reliant on current, supported technology, but also a performance benefit because Oracle Application Express will not need to load the corresponding library code.

jQuery 3.x breaks compatibility with earlier 2.x versions. For applications that still rely on removed 2.x functionality, you can use the jQuery Migrate plug-in (to include this plug-in, set the Desktop User Interface Details attribute **Include jQuery Migrate to Yes**).

If your application relies on removed 1.x jQuery APIs, that functionality no longer works as of Oracle Application Express release 18.1. You must update the JavaScript to only use jQuery 3.1 (or greater) APIs. In addition, jQuery UI 1.12.x has changed the folder structure and files that make up the library compared to version 1.10.4. To learn more, see Known Issues for jQuery UI and jQuery Upgrade in *Oracle Application Express Release Notes*.

To review the User Interface, JavaScript settings:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.

The Application home page appears.

3. From Application home page, you can access the Edit Application Definition page in two ways:
 - Click the **Edit Application Properties** button.
 - From Shared Components:
 - Click **Shared Components**.
 - Under Application Logic, click **Application Definition Attributes**.

The Edit Application Definition page appears.

4. Click the **User Interface** tab.
5. Edit the following settings:
 - a. **JavaScript, Include Deprecated or Desupported Javascript Functions** - Specifies if deprecated or desupported JavaScript functions are included on every page in the application by selecting the appropriate releases. See the Oracle Application Express Release Notes for a list of deprecated and desupported functions.

Tip:

If you are confident your application does not contain any references to deprecated or desupported functions, do not select any checkboxes to reduce the overall size of the JavaScript files loaded

- b. **JavaScript, Include jQuery Migrate** - Specifies if the **jQuery Migrate** plug-in should be included on every page in the application.

The plug-in restores deprecated features and behaviors of jQuery so that old JavaScript code and jQuery plug-ins will still run properly with the jQuery version loaded by Application Express.

 **Tip:**

If you are confident your application does not use a jQuery plug-in and does not contain any references to deprecated jQuery features, disable **Include jQuery Migrate** to reduce the overall size of the JavaScript files loaded.

6. Click **Apply Changes** to save your changes.
7. Run and test your application.

19

Extending Application Capabilities

Learn about how to extend application capabilities including managing email, running background PL/SQL, utilizing plug-ins, and understanding jQuery support.

- [Sending Email from an Application](#)
To configure and manage email in Oracle Application Express, an Instance administrator must sign in to Oracle Application Express Administration Services.
- [Implementing Plug-ins](#)
Create plug-ins to declaratively extend, share, and reuse the built-in types available with Oracle Application Express.
- [Understanding jQuery and jQuery UI Support](#)
Oracle Application Express includes the jQuery 3.5.1 and jQuery UI 1.12.x.
- [Manually Refreshing Oracle Application Express Components](#)
Use the `apex.region().refresh()` method to refresh the content of a region that supports being refreshed.



See Also:

- [Oracle Application Express API Reference](#)
- ["Deploying an Application"](#)

19.1 Sending Email from an Application

To configure and manage email in Oracle Application Express, an Instance administrator must sign in to Oracle Application Express Administration Services.

- [About Configuring Email](#)
To enable Oracle Application Express to send email, an Instance administrator must configure email settings.
- [About Email Provisioning](#)
You can configure Oracle Application Express to automatically email users their login credentials when a new workspace request has been approved. To accomplish this, you must complete the email configuration process and select the provisioning status, Request with Email Verification.
- [About the Mail Queue](#)
Instance administrators can manage email sent from applications by monitoring email messages in the mail queue and mail log.
- [About the APEX_MAIL Package](#)
You can send email from an Oracle Application Express application using the `APEX_MAIL` package.

19.1.1 About Configuring Email

To enable Oracle Application Express to send email, an Instance administrator must configure email settings.

- [About Enabling Network Services](#)
- [About Configuring Email in a Full Development Environment](#)



See Also:

"Configuring Email" in *Oracle Application Express Administration Guide*

19.1.1.1 About Enabling Network Services

Enabling network services enables support for sending outbound mail in Oracle Application Express, use of Web services in Oracle Application Express, and PDF report printing.

By default, the ability to interact with network services is disabled in Oracle Database 11g Release 2 or later. Therefore, if you are running Oracle Application Express with Oracle Database 11g Release 2 or later, you must use the new `DBMS_NETWORK_ACL_ADMIN` package to grant connect privileges to any host for the `APEX_210100` database user. Failing to grant these privileges results in issues with:

- Sending outbound mail in Oracle Application Express.
Users can call methods from the `APEX_MAIL` package, but issues arise when sending outbound email.
- Using Web services in Oracle Application Express.
- PDF/report printing.



See Also:

- ****Enabling Network Services in Oracle Database 11g or Later in *Oracle Application Express Installation Guide*:**
- "Configuring Email" in *Oracle Application Express Administration Guide*

19.1.1.2 About Configuring Email in a Full Development Environment

To configure Oracle Application Express to send mail in a full development environment your Instance administrator must sign in to Oracle Application Express Administration Services, navigate to the Instance Settings page and configure Email attributes.



See Also:

"Configuring Email" in *Oracle Application Express Administration Guide*

19.1.2 About Email Provisioning

You can configure Oracle Application Express to automatically email users their login credentials when a new workspace request has been approved. To accomplish this, you must complete the email configuration process and select the provisioning status, Request with Email Verification.



See Also:

- "Configuring Email" in *Oracle Application Express Administration Guide*
- "About Specifying How Workspaces Are Created" in *Oracle Application Express Administration Guide*
- "Selecting a Provisioning Mode" in *Oracle Application Express Administration Guide*

19.1.3 About the Mail Queue

Instance administrators can manage email sent from applications by monitoring email messages in the mail queue and mail log.



See Also:

"Managing the Mail Queue" in *Oracle Application Express Administration Guide*

19.1.4 About the APEX_MAIL Package

You can send email from an Oracle Application Express application using the `APEX_MAIL` package.

The `APEX_MAIL` package is built on top of the Oracle supplied `UTL_SMTP` package. Because of this dependence, the `UTL_SMTP` package must be installed and functioning to use `APEX_MAIL`.

 **See Also:**

- "APEX_MAIL" in *Oracle Application Express API Reference*
- "Configuring Email" in *Oracle Application Express Administration Guide*

19.2 Implementing Plug-ins

Create plug-ins to declaratively extend, share, and reuse the built-in types available with Oracle Application Express.

- [About Plug-ins](#)
- [Accessing the Plug-ins Page](#)
- [Creating a Plug-in](#)
- [Editing a Plug-in](#)
- [Adding Custom Attributes to a Plug-in](#)
- [Uploading Files Associated with a Plug-in](#)
- [Adding Events to a Plug-in](#)
- [Deleting a Plug-in](#)
- [Viewing the Plug-in Repository](#)
- [Exporting a Plug-in from the Plug-in Page](#)
- [Importing a Plug-in from the Plug-in Page](#)
- [Resetting the Plug-in Interactive Report](#)
- [Viewing Plug-in Utilization Page](#)
- [Viewing Plug-in History](#)

19.2.1 About Plug-ins

Oracle Application Express supports a set group of authentication scheme, authorization scheme, item, region, dynamic action, and process types. Plug-ins offer a means of augmenting these built-in types by declaratively creating and using new types in your application. Because plug-ins are designed for reuse, developers can export and import them to other workspaces and also share them with the Oracle Application Express Plug-in community by using the Plug-in Repository.

The process of implementing a plug-in involves the following steps:

1. Create a plug-in or import a plug-in into your application workspace.
2. Edit or create an authorization scheme, item, region, process, or dynamic action type to use the plug-in.
3. Run your application to test the plug-in.

Viewing Plug-in Examples

You can view plug-in implementation examples in the following locations:

- [APEX World Plug-ins](#)
- [Sample Plug-ins](#)

19.2.2 Accessing the Plug-ins Page

To access the Plug-ins page

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.

The Shared Components page appears.

2. Under Other Components, click **Plug-ins**.

The Plug-ins page displays with the Plug-ins tab selected by default. All available plug-ins appear.

You can customize the appearance of the page using the Search bar at the top of the page.

19.2.3 Creating a Plug-in

To create a plug-in:



Tip:

To learn more about an attributes described in this section see field-level Help. See "[Viewing Field-level Help in Oracle Application Express](#)."

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.The Shared Components page appears.
2. Under Other Components, click **Plug-ins**.
3. Click **Create**.

The Create Plug-in wizard appears.
4. For Create Plug-in, select the method by which you would like to create a plug-in and click **Next**.
5. Under Name:
 - a. Name (Required) - Enter name of the plug-in.
 - b. Internal Name (Required) - Enter the internal name of the plug-in. This name must be unique within the current application.

12. For Help Text, enter help text used by the user to understand how the plug-in works.
13. For Comments, enter comments and notes that never display when the application is running.

To learn more about each option, see field-level Help.

14. Click **Create. Plug-in**.

Now that the plug-in is created, you can specify additional custom attributes, upload files such as image, CSS and JavaScript files to associate with your plug-in and add events.

See Also:

- ["Adding Custom Attributes to a Plug-in"](#)
- ["Uploading Files Associated with a Plug-in"](#)
- ["Adding Events to a Plug-in"](#)

19.2.4 Editing a Plug-in

To edit a plug-in:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.

The Shared Components page appears.

2. Under Other Components, click **Plug-ins**.
3. Click the plug-in you want to edit or view.

The Plug-in Create/Edit page appears.

4. Make modifications.

To learn more about each option, see field-level Help.

5. Click **Apply Changes**.

19.2.5 Adding Custom Attributes to a Plug-in

Custom Attributes specified by the developer might contain items referenced with substitution syntax.

To add custom attributes to the plug-in:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.

The Shared Components page appears.

2. Under Other Components, click **Plug-ins**.
3. Click the plug-in you want to modify.
The Plug-in Create/Edit page appears.
4. Under Custom Attributes, enable or disable the substitution of attribute values.
 - **Substitute Attribute Values** - Custom attribute values specified by the developer might contain items referenced with substitution syntax, for example `&P1_DNAME`.

If set to **On**, Application Express automatically replaces substitution syntax with their actual values.

If set to **Off**, substitution syntax is written unchanged into the `attribute_01` through `attribute_15` record type attributes of `p_plugin`, `p_item`, `p_region`, and so on. The plug-in developer is responsible for replacing those substitution syntax references with a call to `apex_plugin_util.replace_substitutions` or perform similar replacements. See item help for further details.

To learn more, see field-level Help.
5. To add an attribute click **Add Attribute**.
The Edit Attribute page appears. Edit the appropriate attributes.
To learn more about a specific attribute, see field-level Help.
6. Click **Create** to create the attribute and go back to the Edit page, or click **Create and Create Another** to create the attribute and continue to create another attribute.

**Note:**

If you click **Create** or **Create and Create Another** and the **Return To Page** check box on the right panel under Plug-ins is checked, this same Edit Attribute page displays.

19.2.6 Uploading Files Associated with a Plug-in

Learns how to upload the files associated with a plug-in.

- [Uploading a File to Associate with a Plug-in](#)
- [Automatically Loading CSS and JavaScript Files](#)

19.2.6.1 Uploading a File to Associate with a Plug-in

To upload a file:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.

The Shared Components page appears.

2. Under Other Components, click **Plug-ins**.
3. Select the plug-in.

The Plug-in Create/Edit page appears.

4. Locate the **Files** section.

File Prefix determines the virtual path the Web server uses to point to the files of the plug-in. Do not specify anything to reference files which are stored with your plug-in definition in the database.

5. To upload a file:
 - a. Click **Upload File**.
 - b. Browse to and select the file you want to upload.
 - c. Click **Upload**.

The Create/Edit page appears. The name of the uploaded file appears under Files.

6. Click **Apply Changes**.

19.2.6.2 Automatically Loading CSS and JavaScript Files

You can have Oracle Application Express automatically load CSS and JavaScript files when a plug-in is used on a page by configuring the File URLs to Load attributes. To specify which of the uploaded files should be loaded and in what order.

To automatically load a CSS or JavaScript file:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.

The Shared Components page appears.

2. Under Other Components, click **Plug-ins**.
3. Select the plug-in.

The Plug-in Create/Edit page appears.

4. Under File URLs to Load:
 - a. Cascading Style Sheet - Enter Cascading Style Sheet file URLs to be loaded with this plug-in.
 - b. JavaScript - Enter JavaScript file URLs for code to be loaded with this plug-in.

You can substitute with the value of the plug-in's file prefix by using substitution string `#PLUGIN_FILES#`. For example:

```
#PLUGIN_FILES#my_plugin.css
```

To learn more and view examples, see field-level Help.

5. Click **Apply Changes**.

19.2.7 Adding Events to a Plug-in

This section describes how to add events to an item, region, or dynamic action type plug-in, enables them to be exposed to dynamic actions. For example, a Slider plug-in that exposes events such as Start Slide, Sliding, and Stop Slide, allows the creation of dynamic actions that can react when these events occur.

To add events to a plug-in:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, click **Plug-ins**.
3. Click the plug-in you want to edit.
The Plug-in Create/Edit page appears
4. Under Events and click **Add Event**.
A new row displays under Events.
5. Under Events:
 - a. Name - The display name under which the plug-in event appears in the dynamic action, for example: `Start Slide`.
 - b. Internal Name - The name of the assigned JavaScript event that triggers the dynamic action, for example: `slidestart`.
6. Click **Add Event**.
7. Repeat steps 3 through 4 to add another event.
8. Click **Apply Changes**.



See Also:

["Accessing the Plug-ins Page"](#)

19.2.8 Deleting a Plug-in

You can delete a plug-in if it is not in use. If it is in use, the Delete button does not display.

To delete a plug-in:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.

- c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, click **Plug-ins**.
3. Click the plug-in you want to delete.
The Plug-in Create/Edit page appears.
4. Click **Delete**.
5. To confirm, click **OK**.

19.2.9 Viewing the Plug-in Repository

The Plug-in Repository provides a central location where developers can share and download plug-ins. The repository is located on the Oracle Technology Network.

To view the Plug-in repository:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, click **Plug-ins**.
3. Click **View Plug-in Repository**.
The Oracle Application Express Plug-in Repository displays.

19.2.10 Exporting a Plug-in from the Plug-in Page

Use this option to export a plug-in definition to a file. This file can be imported into any Oracle Application Express application. You can access the Export page from the Shared Components, Plug-ins page, as described here, or from the Export page.

1. To export a plug-in from the Plug-in page:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Other Components, click **Plug-ins**.
 3. Under Tasks, click **Export Plug-in**.
The Export Plug-in page appears.
 4. On the **Export Plug-in** page:
 - a. **Choose Application** - Select an application
 - b. **Plug-in** - Select the plug-in to export.
 - c. Click **Export**.

5. Click **Export**.
A downloads complete message appears.

**See Also:**

- ["Importing a Plug-in from the Plug-in Page"](#)
- ["Exporting Plug-ins"](#)

19.2.11 Importing a Plug-in from the Plug-in Page

Use this option to import an Plug-in Export-in to your application. Importing a plug-in can be done from the Shared Components, Plug-ins page, as described here, or from the Import home page.

1. To import a plug-in from the Plug-in page:
 1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 2. Under Other Components, click **Plug-ins**.
 3. Click **Import**.
The import Plug-in page appears.
 4. On Import:
 - a. Drag and drop, or navigate to the file.
 - b. **File Type** - Select **Plug-in**.
 - c. **File Character Set** - Verify that File Character Set is correct.
 - d. Click **Next**.
Once you import a file, you have the option to install it. You can also install this file at a later time by navigating to the Export Repository.
 5. To install an imported file, click **Next**.
 6. On Install:
 - a. **Install Into Application** - Select the target application. You can install the plug-in into the same application or into a different application.

 **Tip:**

When you install a plug-in into the current application, the new plug-in will overwrite an existing plug-in having the same plug-in name. If the installation succeeds, the installation of the plug-in becomes permanent. If any errors are encountered, the actions are rolled back, resulting in no permanent changes.

- b. Click **Install Plug-in**.

 **See Also:**

"Importing Plug-ins"

19.2.12 Resetting the Plug-in Interactive Report

You can reset the plug-in interactive report to clear all current filters applied to the report.

To reset the interactive report:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, click **Plug-ins**.
3. On the Plug-ins page, click **Reset**.

19.2.13 Viewing Plug-in Utilization Page

The Plug-in Utilization page displays which pages, components, and regions use each plug-in.

To view plug-in utilization:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Other Components, click **Plug-ins**.
3. Click **Utilization**.
The Utilization page appears.

19.2.14 Viewing Plug-in History

The Plug-in History page shows the actions taken on each plug-in, the developer that performed the action and the date of each action.

To view plug-in history:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.

The Shared Components page appears.

2. Under Other Components, click **Plug-ins**.
3. Click **History**.

The History page appears.

19.3 Understanding jQuery and jQuery UI Support

Oracle Application Express includes the jQuery 3.5.1 and jQuery UI 1.12.x.

- [About Upgrading to jQuery 3.5.1](#)
- [About Upgrading to jQuery UI 1.12.x](#)

19.3.1 About Upgrading to jQuery 3.5.1

jQuery 3.x breaks compatibility with earlier 2.x versions. If your application relies on removed jQuery 2.x functionality, you can use the jQuery Migrate plug-in. To include the jQuery Migrate plug-in, go to the User Interface page and set **Include jQuery Migrate** to **On**.

If your application relies on removed 1.x jQuery APIs, be aware that this functionality no longer works as of Oracle Application Express release 18.1. You must update the JavaScript to only use jQuery 3.5+ APIs. See the jQuery migration guides to learn more:

- To migrate from 1.x to 2.x, see <http://jquery.com/upgrade-guide/1.9/>
- To migrate from 2.x to 3.5.x, see <https://jquery.com/upgrade-guide/3.5/>



See Also:

["Accessing the User Interface Page"](#)

19.3.2 About Upgrading to jQuery UI 1.12.x

jQuery UI 1.12.x has changed the folder structure and files that make up the library compared to jQuery UI 1.10.4. If you have direct references to any of the old file

filenames, you must update them to the new name. For example, if you previously referenced the tabs widget with `#JQUERYUI_DIRECTORY#ui/#MIN_DIRECTORY#jquery.ui.tabs#MIN#.js`, you must change it to `#JQUERYUI_DIRECTORY#ui/widgets/#MIN_DIRECTORY#tabs#MIN#.js`.

The Oracle Application Express specific bundle `jquery-ui-apex[.min].js` that loads by default for Application Express desktop UI pages (either as `jquery-ui-apex.js` or as part of `desktop[_all].min.js`) includes all the core files, the drop effect, and the following widgets:

- button
- checkboxradio
- controlgroup
- datepicker
- dialog
- draggable
- droppable
- resizable
- selectable
- sortable
- tooltip

This is essentially the same set as in 1.10.4 with the addition of sortable. If you have a separate reference to sortable, you can remove it.

19.4 Manually Refreshing Oracle Application Express Components

Use the `apex.region().refresh()` method to refresh the content of a region that supports being refreshed.

Although the Dynamic Action framework provides refresh capability for supported Oracle Application Express components, there may be cases where you wish to manually invoke a refresh from JavaScript code. To do this, use the `apex.region().refresh()` method as follows:

```
apex.region("myRegionStatidID").refresh();
```

Managing Application Security

Administrators are primarily responsible for ensuring the security of the Oracle Application Express installation and developers are responsible for building secure applications. Learn about how to implement best practices for Oracle Application Express application security.

 **Note:**

To ensure the security and performance of your development environment, some Administration Services functionality is not available in Application Express instances running in Oracle Cloud.

- [Understanding Administrator Security Best Practices](#)
Learn about security best practices for Oracle Application Express administrators.
- [Understanding Developer Security Best Practices](#)
Learn about security best practices for Oracle Application Express developer.
- [Controlling Access to Applications, Pages, and Page Components](#)
Control access to an application, individual pages, or page components by creating an access control list.
- [Establishing User Identity Through Authentication](#)
Use authentication to establish a user's identity to control access to an application. Authentication may require a user identify a user name and password or could involve the use of digital certificates or a secure key.
- [Providing Security Through Authorization](#)
Extend the security of your application by creating an authorization scheme.

 **See Also:**

["Running Advisor to Check Application Integrity"](#)

20.1 Understanding Administrator Security Best Practices

Learn about security best practices for Oracle Application Express administrators.

 **Note:**

To ensure the security and performance of your development environment, some Administration Services functionality is not available in Application Express instances running in Oracle Cloud.

This section references many settings in the Oracle Application Express Administration Services application.

- [About Oracle Application Express Administrator Roles](#)
Oracle Application Express includes two different types of administrators: Workspace administrators and Instance administrators.
- [Web Listener Security Considerations](#)
Review Oracle REST Data Services security considerations.
- [Managing Instance Security](#)
Learn about security best practices when managing an Oracle Application Express instance.
- [Configuring Instance Settings](#)
Security best practices when configuring an Oracle Application Express instance include determining whether to automate the creation workspaces., enabling and configuring email, configuring storage options, and creating wallets.
- [About Configuring Workspace Purge Settings](#)
Save storage space and improve system performance by purging inactive workspaces.
- [Understanding Workspace Management](#)
Instance administrators can define associations between workspaces and schemas. Administrators can manage developers and users at the workspace or instance-level and control user access to key components such as App Builder, Team Development, and SQL Workshop, and PL/SQL editing.
- [About Integrating with Oracle BI Publisher](#)
Oracle recommends that you employ Secure Sockets Layer (SSL) when integrating Oracle Application Express with Oracle BI Publisher. Once SSL (HTTPS protocol) is configured for your Oracle BI Publisher server, you must create a wallet and specify the HTTPS protocol for the Report Server in the internal administration Environment Settings.
- [About the Advantages of the Application Express Runtime Environment](#)
An Oracle Application Express runtime environment enables you to run production applications, but does not provide a web interface for administration or direct development of these applications.
- [Enabling Network Services in Oracle Database 11g or Later](#)
You must enable network services in Oracle Database 11g or later versions to send outbound mail, use Web services, or use PDF report printing in Oracle Application Express.



See Also:

["Understanding Developer Security Best Practices"](#)

20.1.1 About Oracle Application Express Administrator Roles

Oracle Application Express includes two different types of administrators: Workspace administrators and Instance administrators.

To access the Oracle Application Express development environment, users sign in to a shared work area called a workspace. **Workspace administrators** are users who perform administrator tasks specific to a workspace such as managing user accounts, monitoring workspace activity, and viewing log files. **Instance administrators** are superusers that manage an entire hosted instance using the Application Express Administration Services application.

 **Tip:**

The role of Instance administrator is not available in Oracle Database Cloud Service (Database Schema).

 **See Also:**

"Workspace and Application Administration" and "Oracle Application Express Administration Services" in *Oracle Application Express Administration Guide*

20.1.2 Web Listener Security Considerations

Review Oracle REST Data Services security considerations.

- [About Configuring Oracle REST Data Services with Oracle Application Express](#)
Oracle Application Express requires access to the Web listener, Oracle REST Data Services

20.1.2.1 About Configuring Oracle REST Data Services with Oracle Application Express

Oracle Application Express requires access to the Web listener, Oracle REST Data Services

Oracle REST Data Services (formerly known as Oracle Oracle Application Express Listener) is a J2EE application which communicates with the Oracle Database by mapping browser requests to the Application Express engine database over a SQL*Net connection. In a production environment, you deploy Oracle REST Data Services web archive files to a supported Java EE application server, like Oracle Web Logic Server. Each deployment can be configured individually and serves the same purpose as a `mod_plsql` Database Access Descriptor, which is to communicate with an Oracle database.

An Oracle REST Data Services deployment configuration contains several security related parameters. In a configuration for Oracle Application Express, Oracle recommends to set the parameter `security.requestValidationFunction` to `wwv_flow_epg_include_modules.authorize`. This activates the white list of callable procedures which ships with Oracle Application Express and prohibits calls to other procedures. This can be extended using the validation functions shipped with Oracle Application Express.

20.1.3 Managing Instance Security

Learn about security best practices when managing an Oracle Application Express instance.

Note:

To ensure the security and performance of your development environment, this functionality is not available in Application Express instances running in Oracle Cloud.

- [About Creating Login Controls](#)
Administrators can configure login controls for an entire instance or for individual workspaces.
- [About Enabling Public File Upload](#)
Administrators can use the Allow Public File Upload attribute to control whether unauthenticated users can upload files in applications that provide file upload capability
- [About Restricting User Access by IP Address](#)
Administrators can restrict user access to an Oracle Application Express instance by entering a comma-delimited list of allowable IP addresses in the Restrict Access by IP Address attribute on the Manage Instance, Security page.
- [About Specifying an Instance Proxy](#)
Administrators can use the Instance Proxy attribute to configure an entire Oracle Application Express instance to use a proxy for all outbound HTTP traffic.
- [About Utilizing Secure Sockets Layer](#)
Secure Sockets Layer (SSL) is a protocol for managing the security of data transmitted on the Internet. For web applications, SSL is implemented by using the HTTPS protocol. Oracle recommends that you run Oracle Application Express applications using SSL (HTTPS protocol) to prevent any sensitive data from being sent over an unencrypted (cleartext) communication channel.
- [About Enabling RESTful Access](#)
Administrators can use the Allow RESTful Access attribute to control whether developers can expose report regions as RESTful services.
- [About Rejoin Sessions](#)
Use the Rejoin Sessions attribute to control if Oracle Application Express supports application URLs that do not contain session IDs.
- [About Isolating Workspaces](#)
Isolating workspaces is an effective approach to preventing browser attacks.
- [About Utilizing Session Timeout](#)
Configure Session Timeout attributes to reduce your application's exposure.
- [Restricting Password Reuse](#)
Site administrators can restrict password reuse for all administrator, developer, and end-user accounts based on a history of passwords previously used for the accounts.

- [About Enabling RESTful Services](#)
Administrators can control the ability to create and access RESTful Services at either the workspace or instance-level.



See Also:

"Configuring Security" in *Oracle Application Express Administration Guide*

20.1.3.1 About Creating Login Controls

Administrators can configure login controls for an entire instance or for individual workspaces.

Workspace administrators and developers can create user accounts for the purpose of logging in to the Oracle Application Express development environment and for end-user authentication to applications developed within their workspaces.

Administrators can configure login controls at the instance or workspace level. For example, if an Instance administrator configures account login controls in Oracle Application Express Administration Services that configuration applies to all Application Express accounts in all workspaces across an entire development instance.

If the Instance administrator does *not* enable login controls across an entire instance, then each Workspace administrator can enable the following controls on a workspace-by-workspace basis:

- End-user account expiration and locking.
- A maximum number of failed login attempts for end-user accounts.
- The password lifetime (or number of days an end-user account password can be used before it expires for end-user accounts).



See Also:

"Managing Workspace Account Login Controls" and in "Configuring Authentication Controls for an Instance" in *Oracle Application Express Administration Guide*

20.1.3.2 About Enabling Public File Upload

Administrators can use the Allow Public File Upload attribute to control whether unauthenticated users can upload files in applications that provide file upload capability



See Also:

"Controlling Public File Upload" in *Oracle Application Express Administration Guide*

20.1.3.3 About Restricting User Access by IP Address

Administrators can restrict user access to an Oracle Application Express instance by entering a comma-delimited list of allowable IP addresses in the Restrict Access by IP Address attribute on the Manage Instance, Security page.

 **See Also:**

"Restricting User Access by IP Address" in *Oracle Application Express Administration Guide*

20.1.3.4 About Specifying an Instance Proxy

Administrators can use the Instance Proxy attribute to configure an entire Oracle Application Express instance to use a proxy for all outbound HTTP traffic.

Setting a proxy at the instance-level supersedes any proxies defined at the application-level or in web service references. If a proxy is specified, regions of type URL, Web services, and report printing will use the proxy.

 **See Also:**

"Configuring a Proxy Server for an Instance" in *Oracle Application Express Administration Guide*

20.1.3.5 About Utilizing Secure Sockets Layer

Secure Sockets Layer (SSL) is a protocol for managing the security of data transmitted on the Internet. For web applications, SSL is implemented by using the HTTPS protocol. Oracle recommends that you run Oracle Application Express applications using SSL (HTTPS protocol) to prevent any sensitive data from being sent over an unencrypted (cleartext) communication channel.

Instance administrators can configure both their Oracle Application Express instance and all related applications to require HTTPS by configuring the **Require HTTPS** and **Require Outbound HTTPS** attributes. Configuring these attributes forces authenticated pages within the App Builder to require HTTPS which encrypts network communications. Changing the Require HTTPS option does not affect the web server in any way. You will still need to enable the web server for HTTPS for these options to have any meaning. To learn more about enabling HTTPS, see the documentation for your specific web server.

Require HTTPS options include:

- **Always** - Enforces HTTPS for all applications (including the Oracle Application Express development and administration applications) to require HTTPS.

- **Development and Administration** - Forces all internal applications within Oracle Application Express (that is, App Builder, SQL Workshop, Instance Administration and so on) to require HTTPS.
- **Application specific** - Makes HTTPS dependent on application-level settings.



See Also:

"Configuring HTTP Protocol Attributes" in *Oracle Application Express Administration Guide*

20.1.3.6 About Enabling RESTful Access

Administrators can use the Allow RESTful Access attribute to control whether developers can expose report regions as RESTful services.



See Also:

"Enabling RESTful Services for an Instance" in *Oracle Application Express Administration Guide*

20.1.3.7 About Rejoin Sessions

Use the Rejoin Sessions attribute to control if Oracle Application Express supports application URLs that do not contain session IDs.



Tip:

For security reasons, Oracle recommends that administrators disable Rejoin Sessions unless they implement workspace isolation by configuring the Allow Hostname attribute at the workspace or instance-level. See "[About Isolating Workspaces](#)."

When rejoin sessions is enabled, Oracle Application Express attempts to use the session cookie to join an existing session, when a URL does not contain a session ID. To use Rejoin Sessions, administrators must enable Rejoin Sessions at the application or page-level. Note that a more restrictive value of Rejoin Sessions at the instance-level overrides application and page settings.

While supporting session joins is convenient, it does present some serious security risks:

- **Triggering malicious session state changes or other modifications.**

If an attacker tricks the user into clicking an application link, this can trigger malicious session state changes or other modifications. Because of this risk, Application Express requires a checksum that the attacker will not be able to guess when processing requests that alters data.

- **Triggering unintended changes between applications.**

If a user has two applications open in separate tabs on the same Oracle Application Express instance, one application could trigger unintended changes in the other one. The attacking application could be written by a hacker or it could have an XSS vulnerability that enables an attacker to inject code. This application could use Ajax calls that simulate user interactions with the other application.

 **See Also:**

- ["About Enabling Support for Bookmarks"](#)
- ["Session Management"](#)
- ["Configuring Rejoin Sessions for a Page "](#)
- ["Configuring Rejoin Sessions for an Instance" in *Oracle Application Express Administration Guide*](#)

20.1.3.8 About Isolating Workspaces

Isolating workspaces is an effective approach to preventing browser attacks.

The only way to truly isolate a workspace is to enforce different domains in the URL by configuring the Allow Hostnames attribute in Oracle Application Express Administration Services. When the URLs of the attacker and the victim have different domains and hostnames, the browser's same-origin policy prevents attacks.

Workspace isolation by configuring Allow Hostnames is a counter measure against client side attacks that attempt to cross workspace boundaries. This security measure is not necessary if you trust all applications that are accessible using the instance's host which includes applications that are written in other frameworks and languages such as Oracle Application Development Framework (ADF) and Java.

 **See Also:**

- [Isolating All Workspaces in an Instance in *Oracle Application Express Administration Guide*](#)
- [Isolating a Workspace to Prevent Browser Attacks in *Oracle Application Express Administration Guide*](#)

20.1.3.9 About Utilizing Session Timeout

Configure Session Timeout attributes to reduce your application's exposure.

Users often leave their computers unattended for extended periods and do not close applications before departing. Therefore, an unauthorized person can easily assume the user's identity within the application. By setting the session and idle timeout, users are automatically logged out of their application after the specified timeout.

Session Timeout attributes include:

- Maximum Session Length in Seconds
- Maximum Session Idle Time in Seconds
- Session Timeout Warning in Seconds
- Session Timeout URL (application-level setting)
- Idle Timeout URL (application-level setting)

Developers can configure session timeout for a specific application, or administrators can configure sessions timeout for a workspace or an entire instance.

See Also:

- "[Session Management](#)" to learn how to configure these attributes at an application-level.
- "Configuring Session Timeout for a Workspace" and "Configuring Session Timeout for an Instance" in *Oracle Application Express Administration Guide*

20.1.3.10 Restricting Password Reuse

Site administrators can restrict password reuse for all administrator, developer, and end-user accounts based on a history of passwords previously used for the accounts.

To restrict password reuse:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed having the `apex_administrator_role` role or as `SYS` specifying the `SYSDBA` role. For example:

- On Windows:

```
SYSTEM_DRIVE:\ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password
```

- On UNIX and Linux:

```
$ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password
```

Tip:

The `APEX_ADMINISTRATOR_ROLE` must be granted directly to a user and not through another database role.

2. Execute the following statement:

```
ALTER SESSION SET CURRENT_SCHEMA = APEX_210100;
```

3. Execute the following statement:

```
BEGIN
APEX_INSTANCE_ADMIN.SET_PARAMETER('PASSWORD_HISTORY_DAYS',365);
COMMIT;
END;
/
```

This restricts new or updated passwords to those that have not been used for the account for the previous 365 days. Recording of previously used passwords (actually, hashed representations of passwords) begins upon installation of Oracle Application Express.

4. To disable this feature, run the block above, providing 0 for the parameter value. For example:

```
BEGIN
APEX_INSTANCE_ADMIN.SET_PARAMETER('PASSWORD_HISTORY_DAYS',0);
COMMIT;
END;
/
```

See Also:

- [STRONG_PASSWORD_CHECK Procedure in Oracle Application Express API Reference](#)
- [STRONG_PASSWORD_VALIDATION Function in Oracle Application Express API Reference](#)

20.1.3.11 About Enabling RESTful Services

Administrators can control the ability to create and access RESTful Services at either the workspace or instance-level.

Disabling the **Enable RESTful Services** attribute prevents developers from creating and editing RESTful Web Services mapped to SQL and PL/SQL in conjunction with Oracle REST Data Services 2.0 or later.

To configure Enable RESTful Services:

- In Workspace Administration — Sign in to Oracle Application Express and click the **Administration** menu. Select **Manage Service, Set Workspace Preferences, SQL Workshop** and find the **Enable RESTful Services** attribute.
- In Instance Administration — Sign in to Oracle Application Express Administration Services. Under Instance Settings, click **Feature Configuration** and click **Feature Configuration**. Find the **REST** tab and then **Enable RESTful Services** attribute.

See Also:

"Enabling RESTful Services and Defining a Path Prefix for a Workspace" and "Enabling RESTful Services for an Instance" in *Oracle Application Express Administration Guide*

20.1.4 Configuring Instance Settings

Security best practices when configuring an Oracle Application Express instance include determining whether to automate the creation workspaces., enabling and configuring email, configuring storage options, and creating wallets.

Note:

To ensure the security and performance of your development environment, some Administration Services functionality is not available in Application Express instances running in Oracle Cloud.

- [About Enabling Automation When Creating Workspaces](#)
- [About Enabling and Configuring Email](#)
- [About Configuring Storage Options](#)
- [About Creating Wallets](#)

See Also:

"Configuring Instance Settings" in *Oracle Application Express Administration Guide*

20.1.4.1 About Enabling Automation When Creating Workspaces

Administrators determine the amount of automation when provisioning (or creating) new workspaces.

To determine how provisioning works, an Instance Administrator selects one of the following options on the Instance Settings page:

- **Manual** - An Instance administrator creates new workspaces and notifies the Workspace administrator regarding the Sign In credentials.
- **Request** - Users request a workspace. Once an administrator approves the request, the user receives an email containing an email verification link. After the user clicks the email verification link, the workspace is created.
- **Automatic** - Works similar to **Request** except requests are automatically approved with no administrator review required.

Note:

To enable users to request a workspace using a link on the Sign In page, the Instance administrator must choose either the **Request** or **Automatic** Provisioning Method and configure email. If the Provisioning Method is set to **Manual**, no link appears on the Sign In page.

 **See Also:**

About the Workspace Request Approval Process and Selecting a Provisioning Mode in *Oracle Application Express Administration Guide*

20.1.4.2 About Enabling and Configuring Email

In order to send email from an Oracle Application Express application, an Instance administrator must define the email SMTP settings and set the Use SSL/TLS attribute to use a secure connection for Oracle Database 11g R2 or later.

 **See Also:**

- "Configuring Email" in *Oracle Application Express Administration Guide*
- ["When and Why Network Services Must be Enabled"](#)

20.1.4.3 About Configuring Storage Options

Administrators can configure the following storage options: require a new schema when requesting a workspace, auto extend tablespaces, or delete uploaded files after a specified number of days.

 **See Also:**

"Configuring Storage" in *Oracle Application Express Administration Guide*

20.1.4.4 About Creating Wallets

A wallet is a password-protected container that stores authentication and signing credentials (including private keys, certificates, and trusted certificates) needed by SSL. You must create a wallet if you:

- Call a SSL-enabled URL (for example, by invoking a Web service).
- Create a region of type URL that is SSL-enabled.
- Configure secure SMTP by setting the Use SSL/TLS attribute to **Yes**.
- Have applications with LDAP authentication schemes that are configured to use SSL with Authentication.



See Also:

"Configuring Wallet Information" in *Oracle Application Express Administration Guide*

20.1.5 About Configuring Workspace Purge Settings

Save storage space and improve system performance by purging inactive workspaces.

Inactive workspaces consume valuable storage space and degrade system performance. By enabling Workspace Purge Settings, administrators can configure Oracle Application Express to purge inactive workspaces.



See Also:

Purging Inactive Workspaces in *Oracle Application Express Administration Guide*

20.1.6 Understanding Workspace Management

Instance administrators can define associations between workspaces and schemas. Administrators can manage developers and users at the workspace or instance-level and control user access to key components such as App Builder, Team Development, and SQL Workshop, and PL/SQL editing.

- [About Managing Workspace to Schema Assignments](#)
- [About Managing Developers and Users](#)
- [About Managing Component Availability](#)



See Also:

"Managing Existing Workspaces" in *Oracle Application Express Administration Guide*

20.1.6.1 About Managing Workspace to Schema Assignments

When users sign in to Oracle Application Express, they sign in to a shared work area called a workspace. Each workspace can have multiple associated (or mapped) schemas. Instance administrators can define associations between workspaces and schemas as appropriate. By associating a workspace with a schema, developers in that workspace can create new database objects in that schema and build applications that interact with the database objects in that schema.

 **See Also:**

"Managing Workspace to Schema Assignments" in *Oracle Application Express Administration Guide*

20.1.6.2 About Managing Developers and Users

Administrators can define what schemas specific users have access to and also their user role, that is if they are a workspace administrator, a developer, or an end user. Administrators can also limit developer access to specific Application Express components and lock accounts. Oracle Application Express includes two separate interfaces for managing developers and users. Workspace administrators manage user accounts within their workspace and Instance administrators manage all user accounts across an Application Express development instance.

 **See Also:**

"Managing Users in a Workspace" and "Managing Users Across an Application Express Instance" in *Oracle Application Express Administration Guide*

20.1.6.3 About Managing Component Availability

Workspace administrators can control user access to key components such as App Builder, Team Development, SQL Workshop, and PL/SQL editing, which determines whether developers have the ability to edit and compile PL/SQL program units from Object Browser. For example, suppose an administrator wants users to be able to build database components, run SQL statements, but not create applications, he or she could define a workspace with rights to a specific schema and then configure the users as developers using the options on the Set Workspace Preferences page.

 **See Also:**

Configuring Workspace Preferences in *Oracle Application Express Administration Guide*

20.1.7 About Integrating with Oracle BI Publisher

Oracle recommends that you employ Secure Sockets Layer (SSL) when integrating Oracle Application Express with Oracle BI Publisher. Once SSL (HTTPS protocol) is configured for your Oracle BI Publisher server, you must create a wallet and specify the HTTPS protocol for the Report Server in the internal administration Environment Settings.

 **See Also:**

Configuring Wallet Information and Configuring Report Printing for an Instance in *Oracle Application Express Administration Guide*

20.1.8 About the Advantages of the Application Express Runtime Environment

An Oracle Application Express runtime environment enables you to run production applications, but does not provide a web interface for administration or direct development of these applications.

 **Note:**

To ensure the security and performance of your development environment, this functionality is not available in Application Express instances running in Oracle Cloud.

Oracle recommends that you run any sensitive production Oracle Application Express applications with a runtime installation of Oracle Application Express. A runtime installation does not expose the web-based application development environment, thus preventing the use of App Builder, SQL Workshop, and related utilities on a production installation. Additionally, a runtime environment only includes the Oracle Application Express database objects and privileges necessary to run applications, making it a more hardened environment.

 **See Also:**

"Installing Exported Applications in a Runtime Environment" in *Oracle Application Express Administration Guide*

20.1.9 Enabling Network Services in Oracle Database 11g or Later

You must enable network services in Oracle Database 11g or later versions to send outbound mail, use Web services, or use PDF report printing in Oracle Application Express.

- [When and Why Network Services Must be Enabled](#)
Enabling network services enables support for sending outbound mail in Oracle Application Express, use of Web services in Application Express, and PDF report printing with BI Publisher.
- [Granting Connect Privileges Prior to Oracle Database 12c](#)
Demonstrates how to grant connect privileges to any host for the APEX_210100 database user.

- [Granting Connect Privileges in Oracle Database 12c or Later](#)
Procedures `CREATE_ACL`, `ASSIGN_ACL`, `ADD_PRIVILEGE` and `CHECK_PRIVILEGE` in `DBMS_NETWORK_ACL_ADMIN` are deprecated in Oracle Database 12c. Oracle recommends to use `APPEND_HOST_ACE`.
- [Troubleshooting an Invalid ACL Error](#)
Learn how to identify any invalid ACL error by running the query.

20.1.9.1 When and Why Network Services Must be Enabled

Enabling network services enables support for sending outbound mail in Oracle Application Express, use of Web services in Application Express, and PDF report printing with BI Publisher.

By default, the ability to interact with network services is disabled in Oracle Database 11g Release 2 or later. Therefore, if you are running Application Express with Oracle Database 11g Release 2 or later, you must use the new `DBMS_NETWORK_ACL_ADMIN` package to grant connect privileges to any host for the `APEX_210100` database user. Failing to grant these privileges results in issues with:

- Sending outbound mail in Application Express.
Users can call methods from the `APEX_MAIL` package, but issues arise when sending outbound email.
- Consuming web services from Application Express.
- Making outbound LDAP calls from Application Express.
- PDF report printing with BI Publisher.

Note:

When upgrading Application Express on a database 12c or newer, based on the configuration of the old Application Express version the upgrade automatically configures Network Services.

Tip:

To run the examples described in this section, the compatible initialization parameter of the database must be set to at least 11.1.0.0.0. By default an 11g or 12c database will already have the parameter set properly, but a database upgraded to 11g or 12c from a prior version may not. For information about changing database initialization parameters, see *Specifying the Database Compatibility Level in Oracle Multitenant Administrator's Guide*.

 **See Also:**

About Report Printing in *Oracle Application Express App Builder User's Guide*.

20.1.9.2 Granting Connect Privileges Prior to Oracle Database 12c

Demonstrates how to grant connect privileges to any host for the APEX_210100 database user.

The following example demonstrates how to grant connect privileges to any host for the APEX_210100 database user. This example assumes you connected to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role.

```

DECLARE
  ACL_PATH VARCHAR2(4000);
BEGIN
  -- Look for the ACL currently assigned to '*' and give APEX_210100
  -- the "connect" privilege if APEX_210100 does not have the privilege yet.

  SELECT ACL INTO ACL_PATH FROM DBA_NETWORK_ACLS
    WHERE HOST = '*' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL;

  IF DBMS_NETWORK_ACL_ADMIN.CHECK_PRIVILEGE(ACL_PATH, 'APEX_210100',
    'connect') IS NULL THEN
    DBMS_NETWORK_ACL_ADMIN.ADD_PRIVILEGE(ACL_PATH,
    'APEX_210100', TRUE, 'connect');
  END IF;

EXCEPTION
  -- When no ACL has been assigned to '*'.
  WHEN NO_DATA_FOUND THEN
    DBMS_NETWORK_ACL_ADMIN.CREATE_ACL('power_users.xml',
    'ACL that lets power users to connect to everywhere',
    'APEX_210100', TRUE, 'connect');
    DBMS_NETWORK_ACL_ADMIN.ASSIGN_ACL('power_users.xml', '*');
END;
/
COMMIT;

```

The following example demonstrates how to provide less privileged access to local network resources. This example enables access to servers on the local host only, such as email and report servers.

```

DECLARE
  ACL_PATH VARCHAR2(4000);
BEGIN
  -- Look for the ACL currently assigned to 'localhost' and give APEX_210100
  -- the "connect" privilege if APEX_210100 does not have the privilege yet.
  SELECT ACL INTO ACL_PATH FROM DBA_NETWORK_ACLS
    WHERE HOST = 'localhost' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL;

  IF DBMS_NETWORK_ACL_ADMIN.CHECK_PRIVILEGE(ACL_PATH, 'APEX_210100',
    'connect') IS NULL THEN

```

```

        DBMS_NETWORK_ACL_ADMIN.ADD_PRIVILEGE(ACL_PATH,
        'APEX_210100', TRUE, 'connect');
    END IF;

EXCEPTION
    -- When no ACL has been assigned to 'localhost'.
    WHEN NO_DATA_FOUND THEN
        DBMS_NETWORK_ACL_ADMIN.CREATE_ACL('local-access-users.xml',
        'ACL that lets users to connect to localhost',
        'APEX_210100', TRUE, 'connect');
        DBMS_NETWORK_ACL_ADMIN.ASSIGN_ACL('local-access-
users.xml','localhost');
    END;
    /
    COMMIT;

```

20.1.9.3 Granting Connect Privileges in Oracle Database 12c or Later

Procedures `CREATE_ACL`, `ASSIGN_ACL`, `ADD_PRIVILEGE` and `CHECK_PRIVILEGE` in `DBMS_NETWORK_ACL_ADMIN` are deprecated in Oracle Database 12c. Oracle recommends to use `APPEND_HOST_ACE`.

The following example demonstrates how to grant connect privileges to any host for the `APEX_210100` database user. This example assumes you connected to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role.

```

BEGIN
    DBMS_NETWORK_ACL_ADMIN.APPEND_HOST_ACE(
        host => '*',
        ace => xs$ace_type(privilege_list => xs$name_list('connect'),
            principal_name => 'APEX_210100',
            principal_type => xs_acl.p_type_db));
END;
/

```

The following example demonstrates how to provide less privileged access to local network resources. This example enables access to servers on the local host only, such as email and report servers.

```

BEGIN
    DBMS_NETWORK_ACL_ADMIN.APPEND_HOST_ACE(
        host => 'localhost',
        ace => xs$ace_type(privilege_list => xs$name_list('connect'),
            principal_name => 'APEX_210100',
            principal_type => xs_acl.p_type_db));
END;
/

```

20.1.9.4 Troubleshooting an Invalid ACL Error

Learn how to identify any invalid ACL error by running the query.

If you receive an ORA-44416: Invalid ACL error after running the previous script, use the following query to identify the invalid ACL:

```
REM Show the dangling references to dropped users in the ACL that is assigned
REM to '*'.
```

```
SELECT ACL, PRINCIPAL
       FROM DBA_NETWORK_ACLS NACL, XDS_ACE ACE
       WHERE HOST = '*' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL AND
             NACL.ACLID = ACE.ACLID AND
             NOT EXISTS (SELECT NULL FROM ALL_USERS WHERE USERNAME = PRINCIPAL);
```

Next, run the following code to fix the ACL:

```
DECLARE
  ACL_ID  RAW(16);
  CNT     NUMBER;
BEGIN
  -- Look for the object ID of the ACL currently assigned to '*'
  SELECT ACLID INTO ACL_ID FROM DBA_NETWORK_ACLS
         WHERE HOST = '*' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL;

  -- If just some users referenced in the ACL are invalid, remove just those
  -- users in the ACL. Otherwise, drop the ACL completely.
  SELECT COUNT(PRINCIPAL) INTO CNT FROM XDS_ACE
         WHERE ACLID = ACL_ID AND
               EXISTS (SELECT NULL FROM ALL_USERS WHERE USERNAME = PRINCIPAL);

  IF (CNT > 0) THEN

    FOR R IN (SELECT PRINCIPAL FROM XDS_ACE
              WHERE ACLID = ACL_ID AND
                    NOT EXISTS (SELECT NULL FROM ALL_USERS
                               WHERE USERNAME = PRINCIPAL)) LOOP

      UPDATE XDB.XDB$ACL
      SET OBJECT_VALUE =
          DELETEXML(OBJECT_VALUE,
                   '/ACL/ACE[PRINCIPAL="' || R.PRINCIPAL || '"]')
      WHERE OBJECT_ID = ACL_ID;
    END LOOP;

  ELSE
    DELETE FROM XDB.XDB$ACL WHERE OBJECT_ID = ACL_ID;
  END IF;

END;
/

REM commit the changes.
```

```
COMMIT;
```

Once the ACL has been fixed, you must run the first script in this section to apply the ACL to the `APEX_210100` user.

20.2 Understanding Developer Security Best Practices

Learn about security best practices for Oracle Application Express developer.

- [About Items of Type Password](#)
Password items do not emit the text entered to the web browser screen. When creating password items, Oracle recommends using password attributes that do not save session state to prevent the password from being saved in the database in the session state tables.
- [Identifying At Risk Password Items](#)
Identify at risk password items by viewing the Security Profiles report and Password Items report.
- [Understanding Cross-Site Scripting Protection](#)
Protect your application from a cross site-scripting security breach.
- [About Session State and Security](#)
Learn about managing session state and security.
- [Preventing URL Tampering](#)
Session State Protection is a built-in functionality that prevents hackers from tampering with the URLs within your application. URL tampering can adversely affect program logic, session state contents, and information privacy.
- [About Securing File Uploads](#)
Learn about developer best practices for securing file uploads.



See Also:

- ["Understanding Administrator Security Best Practices"](#)
- ["About Oracle Application Express Administrator Roles"](#)

20.2.1 About Items of Type Password

Password items do not emit the text entered to the web browser screen. When creating password items, Oracle recommends using password attributes that do not save session state to prevent the password from being saved in the database in the session state tables.

Configurable password item type attributes include:

- **Validation, Value Required** - If set to **On** and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. If set to No, no validation a NULL value is accepted.

- **Settings, Submit when Enter pressed** - If set to **On**, when the user presses the ENTER key in the field the page is submitted.
- **Source, Maintain Session State** - If set to **Per Request (Memory Only)**, the value will not be written to the database and will only be available for the current request. For highly sensitive values, this is the preferred setting. However, if the value of **Maintain Session State** is set to **Per Session (Disk)**, be sure to set **Store value encrypted in session state** to **Yes**.
- **Security, Authorization Scheme** - Optionally select an authorization scheme which must evaluate to TRUE in order for this component to be rendered or otherwise processed.
- **Security, Session State Protection** - You can select the level of session state protection by setting this attribute to Unrestricted or Restricted.
 - Unrestricted means the item may be set by passing the item in a URL or in a form. No checksum is required in the URL.
 - Restricted means the item may not be set from a browser. Use this when you want to restrict the way that the item value can be set to internal processes, computations, and so on. This attribute is applicable only to items that cannot be used as data entry items and is always observed, even if Session State Protection is disabled.
- **Security, Store value encrypted in session state** - You can encrypt sensitive content stored in Application Express session state management tables. To encrypt an item when stored in session state, set this attribute to **On**. To learn more, see "[About Session State and Security](#)".

 **See Also:**

- "[About Item Types](#)"
- "[Editing Page-Level Items](#)"

20.2.2 Identifying At Risk Password Items

Identify at risk password items by viewing the Security Profiles report and Password Items report.

At risk password items are those that either do not use a password item type that does not save session state, or store an unencrypted value in session state.

- [Viewing the Security Profiles Report](#)
- [Viewing the Password Items Report](#)

20.2.2.1 Viewing the Security Profiles Report

To view the Security Profiles Report:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.

The App Builder home page appears.

3. Click the **Workspace Utilities** icon.
4. Locate **Cross Application Reports** on the right side of the window.
5. Under Cross Application Reports, click **Security Profiles** report.

This report list the following information about all applications in the current workspace:

- Application
- Name
- Parsing Schema
- Application Level Authorization Scheme
- Authentication
- Authorization Schemes
- Authorization Schemes
- Pages
- Encrypted Items
- At Risk Password Items

20.2.2.2 Viewing the Password Items Report

To identify at risk password items:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
The App Builder home page appears.
3. Click the **Workspace Utilities** icon.
4. Locate **Cross Application Reports** on the right side of the window.
5. Under Cross Application Reports, click **Password Items**.

The Password Items report shows all of the password items within the application and indicates if they use encryption and whether they save state. Password items that do neither are highlighted as *At Risk*.



Tip:

For pages that contain password items, set the page attribute **Form Auto Complete** to **Off**. Setting that attribute to **Off** prevents the web browser from attempting to auto complete items on the page.

20.2.3 Understanding Cross-Site Scripting Protection

Protect your application from a cross site-scripting security breach.

- [What Is Cross Site-scripting Security Breach?](#)
- [Protecting HTML Regions and Other Static Areas](#)

- [About Protecting Dynamic Output](#)
- [About Protecting Report Regions](#)
- [About Protecting Form Items](#)
- [About Restricting Characters Entered on an Item](#)

20.2.3.1 What Is Cross Site-scripting Security Breach?

Cross site-scripting (also referred to as XSS) is a security breach that takes advantage of dynamically generated web pages. In a XSS attack, a web application is sent a script that activates when it is read by a user's browser. Once activated, these scripts can steal data, even session credentials, and return the information to the attacker.

If malicious code were introduced into an Oracle Application Express application, it could be rendered into HTML regions and other places within the application during normal page rendering. To prevent the introduction of malicious code into session state, the Application Express engine escapes characters in certain cases.

20.2.3.2 Protecting HTML Regions and Other Static Areas

Learn how to protect HTML regions and other static display areas.

- [About Protecting HTML Regions and Other Static Areas](#)
- [About Safe Item Display Types](#)
- [About the Rules Used to Determine Whether to Escape Values](#)
- [About Using Safe Item Types to Hold and Emit HTML Markup](#)

20.2.3.2.1 About Protecting HTML Regions and Other Static Areas

In HTML regions and other static display areas, you can reference session state using the substitution strings. Special substitution strings available within a template are denoted by the number symbol (#), for example, #ABC#. To reference page or application items use the &ITEM. notation.

Examples of static display areas include HTML regions, page headers and footers, region headers and footers, region titles, button labels, help text, form item labels and post-element text, templates, radiogroup (before and after field text), event success messages, event error messages, navigation bar attributes, application static substitution string values, chart labels and legends, breadcrumbs and list framing text, and calendar text, labels, or legends.

Developers can also append an exclamation mark (!) followed by a predefined filter name to a page or application item name or to a report column reference to escape special characters in the substitution value.

See Also:

- ["About Using Substitution Strings"](#)
- ["Controlling Output Escaping in Substitution Strings"](#)

20.2.3.2.2 About Safe Item Display Types

When session state is referenced in this way, the value emitted to the page will not have special characters (<, >, &, ") escaped if the referenced item is **Display Only** with the attribute **Save Session State** set to **No** and **Escape Special** set to **No**.

If the referenced item has a display type other than **Display Only** with the attribute **Save Session State** set to **No**, the value emitted to the page will have special characters escaped. Although application-level items are also considered to have a safe display type, they do not actually have display properties like form items do.



See Also:

["Understanding Page-Level Items"](#)

20.2.3.2.3 About the Rules Used to Determine Whether to Escape Values

The Application Express engine uses predefined smart escaping rules to determine if and when to escape values fetched from session state.

The reason for these rules is that items that use the display types listed previously are often for text containing HTML that is intended to be emitted to the browser without being filtered (that is, escaped). The only way this can be made safe is by the enforcement of the rule that these types of items are always escaped on input to the application. For example, if a user passes some text into a safe item using an Oracle Application Express f?p URL syntax, the Application Express engine escapes special characters when saving the value into session state. This has two intended results:

1. If the value contained no special characters, the value passed in is saved into session state exactly as it was provided.
2. If the value contained special characters, those characters are escaped when the value is saved into session state.

In either situation, the item can now safely be referenced using an `&ITEM.` notation in any HTML region or other static area mentioned previously.

20.2.3.2.4 About Using Safe Item Types to Hold and Emit HTML Markup

You can use the safe item types listed previously to hold and emit HTML markup to the browser. For example, suppose you have a requirement to render some text in bold face by referencing a safe page item named `P1_XXX` (using `&P1_XXX.`) The item `P1_XXX` is presumed to contain the following HTML:

```
<b>ABABABAB</b>
```

You can achieve this by using application controls (computations, processes, item source expressions, item default values, and so on) to store values into these safe items. When values are introduced in this way, you ensure the safety of the content. When you use these methods, the Application Express engine does not escape any special characters when saving the values into session state.

Finally, the safety of safe items is ensured by a rule that prevents those items from being posted on a page and submitted to the Application Express engine as part of a page submission.

20.2.3.3 About Protecting Dynamic Output

Items fetched from session state and rendered using `http.p` or other methods should be explicitly escaped by the code where it is appropriate to do so. For example, suppose a PL/SQL dynamic content region on a page uses the following:

```
http.p(v('SOME_ITEM'));
```

If the value of the item fetched from session state could contain unintended tags or scripts, you might want to use the following in the region:

```
http.p(apex_escape.html(:SOME_ITEM));
```

However, if you are confident that the fetched value is safe for rendering, you do not need to escape the value. As a developer, you must determine when it is appropriate to not escape output.

As a best practice, follow this rule:

- Never emit an item fetched from session state without escaping it unless the item is a safe type.

The reason for this is that as a developer, there is no way you can prevent a hacker from posting a malicious value into a non-safe item. Even if your application does not present these items visibly to ordinary users, be aware that a hacker can mount a XSS attack using your application if you do not follow this rule.



See Also:

["About Safe Item Display Types"](#)

20.2.3.4 About Protecting Report Regions

The Application Express engine escapes data rendered in the body of a report. References to session state in report headings and messages are fetched from session state using the smart escaping rules so that the values of safe item types are not escaped and the values of other item types are escaped.

Oracle Application Express automatically escapes HTML special characters of a report column when the column's **Escape special characters** attribute is set to **On**. If you need to render HTML fragments instead of plain column values (for example, for highlighting), instead of concatenating the HTML fragment in the query itself (which prevents you from using **Escape special characters**), you should use the report column's **HTML Expression** attribute. In the **HTML Expression** attribute, you can enter static HTML and embed escaped column values with the `#COLUMN#` notation. The extended column notation gives you control regarding how Oracle Application Express should escape a column value:

- `#COLUMN!HTML#` - Escapes reserved HTML characters.
- `#COLUMN!ATTR#` - Escapes reserved characters in a HTML attribute context.

- #COLUMN!JS# - Escapes reserved characters in a JavaScript context.
- #COLUMN!RAW# - Preserves the original item value and does not escape characters.
- #COLUMN!STRIPHTML# - Removes HTML tags from the output and escapes reserved HTML characters.

For example, suppose you have a report based on this query:

```
SELECT
  empno,
  ename,
  NULL DELETE_LINK
FROM emp
```

In this example, all columns are escaped. You could define a HTML Expression on DELETE_LINK as follows:

```
<a href="javascript:if (confirm('Do you really want to delete #ENAME!JS#?'))
doSubmit('DELETE-#EMPNO#');">Delete</a>
```

This example renders a link that asks if you would like to delete an employee and submits a request to delete the row if the user is confirmed. If you had not used #ENAME!JS# but #ENAME#, a name like O'Neill would cause a syntax error and an attacker could exploit the improper escaping for cross-site scripting.

See Also:

- ["Controlling Output Escaping in Substitution Strings"](#)
- ["Editing Interactive Report Column Attributes "](#)

20.2.3.5 About Protecting Form Items

When form items, including hidden items, obtain their values during the generation of the form page to be sent to the browser, the resulting text is escaped before rendering. Some of the safe item types are exceptions to this rule to support the intended behavior of each display type.

Some item types have the Security attribute **Escape special characters**. Use the **Escape special characters** attribute to specify whether or not the value should be escaped. To prevent Cross-Site Scripting (XSS) attacks, always set this attribute to **On**. If you need to render HTML tags stored in the page item or in the entries of a list of values, you can set this flag to **Off**. In such cases, you should take additional precautions to ensure any user input to such fields are properly escaped when entered and before saving.

Developers can also append an exclamation mark (!) followed by a predefined filter name to a page or application item name or to a report column reference, to escape special characters in the substitution value.

**See Also:**

["Controlling Output Escaping in Substitution Strings"](#)

20.2.3.6 About Restricting Characters Entered on an Item

Limit cross site-scripting (XSS) and other injection attacks by restricting the characters users can save in session state. To accomplish this, edit the page item and configure the **Security, Restricted Characters** attribute. Restricted Characters can be saved in session state. Available options include:

- **All Characters Allowed**
No restriction applies.
- **Whitelist for a-Z, 0-9 and space**
Only allow characters a-z, A-Z, 0-9, and space.
- **Blacklist HTML command characters (<>)**.
Do not allow reserved HTML characters
- **Blacklist &<>"/,;|=% and --:**
Do not allow &, <, >, ", /, ;, ", ", *, |, =, %, and "--" (PL/SQL comment).
- **Blacklist &<>"/,;|=% or -- and new line**
Do not allow &, <, >, ", /, ;, ", ", *, |, =, %, "--", and new line characters

If you select a restriction, Oracle Application Express displays an error message if a user tries to save data which does not conform to the selected character restriction.

**See Also:**

["Configuring Page Item Security"](#)

20.2.4 About Session State and Security

Learn about managing session state and security.

Oracle Application Express persists session state in database tables. Session state is preserved in database tables because it is more secure to store the session state on the server side than on the client. Because Oracle Application Express applications use the stateless HTTP protocol, an application's session state across multiple page views is preserved in database tables. Not maintaining a synchronous database connection for each Oracle Application Express application user significantly lessens memory and database resource requirements.

Developers can query the session state stored by Oracle Application Express applications using the App Builder and built-in monitoring pages. Developers and administrators can access session state for any application in the workspace to which they are authenticated.

Developer best practices for managing session state include:

- As a standard part of implementing program control flow, clear the session state of unneeded values using clear-cache page processes or clear-cache directives in URLs used to navigate to pages.
- Use password page item types that do not save state. This prevents the entered passwords from being saved in session state tables in the database.
- When sensitive data must persist in a session, it should be saved in Oracle Application Express session state tables in encrypted form. To use this feature, set the page item's **Store value encrypted in session state** attribute to **On**. Encrypted stored values are automatically decrypted when read.

 **Note:**

The objective of encrypted session state is to persist session state such that the unencrypted values cannot be read by other Oracle Application Express developers or database administrators who might have access to the Oracle Application Express session state tables, debug output, or database data files. Oracle recommends that database backups be performed using facilities that encrypt data in the backup files.

 **Tip:**

You can encrypt item values up to 4000 bytes in length. Attempts to encrypt values longer than 4000 bytes produces an error message.

20.2.5 Preventing URL Tampering

Session State Protection is a built-in functionality that prevents hackers from tampering with the URLs within your application. URL tampering can adversely affect program logic, session state contents, and information privacy.

- [How Session State Protection Works](#)
- [Enabling Session State Protection](#)
- [Configuring Session State Protection](#)

20.2.5.1 How Session State Protection Works

Enabling Session State Protection is a two-step process. First, you enable the Session State Protection feature in Shared Components. Second, you set page and item security attributes. You can perform these steps using a wizard, or you can set security attributes for pages and items manually on the Session State Protection page.

When enabled, Session State Protection uses the **Page Access Protection** and the item **Session State Protection** attributes with checksums positioned in $f?p=$ URLs to prevent URL tampering and unauthorized access to and alteration of session state. When Session State Protection is disabled, the page and item attributes related to session state protection are ignored and checksums are not included in generated $f?p=$ URLs.

20.2.5.2 Enabling Session State Protection

To enable Session State Protection:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Security, select **Session State Protection**.

The Session State Protection page appears. Note the current **Session State Protection** status (**Enabled** or **Disabled**) displays at the top of the page.

2. Click the **Set Protection** button.

The Session State Protection wizard appears.
3. Under Select Action, select **Enable** and click **Next**.

Next, determine whether to set security attributes for pages and items.
4. Select **Enable** and click **Next**.
5. Click **Enable Session State Protection**.

Tip:

To disable Session State Protection, perform the same steps, but select **Disable** instead of **Enable**. Disabling Session State Protection does not change existing security attribute settings, but those attributes are ignored at runtime.

20.2.5.3 Configuring Session State Protection

Tip:

Before you can configure security attributes, you must first enable Session State Protection. See "[Enabling Session State Protection](#)".

- [About Configuring Session State Protection](#)
- [Reviewing Existing Session State Protection Settings](#)
- [Configuring Session State Protection Using a Wizard](#)
- [Configuring Session State Protection for a Page](#)
- [Configuring Session State Protection for Page Items](#)
- [Configuring Session State Protection for Application Items](#)

20.2.5.3.1 About Configuring Session State Protection

Once you have enabled Session State Protection, the next step is to configure security attributes. You can configure security attributes in two ways:

- Use a wizard and select a value for specific attribute categories. Those selections are then applied to all pages and items within the application.
- Configure values for individual pages, items, or application items.

20.2.5.3.2 Reviewing Existing Session State Protection Settings

You can review a summary of Session State Protection settings for pages, items, and application items on the first page of the Session State Protection wizard.

To view summaries of existing Session State Protection settings:

1. Navigate to the Session State Protection page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Security, select **Session State Protection**.The Session State Protection page appears.
2. Click **Set Protection**.
3. Expand and review the following regions at the bottom of the page:
 - **Page Level Session State Protection Summary**
 - **Page Item Session State Protection Summary**
 - **Application Item Session State Protection**

20.2.5.3.3 Configuring Session State Protection Using a Wizard

When you configure Session State Protection using a wizard, you set a value for specific attribute categories. Those selections are then applied to all pages and items within the application.

To configure Session State Protection using a wizard:

1. Navigate to the Session State Protection page:
 - a. On the Workspace home page, click the App Builder icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Security, select **Session State Protection**.The Session State Protection page appears.
2. Click **Set Protection**.
The Session State Protection wizard appears.
3. Under Select Action, select **Configure** and click **Next**.
4. Select a **Page Access Protection**:

- **Unrestricted** - The page may be requested using a URL with or without session state arguments (Request, Clear Cache, Name/Values).
 - **Arguments Must Have Checksum** - If Request, Clear Cache, or Name/Value arguments appear in the URL, a checksum must also be provided. The checksum type must be compatible with the most stringent Session State Protection attribute of all the items passed as arguments.
 - **No Arguments Allowed** - A URL may be used to request the page but no Request, Clear Cache, or Name/Value arguments are allowed.
 - **No URL Access** - The page may not be accessed using a URL; however, the page may be the target of a Branch to Page branch type, which does not do a URL redirect.
5. Select a **Application Item Protection**:
- **Unrestricted** - The item's session state may be set by passing the item name/value in a URL or in a form. No checksum is required in the URL.

 **Note:**

If you must set this item's value in session state using Ajax, then an Unrestricted protection level must be used for the item (for example in Dynamic Actions, Set Value, Page Items to Submit or Cascading LOVs, Page Items to Submit).

- **Checksum Required: Application Level** - The item's session state may be set by passing the item name/value in a URL if a checksum specific to the schema is provided. You can also use a user-level checksum or a session-level checksum (see next bullets). Use this option when you want to allow the item to be set only by URLs having checksums that were generated by any user running the same application in the current workspace but in a different session.
- **Checksum Required: User Level** - The item's session state may be set by passing the item name/value in a URL if a checksum specific to the workspace, application, and user is provided. You can also use a session-level checksum (see next bullet). Use this option when you want to allow the item to be set only by URLs having checksums that were generated by the same named user, running the same application in the current workspace but in a different session.
- **Checksum Required: Session Level** - The item's session state may be set by passing the item name/value in a URL if a checksum specific to the current session is also provided. Use this option when you want to allow this item to be set only by URLs having checksums that were generated in the current session.
- **Restricted - May not be set from browser** - The item may not be altered using the URL or POSTDATA. Use this option when you want to restrict the way that the item value can be set to internal processes, computations, and so on. This attribute is applicable only to items that cannot be used as data entry items and is always observed even if Session State Protection is disabled.

Use the **Restricted - May not be set from browser** attribute for application items or for page items with any of these Display As types:

- Display as Text (escape special characters, does not save state)
- Display as Text (does not save state)
- Display as Text (based on LOV, does not save state)

- Display as Text (based on PLSQL, does not save state)
 - Text Field (Disabled, does not save state)
 - Stop and Start HTML Table (Displays label only)
6. Select **Page Data Entry Item Protection**:
- **Unrestricted** - The item's session state may be set by passing the item name/value in a URL or in a form. No checksum is required in the URL.
Note: If you must set this item's value in session state using Ajax, then an Unrestricted protection level must be used for the item (for example in Dynamic Actions, Set Value, Page Items to Submit or Cascading LOVs, Page Items to Submit).
 - **Checksum Required: Application Level** - The item's session state may be set by passing the item name/value in a URL if a checksum specific to the schema is provided. You can also use a user-level checksum or a session-level checksum (see next bullets). Use this option when you want to allow the item to be set only by URLs having checksums that were generated by any user running the same application in the current workspace but in a different session.
 - **Checksum Required: User Level** - The item's session state may be set by passing the item name/value in a URL if a checksum specific to the workspace, application, and user is provided. You can also use a session-level checksum (see next bullet). Use this option when you want to allow the item to be set only by URLs having checksums that were generated by the same named user, running the same application in the current workspace but in a different session.
 - **Checksum Required: Session Level** - The item's session state may be set by passing the item name/value in a URL if a checksum specific to the current session is provided. Use this option when you want to allow this item to be set only by URLs having checksums that were generated in the current session.
7. Select a **Page Display-Only Item Protection**:
- **Unrestricted** - The item may be set by passing the item name/value in a URL or in a form. No checksum is required in the URL.
Note: If you must set this item's value in session state using Ajax, then an Unrestricted protection level must be used for the item (for example in Dynamic Actions, Set Value, Page Items to Submit or Cascading LOVs, Page Items to Submit).
 - **Checksum Required: Application Level** - The item's session state may be set by passing the item name/value in a URL if a checksum specific to the schema is provided. You can also use a user-level checksum or a session-level checksum (see next bullets). Use this option when you want to allow the item to be set only by URLs having checksums that were generated by any user running the same application in the current workspace but in a different session.
 - **Checksum Required: Session Level** - The item's session state may be set by passing the item name/value in a URL if a checksum specific to the current session is provided. Use this option when you want to allow this item to be set only by URLs having checksums that were generated in the current session.
 - **Checksum Required: User Level** - The item's session state may be set by passing the item name/value in a URL if a checksum specific to the

workspace, application, and user is provided. You can also use a session-level checksum. Use this option when you want to allow the item to be set only by URLs having checksums that were generated by the same named user, running the same application in the current workspace but in a different session.

- **Restricted: May not be set from browser** - The item may not be altered using the URL or POSTDATA. Use this when you want to restrict the way that the item value can be set to internal processes, computations, and so on. This attribute is always observed, even if Session State Protection is disabled.

This attribute may be used with any of these Display As types:

- Display as Text (escape special characters, does not save state)
- Display as Text (does not save state)
- Display as Text (based on LOV, does not save state)
- Display as Text (based on PLSQL, does not save state)
- Text Field (Disabled, does not save state)
- Stop and Start HTML Table (Displays label only)

8. Click **Next**.
9. Click **Finish**.

20.2.5.3.4 Configuring Session State Protection for a Page

To configure Session State Protection for a page:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In either the Rendering tab or the Layout tab, select the page name.

The Property Editor displays the page attributes in the right pane. Attributes are organized in groups.
3. Find the **Security** group and edit the **Page Access Protection** attribute. Options include:
 - **Unrestricted** - The page may be requested using a URL, with or without session state arguments, and without having to have a checksum.
 - **Arguments Must Have Checksum** - If Request, Clear Cache, or Name/Value arguments appear in the URL, a checksum must also be provided. The checksum type must be compatible with the most stringent **Session State Protection** attribute of all the items passed as arguments.
 - **No Arguments Allowed** - A URL may be used to request the page, but the URL can not contain Request, Clear Cache, or Name/Value Pair arguments.
 - **No URL Access** - The page may not be accessed using a URL. However, the page may be the target of a Branch to Page branch type, as this does not perform a URL redirect.
4. To save your changes, click **Save**.

20.2.5.3.5 Configuring Session State Protection for Page Items

To configure Session State Protection for items:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.Page Designer appears.
2. In either the Rendering tab or the Layout tab, select the page item.

The Property Editor displays the page attributes in the right pane. Attributes are organized in groups.
3. In either the Rendering tab or the Layout tab, select page item.
4. Find the **Security** group .
5. Under **Security**, edit the **Session State Protection** attribute. Options include:
 - **Unrestricted** - The item can be set by passing the item in a URL or in a form. No checksum is required in the URL.
 - **Checksum Required - Application Level** - The item can be set by passing the item in a URL that includes a checksum specific to the the workspace and application.
 - **Checksum Required - User Level** - The item can be set by passing the item in a URL that includes a checksum specific to the the workspace, application and user.
 - **Checksum Required - Session Level** - The item can be set by passing the item in a URL that includes a checksum specific to the the session.
 - **Restricted - May not be set from browser** - The item can not be altered using the URL or POSTDATA. Select this option to restrict what can set the item value to internal processes, computations, and so on. This attribute only applies to items that are not used as data entry items and is always observed, even if Session State Protection is disabled. Use this attribute for page or application items that have the following **Display As** types:
 - **Display Only (Save State=No)**
 - **Text Field (Disabled, does not save state)**
6. To save your changes, click **Save**.

20.2.5.3.6 Configuring Session State Protection for Application Items

To configure Session State Protection for an application item:

1. Navigate to the Session State Protection page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Application Logic, select **Application Items**.

The Application Items page appears.

2. Click the name of an **Application Item**.
3. Select an application item.
4. Under **Security**, edit Session State Protection. Options include:
 - **Unrestricted** - The item's session state may be set by passing the item name/value in a URL or in a form. No checksum is required in the URL.
 - **Restricted - May not be set from browser** - The item may not be altered using the URL or POSTDATA. Use this option when you want to restrict the way that the item value can be set to internal processes, computations, and so on. This attribute is only applicable only to items that cannot be used as data entry items and is always observed even if Session State Protection is disabled. This attribute may be used for application items or for page items with any of these **Display As** types:
 - **Display Only (Save State=No)**
 - **Text Field (Disabled, does not save state)**
 - **Stop and Start Grid Layout (Displays label only)**
 - **Checksum Required: Application Level** - The item may be set by passing the item name/value in a URL if a checksum is also provided that is specific to the workspace and application. Use this option when you want to allow the item to be set only by URLs having checksums that were generated by any user running the same application in the current workspace but in a different session.
 - **Checksum Required: User Level** - The item may be set by passing the item name/value in a URL if a checksum is also provided that is specific to the workspace, application, and user. Use this option when you want to allow the item to be set only by URLs having checksums that were generated by the same named user, running the same application in the current workspace but in a different session.
 - **Checksum Required: Session Level** - The item may be set by passing the item name/value in a URL if a checksum is also provided that is specific to the current session. Use this option when you want to allow this item to be set only by URLs having checksums that were generated in the current session.
5. Click **Apply Changes**.

20.2.6 About Securing File Uploads

Learn about developer best practices for securing file uploads.

Oracle Application Express enables you to easily build an application that can be used to upload files and to access uploaded files. These files are uploaded into a common file storage table. Although the database view `APEX_APPLICATION_FILES` shows those files associated with your database account (or workspace), programmatic access to the common file storage table does not always require authentication, enabling other users to see your uploaded files. For this reason, Oracle recommends that developers use the methods described in "[Understanding BLOB Support in Forms and Reports](#)," with the files being uploaded directly to a table in your workspace schema, or if you need programmatic access, uploaded to `APEX_APPLICATION_TEMP_FILES`. When you use the built-in methods of files access, the authorization checks on the page also apply to file access.

 **See Also:**

- ["About the Differences Between Page Items and Application Items"](#)
- ["About Item Types"](#) to learn more about creating a File Browse page-level item

20.3 Controlling Access to Applications, Pages, and Page Components

Control access to an application, individual pages, or page components by creating an access control list.

 **Tip:**

To create an access control page, the application schema must have `CREATE TABLE`, `CREATE TRIGGER`, and `CREATE SEQUENCE` privileges.

- [Understanding Access Control](#)
Adding the Access Control feature to an application, creates multiple pages and the following components: an Access Control region, access roles, authorization schemes, a build option, and an Application Setting.
- [Creating an Access Control Using the Create Application Wizard](#)
Create an access control list using the Create Application Wizard.
- [Creating an Access Control Using the Create Page Wizard](#)
Create an access control list using the Create Page Wizard.
- [Managing User Access](#)
Manage user access on the Administration page.
- [Configuring Access Control](#)
Configure user access on the Administration page.
- [About Controlling Access for Pages and Page Components](#)
Control access to a specific page or page component by editing the page or component and selecting an authorization schemes.
- [About Removing an Access Control Created with a Wizard](#)
Remove an access control created with a wizard using build options.
- [Managing Roles and User Assignments](#)
Manage application access control roles and user role assignments on the Application Access Control page..

 **See Also:**

["Managing Roles and User Assignments"](#)

20.3.1 Understanding Access Control

Adding the Access Control feature to an application, creates multiple pages and the following components: an Access Control region, access roles, authorization schemes, a build option, and an Application Setting.

- [About Adding Access Control](#)
- [About Access Control Authorization Schemes](#)
- [About Configuring Access Control](#)
- [About Exporting an Application with Access Control](#)

20.3.1.1 About Adding Access Control

Running the Access Control Wizard creates multiple pages and the following components:

- Adds an Access Control region to the Administration page you specify.
- Creates the access roles: Administrator, Contributor, and Reader.
- Creates the authorization schemes: Administration Rights, Contribution Rights, and Reader Rights.

Note:

When you add a new Access Control to an existing application, these authorization schemes are only be created if the names do not exist. For example, if Administration Rights already exists (case sensitive comparison), the wizard will not recreate. Instead, the Access Control page will re-use the existing authorization scheme.

- Creates the build option, Feature: Access Control.
- Creates the Application Setting, ACCESS_CONTROL_SCOPE.

Developers use the access control list to associate the privileges, view, edit, and administration, with application users. Within the final Access Control UI, each privileges correlates to an access role:

- View correlates to the Reader role.
- Edit correlates to the Contributor role.
- Administration correlates to the Administrator role.

See Also:

- ["Attaching an Authorization Scheme to an Application, Page, or Components"](#)
- ["Managing Roles and User Assignments"](#)

20.3.1.2 About Access Control Authorization Schemes

When you add the Access Control feature to an application, the PL/SQL Body Wizard creates the following authorization schemes:

- **Administration Rights** – This authorization scheme checks if the current user in the application is assigned `ADMINISTRATOR` role.

```
return APEX_ACL.HAS_USER_ROLE (
    p_application_id=>:APP_ID,
    p_user_name => :APP_USER,
    p_role_static_id => 'ADMINISTRATOR');
```

- **Contribution Rights** – This authorization scheme checks if the current user in the application is assigned the `ADMINISTRATOR` role or the `CONTRIBUTOR` role.

```
if apex_acl.has_user_role (
    p_application_id=>:APP_ID,
    p_user_name => :APP_USER,
    p_role_static_id => 'ADMINISTRATOR') or
apex_acl.has_user_role (
    p_application_id=>:APP_ID,
    p_user_name=> :APP_USER,
    p_role_static_id=> 'CONTRIBUTOR') then
    return true;
else
    return false;
end if;
```

- **Reader Rights** – This authorization scheme returns `TRUE` if the access control is configured to allow any authenticated user access the application. If this behavior is not allowed, it checks if the current user in the application is assigned to any application role.

```
if nvl(apex_app_setting.get_value(
    p_name => 'ACCESS_CONTROL_SCOPE'),'x') = 'ALL_USERS' then
    -- allow user not in the ACL to access the application
    return true;
else
    -- require user to have at least one role
    return apex_acl.has_user_any_roles (
        p_application_id => :APP_ID,
        p_user_name      => :APP_USER);
end if;
```



See Also:

["Attaching an Authorization Scheme to an Application, Page, or Components"](#)

20.3.1.3 About Configuring Access Control

Once you add the Access Control feature, you configure it by running the application and accessing the Access Control region on the Administration page.

Administration

Access Control Add

All authenticated users can access this application

Administrator	1
Contributor	0
Reader	0

Users
Change access control settings and disable access control

Access Control
Set level of access for authenticated users of this application

The Access Control region lists currently defined access roles and contains two sections: **Users** and **Access Control**.

Users

Click **Users** to add new users, change a user's role, or disable access control by locking an account.

Tip:

You add additional roles and configure role assignments on the Shared Components, Application Access Control page. See "[Managing Roles and User Assignments](#)."

Access Control

Click **Access Control** to specify the behavior when authenticated users access the application.

For **Any authenticated user may access this application**, select one of the following:

- **Off** - Choose **Off** if all defined users are included in the access control list.
- **On** - Choose **On** if authenticated users not in the access control list may also use this application.

 **See Also:**

- ["Managing User Access"](#)
- ["Configuring Access Control"](#)

20.3.1.4 About Exporting an Application with Access Control

When you export an application with the Access Control feature, the application roles, Administrator, Contributor, and Reader, are exported. However, the users assigned to these roles are not exported. If you deploy a exported application with the Access Control feature, navigation menu entry for Administration page will not display. When you deploy an application with Access Control feature, your can add user roles as needed by going to Shared Components, Application Access Control. If the application is being deployed in a runtime environment, you can add user roles using `APEX_ACL` API. For example, the following example adds the user name 'SCOTT' as Administrator in application 255:

```
begin
  APEX_ACL.ADD_USER_ROLE (
    p_application_id => 255,
    p_user_name      => 'SCOTT',
    p_role_static_id => 'ADMINISTRATOR' );
end;
```

You can also execute the `APEX_ACL` API from the command line or create an install script in application supporting objects.

 **See Also:**

- ["Attaching an Authorization Scheme to an Application, Page, or Components"](#)
- ["Managing Roles and User Assignments"](#)
- ["APEX_ACL" in Oracle Application Express API Reference](#)

20.3.2 Creating an Access Control Using the Create Application Wizard

Create an access control list using the Create Application Wizard.

To create an access control list using the Create Application Wizard:

1. On the Workspace home page, click the **App Builder** icon.
2. Click the **Create** button.
3. Click **Application**.
4. For Name, enter the name used to identify the application to developers.
5. For Appearance, accept the default Theme Style and menu layout (Vita, Side Menu), or change it by clicking the **Set Appearance** icon adjacent to the Appearance field.
6. To add a new page (such as a blank page, calendar, chart, form, report, and so on) click **Add Page** and select the desired page type.
7. Under Features, select **Access Control**.
8. Under Settings, specify settings used to generate this application. To learn more about an attribute, click the Help icon adjacent to **Settings**.
9. Click **Create Application**.



See Also::

["Understanding Page Types, Features, and Settings"](#)

20.3.3 Creating an Access Control Using the Create Page Wizard

Create an access control list using the Create Page Wizard.



Tip:

This section describes how to create an access control list by running the Create Page Wizard from the Application home page. You can also run this wizard in Page Designer by clicking the **Create** menu and selecting **Page**.

To create an access control list using the Create Page Wizard:

1. On the Workspace home page, click **App Builder**.
2. Select an application.
The Application home page appears.
3. Click the **Create Page** button.
4. For Create a Page:
 - a. User Interface - Select a user interface for the page (optional). This attribute only displays for applications using older themes and for which Desktop and Mobile User Interfaces have been defined

- b. Page Type - Select the type of page you want to create.
 - **Component** - Provides page-level functionality and can be added multiple times within a given application. Examples include reports, forms, plug-ins, charts, calendar and so on.
 - **Feature** - Provide application-level functionality and can only be added once per application.

 **Tip:**

The options that appear change based on the selected Page Type. To learn more, "[Understanding Page Types in the Create Page Wizard](#)."

5. For Page Type, select **Feature** and then **Access Control**.
6. On the Create Access Control:
 - a. Administration Page Number - Enter an unused starting page number. This wizard creates multiple pages starting with the number specified.
 - b. Page Group - Identify the name of the page group you to associate with this page. Page groups help developers manage the pages within an application. To create a page group, enter the name. To use an existing page group, select the name from the list.
 - c. Build Option - The wizard creates this build option to support this feature. You can use the build option to control whether the feature appears or to remove it later on.
 - d. Administration Page Preference - Specify the administration page to which this access control list will be added. Options include:
 - **Create a new page**
 - **Identify an existing page**What appears next depends upon your selection. Follow the on-screen instructions.
 - e. Click **Next**.
A summary page appears.
7. Click **Create**.

20.3.4 Managing User Access

Manage user access on the Administration page.

Use Manage User Access page to add new users, change a user's role, or disable access control by locking an account.

 **Tip:**

You can also add users by clicking the **Add** button adjacent to the Access Control region heading.

To manage user access:

1. Run the application and navigate to Access Control.
By default, navigate to the **Administration** page and locate **Access Control** region.
2. Under Access Control, click **Users**.
The Manage User Access appears.
3. To add a user:
 - a. Click the **Add User** .
 - b. On Manage User Access, edit the attributes:
 - Username
 - Email
 - Role - Select role (for example, **Administrator**, **Contributor**, or **Reader**).
 - c. Click **Add User**.
4. To edit an existing user:
 - a. Click the **Edit** icon adjacent to the Username.
 - b. On Manage User Access, edit the following:
 - Username
 - Email
 - Role - Select role (for example, **Administrator**, **Contributor**, or **Reader**).
 - Account Locked - Select **Yes** or **No**.
 - c. Click **Apply Changes**.
5. To add multiple users:
 - a. Role - Select a role (such as **Administrator**, **Contributor**, or **Reader**).
 - b. Username - Enter usernames separated by commas, semicolons, or white space. Existing or duplicate usernames are automatically be ignored.
 - c. Confirm the additions and click **Apply Changes**.
6. To delete a user:
 - a. Click the **Edit** icon adjacent to the Username.
 - b. Click **Delete**
7. To revert you changes, click **Reset**.

20.3.5 Configuring Access Control

Configure user access on the Administration page.

Use Configure Access Control to specify the behavior when authenticated users access the application, determine the default role for users not in the access control list, and determine the userame format (email or string).

To configure access control:

1. Run the application and navigate to Access Control.
By default, navigate to the **Administration** page and locate **Access Control** section.

2. Under Access Control, click **Access Control**.
3. In the Configure Access Control dialog, edit **Any authenticated user may access this application**:
 - **Off** - Choose **Off** if all defined users are included in the access control list.
 - **On** - Choose **On** if authenticated users not in the access control list may also use this application.
4. To save your changes, click **Apply Changes**.

20.3.6 About Controlling Access for Pages and Page Components

Control access to a specific page or page component by editing the page or component and selecting an authorization schemes.

The Access Control Wizard creates authorization schemes that correspond to the application mode list options and the privileges available in the Access Control List.

You can control access to a specific page or page component by editing the page or component and selecting one of the following authorization schemes:

- **Administration Rights** - Only users with Administrator privileges can view the page or component.
- **Contribution Rights** - Users with both Edit and Administrator privileges can view the page or component. Users with View privileges cannot view the page or component.
- **Reader Rights** - Users with Administrator, Edit, or View privileges can view the page or component.
- **Not Administration Rights** - Users with Administrator privileges cannot view the page or component.
- **Not Contribution Rights** - Users with both Edit and Administrator privileges cannot view the page or component. Users with View privileges can view the page or component.
- **Not Reader Rights** - Users with Administrator, Edit, or View privileges cannot view the page or component.



See Also:

["Attaching an Authorization Scheme to an Application, Page, or Components"](#)

20.3.7 About Removing an Access Control Created with a Wizard

Remove an access control created with a wizard using build options.

When you add an access control list using a wizard, the wizard creates one or more pages and other components and processes to seamlessly integrate it into your application. Each feature is associated with a build option which contains one or more components. You use the associated build option to enable, disable, or permanently remove features.

Using Build Options to Include or Exclude Features

Build options have two possible values: **Include** and **Exclude**. If you select the build option status of **Include**, then the Application Express engine considers the associated components (in this case features) as part of the application definition at runtime. Conversely, if you specify the build options status as **Exclude**, then the Application Express engine treats it and any associated components as if it did not exist.

Removing Features Permanently

You remove features created with a wizard by first removing the components associated with the build option and then deleting the build option.



See Also:

- ["Including or Excluding Build Options"](#)
- ["Deleting Build Options and Associated Components"](#)

20.3.8 Managing Roles and User Assignments

Manage application access control roles and user role assignments on the Application Access Control page..



Tip:

You also use the `APEX_APP_ACL` API.

- [About Application Access Control](#)
Learn about managing access control application users and roles.
- [Creating Access Control Roles](#)
Create application access control roles.
- [Editing or Deleting Access Control Roles](#)
Edit or delete application access control roles.
- [Adding User Role Assignments](#)
Define additional user role assignments on the Application Access Control page.
- [Editing User Role Assignments](#)
Edit or delete user role assignments.



See Also:

- ["Controlling Access to Applications, Pages, and Page Components"](#)
- ["APEX_ACL" in Oracle Application Express API Reference](#)

20.3.8.1 About Application Access Control

Learn about managing access control application users and roles.

You create an access control list by running the Access Control Wizard from either the Create Application Wizard or Create Page Wizard. The Access Control Wizard creates a page to manage an access control list and creates two tables within the application's default parsing schema to manage the access control list. Use the access control list within the application to associate the privileges (`view`, `edit`, and `administration`), with application users. Each privileges correlates to an access level role:

- `View` correlates to the `READER` role.
- `Edit` correlates to the `CONTRIBUTOR` role.
- `Administration` correlates to the `ADMINISTRATOR` role.

To control access to application pages and components, you need to create an Authorization Scheme and associate it with the application.

About Defining Additional Roles

You can define additional roles on the Application Access Control page. Since roles are applied to users you must create the roles before adding users. Roles and users defined on the Application Access Control page can be reviewed using the following view:

- `APEX_APPL_ACL_USERS`
- `APEX_APPL_ACL_USER_ROLES`
- `APEX_APPL_ACL_ROLES`



See Also:

["Attaching an Authorization Scheme to an Application"](#)

20.3.8.2 Creating Access Control Roles

Create application access control roles.



Tip:

Since roles are applied to users, you must create the roles before adding users.

To create an application access control role:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.The Shared Components page appears.
2. Under Security, select **Application Access Control**.
The Application Access Control page appears.
3. Under User Role Assignments, click **Add User Role Assignment**.
The User Assignment dialog appears.
4. On User Assignment:
 - a. **User Name** - Enter a descriptive name for this role. Name may only contain alphanumeric characters and underscores (_).
 - b. **Application Role** - Select a role.
5. Click **Create Assignment**.
The new user assignment displays under User Role Assignments.



Tip:

Application users are not exported as part of your application. When you deploy your application you will need to manually manage your user to role assignments. Roles are exported as part of an application export and imported with application imports.

20.3.8.5 Editing User Role Assignments

Edit or delete user role assignments.

To edit user role assignments:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.The Shared Components page appears.
2. Under Security, select **Application Access Control**.
The Application Access Control page appears.
3. To edit an existing user role assignment:
 - a. Under User Role Assignments, select a user name.
The User Assignment dialog appears.
 - b. For Application Role, select a new role.
 - c. Click **Save**.

4. To delete a user role assignment:
 - a. Under User Role Assignments, select a user name.
The User Assignment dialog appears.
 - b. Click **Delete**.

 **Tip:**

Application users are not exported as part of your application. When you deploy your application you will need to manually manage your user to role assignments. Roles are exported as part of an application export and imported with application imports.

 **See Also:**

["Exporting an Application and Application Components"](#)

20.4 Establishing User Identity Through Authentication

Use authentication to establish a user's identity to control access to an application. Authentication may require a user identify a user name and password or could involve the use of digital certificates or a secure key.

- [Understanding Authentication](#)
Learn about authentication.
- [Creating an Authentication Scheme](#)
Create an authentication scheme on the Shared Components page.
- [Understanding Preconfigured Authentication Schemes](#)
Learn about the preconfigured authentication schemes.
- [Configuring an Existing Authentication Scheme](#)
Configure various settings and program hooks in an existing authentication scheme.
- [Viewing the Authentication Scheme Associated with an Application](#)
View the current authentication scheme associated with an application.
- [Changing the Authentication Scheme Associated with an Application](#)
Change the authentication scheme associated with an application.
- [Creating a Login Page](#)
Create an application login page.
- [Viewing Authentication Scheme Reports](#)
View authentication scheme reports.

20.4.1 Understanding Authentication

Learn about authentication.

- [How Authentication Works](#)

- [About Support for Deep Linking](#)
- [About Determining Whether to Include Authentication](#)

20.4.1.1 How Authentication Works

You determine how your application interacts with users. If all users have the same rights and privileges, they are referred to as public users. However, if your application must track each user individually, you must specify an authentication method.

Authentication establishes the identity of each user who accesses your application. Many authentication processes require that a user provide some type of credentials such as a user name and password. These credentials are then evaluated and they either pass or fail. If the credentials pass, the user has access to the application. Otherwise, access is denied.

Once a user has been identified, the Application Express engine keeps track of each user by setting the value of the built-in substitution string `APP_USER`. As a user navigates from page to page, the Application Express engine sets the value of `APP_USER` to identify the user. The Application Express engine uses `APP_USER` as one component of a key for tracking each user's session state.

From a programming perspective, you can access `APP_USER` using the following syntax:

- As a bind variable from either PL/SQL or SQL:

```
:APP_USER
```

- From PL/SQL packages and triggers:

```
V('APP_USER')
```

- As an attribute of the context `APEX$SESSION`:

```
sys_context('APEX$SESSION', 'APP_USER')
```

You can use `APP_USER` to perform your own security checks and conditional processing. For example, suppose you created the following table:

```
CREATE TABLE my_security_table (  
  user_id VARCHAR2(30),  
  privilege VARCHAR2(30));
```

Once created, you could populate this table with user privilege information and then use it to control the display of pages, tabs, navigation bars, buttons, regions, or any other control or component.

See Also:

- ["APP_USER"](#)
- ["Configuring Security Attributes"](#)

20.4.1.2 About Support for Deep Linking

Oracle Application Express applications that use authentication schemes support deep linking. Deep linking refers to the ability to link to an Oracle Application Express page out of context (for example, from a hyperlink in an email or workflow notification). When you link to a page out of context and the application requires the user be authenticated, the user is taken to the login page. After credentials verification, the Application Express engine automatically displays the page that was referenced in the original link.

20.4.1.3 About Determining Whether to Include Authentication

As you create your application, you must determine whether to include authentication. You can:

- **Choose to not require authentication.** Oracle Application Express does not check any user credentials. All pages of your application are accessible to all users.
- **Select a built-in authentication scheme.** Create an authentication method based on available preconfigured authentication schemes. Depending on which scheme you choose, you may also have to configure the corresponding components of Oracle 10giAS, Oracle Internet Directory, or other external services.
- **Create custom authentication scheme.** Create a custom authentication method to have complete control over the authentication interface. To implement this approach, you must provide a PL/SQL function the Application Express engine executes before processing each page request. This function's Boolean return value determines whether the Application Express engine processes the page normally or displays a failure page.

See Also:

- ["Understanding Preconfigured Authentication Schemes"](#)
- ["Changing the Authentication Scheme Associated with an Application"](#)
- ["Creating and Editing an Authorization Scheme"](#)

20.4.2 Creating an Authentication Scheme

Create an authentication scheme on the Shared Components page.

To create an authentication scheme:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
4. Under Security, select **Authentication Schemes**.
The Authentication Schemes page appears.
5. You can customize the appearance the page using the Search bar at the top of the page.

6. To create a new authentication scheme, click **Create**.
7. Specify how the scheme should be created by selecting one of the following:
 - **Based on a pre-configured scheme from the gallery.**
 - **As a copy of an existing authentication scheme.**
8. Follow the on-screen instructions.

 **See Also:**

- ["Understanding Preconfigured Authentication Schemes"](#)
- ["Custom Authentication"](#)

20.4.3 Understanding Preconfigured Authentication Schemes

Learn about the preconfigured authentication schemes.

When you create an authentication scheme from the gallery you can select a preconfigured authentication scheme which follows a standard behavior for authentication and session management. Note that if you create a new authentication scheme, it automatically becomes the current authentication scheme for the selected application. This section describes all preconfigured authentication schemes that ship with Oracle Application Express.

 **Tip:**

Authentication schemes support plug-ins. To learn more, see "[Implementing Plug-ins](#)."

- [Application Express Accounts](#)
Application Express Accounts are user accounts that are created within and managed in the Oracle Application Express user repository. When you use this method, your application is authenticated against these accounts.
- [Custom Authentication](#)
Creating a Custom Authentication scheme from scratch to have complete control over your authentication interface.
- [Database Accounts](#)
Database Account Credentials authentication utilizes database schema accounts to authenticate users.
- [HTTP Header Variable](#)
Authenticate users externally by storing the username in a HTTP Header variable set by the web server.
- [LDAP Directory](#)
Authenticate a user and password with an authentication request to a LDAP server.

- [No Authentication \(using DAD\)](#)
Adopts the current database user. This approach can be used in combination with a `mod_plsql` Database Access Descriptor (DAD) configuration that uses basic authentication to set the database session user.
- [Open Door Credentials](#)
Enable anyone to access your application using a built-in login page that captures a user name.
- [Oracle Application Server Single Sign-On Server](#)
Delegates authentication to the Oracle AS Single Sign-On (SSO) Server. To use this authentication scheme, your site must have been registered as a partner application with the SSO server.
- [Social Sign-In](#)
Social Sign-In supports authentication with Google, Facebook, and other social network that supports `OpenID Connect` or `OAuth2` standards.

20.4.3.1 Application Express Accounts

Application Express Accounts are user accounts that are created within and managed in the Oracle Application Express user repository. When you use this method, your application is authenticated against these accounts.

- [About Application Express Accounts](#)
- [Setting Up Application Express Accounts Authentication](#)

20.4.3.1.1 About Application Express Accounts

Application Express Accounts authentication requires that a database user (schema) exists in the local database. When using this method, the user name and password of the database account is used to authenticate the user.

Application Express Accounts is a good solution when:

- You want control of the user account repository.
- User name and password-based approach to security is sufficient.
- You do not need to integrate into a single sign-on framework.

Application Express Accounts is an especially good approach when you must get a group of users up and running on a new application quickly.

Recommendations for Production Environments

Oracle does not recommend Application Express Accounts authentication in production environments. The credentials used to log in to an application may be the same as the credentials used to log in to a workspace. In production environments, Oracle recommends using another identity provider such as Oracle Access Manager (OAM), Oracle Identity Cloud Service (IDCS), Okta, or Microsoft Azure authentication.



See Also:

"Managing Application Express Users" in *Oracle Application Express Administration Guide*

20.4.3.1.2 Setting Up Application Express Accounts Authentication

1. To set up Application Express Accounts:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 4. Under Security, select **Authentication Schemes**.
 5. On the Authentication Schemes page, click **Create**.
 6. Select **Based on a pre-configured scheme from the gallery** and click **Next**.
 7. Under Name:
 - a. Name - Enter the name used to reference the authentication scheme by other application developers.
 - b. Scheme Type - Select **Application Express Accounts**.
 - c. Click **Create Authentication Scheme**.

20.4.3.2 Custom Authentication

Creating a Custom Authentication scheme from scratch to have complete control over your authentication interface.

- [About Custom Authentication](#)
- [Setting Up Custom Authentication](#)
- [About Session Management Security](#)

20.4.3.2.1 About Custom Authentication

Custom Authentication is the best approach for applications when any of the following is true:

- Database authentication or other methods are not adequate.
- You want to develop your own login form and associated methods.
- You want to control security aspects of session management.
- You want to record or audit activity at the user or session level.
- You want to enforce session activity or expiry limits.
- You want to program conditional one-way redirection logic before Oracle Application Express page processing.
- You want to integrate your application with non-Oracle Application Express applications using a common session management framework.

- Your application consists of multiple applications that operate seamlessly (for example, more than one application ID).

 **Tip:**

If you are planning on using the same authentication scheme for multiple applications, consider writing a custom authentication plug-in. See "[Implementing Plug-ins](#)."

20.4.3.2.2 Setting Up Custom Authentication

1. To create a custom authentication scheme:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 4. Under Security, select **Authentication Schemes**.
 5. On the Authentication Schemes page, click **Create**.
 6. Select **Based on a pre-configured scheme from the gallery** and click **Next**.
 7. Under Name:
 - a. Name - Enter the name used to reference the authentication scheme by other application developers.
 - b. Scheme Type - Select **Custom**.
 8. Fill in the appropriate fields.
To learn more about a specific field, see field-level Help.
 9. Click **Create Authentication Scheme**.

 **See Also:**

["Viewing Help"](#)

20.4.3.2.3 About Session Management Security

When running custom authentication, Oracle Application Express attempts to prevent two improper situations:

- Intentional attempts by a user to access session state belonging to someone else. However, users can still type in an arbitrary application session ID into the URL.
- Inadvertent access to a stale session state (probably belonging to the same user from an earlier time). This would commonly result from using bookmarks to application pages.

Oracle Application Express checks that the user identity token set by the custom authentication function matches the user identity recorded when the application session was first created. If the user has not yet been authenticated and the user identity is not yet known,

the session state being accessed does not belong to someone else. These checks determine whether the session ID in the request can be used. If not, the Application Express engine redirects back the same page using an appropriate session ID.

20.4.3.3 Database Accounts

Database Account Credentials authentication utilizes database schema accounts to authenticate users.

- [About Database Account Credentials](#)
- [Setting Up Database Account Credentials](#)

20.4.3.3.1 About Database Account Credentials

Database Account Credentials requires that a database user (schema) exist in the local database. This authentication method uses the database account user name and password to authenticate the user. Choose Database Account Credentials if having one database account for each named user of your application is feasible and account maintenance using database tools meets your needs.

20.4.3.3.2 Setting Up Database Account Credentials

1. To set up Database Account Credentials:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 4. Under Security, select **Authentication Schemes**.
 5. On the Authentication Schemes page, click **Create**.
 6. Select **Based on a pre-configured scheme from the gallery** and click **Next**.
 7. Under Name:
 - a. Name - Enter the name used to reference the authentication scheme by other application developers.
 - b. Scheme Type - Select **Database Accounts**.
 - c. Click **Create Authentication Scheme**.

20.4.3.4 HTTP Header Variable

Authenticate users externally by storing the username in a HTTP Header variable set by the web server.

 **Note:**

To ensure the security and performance of your development environment, this functionality is not available in Application Express instances running in Oracle Cloud.

- [About HTTP Header Variable](#)
- [Setting Up HTTP Header Variable](#)

20.4.3.4.1 About HTTP Header Variable

HTTP Header Variable supports the use of header variables to identify a user and to create an Application Express user session. Use HTTP Header Variable authentication scheme if your company employs a centralized web authentication solution like Oracle Access Manager which provides single sign-on across applications and technologies. User credential verification is performed by these systems and they pass the user's name to Oracle Application Express using a HTTP header variable such as "REMOTE_USER" (which is the default).

20.4.3.4.2 Setting Up HTTP Header Variable

1. To set up HTTP Header Variable:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 4. Under Security, select **Authentication Schemes**.
 5. On the Authentication Schemes page, click **Create**.
 6. Select **Based on a pre-configured scheme from the gallery** and click **Next**.
 7. Under Name:
 - a. Name - Enter the name used to reference the authentication scheme by other application developers.
 - b. Scheme Type - Select **HTTP Header Variable**.
 8. Fill in the appropriate fields.
To learn more about a specific field, see field-level Help.
 9. Click **Create Authentication Scheme**.



See Also:

["Viewing Help"](#)

20.4.3.5 LDAP Directory

Authenticate a user and password with an authentication request to a LDAP server.

**Note:**

To ensure the security and performance of your development environment, this functionality is not available in Application Express instances running in Oracle Cloud.

- [About LDAP Directory Verification](#)
- [Setting Up LDAP Directory Verification](#)

20.4.3.5.1 About LDAP Directory Verification

You can configure any authentication scheme that uses a login page to use Lightweight Directory Access Protocol (LDAP) to verify the user name and password submitted on the login page.

App Builder includes wizards and edit pages that explain how to configure this option. These wizards assume that an LDAP directory accessible to your application for this purpose already exists and that it can respond to a `SIMPLE_BIND_S` call for credentials verification. When you create an LDAP Credentials authentication scheme, the wizard requests and saves the LDAP host name, LDAP port, DN string, and determines whether to use SSL, exact DN, and optionally a search filter if not using exact DN. An optional preprocessing function can be specified to adjust formatting of the user name passed to the API.

20.4.3.5.2 Setting Up LDAP Directory Verification

1. To set up LDAP Directory:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 4. Under Security, select **Authentication Schemes**.
 5. On the Authentication Schemes page, click **Create**.
 6. Select **Based on a pre-configured scheme from the gallery** and click **Next**.
 7. Under Name:
 - a. Name - Enter the name used to reference the authentication scheme by other application developers.
 - b. Scheme Type - Select **LDAP Directory**.
 8. Under Settings:
 - a. Host - Enter the hostname of your LDAP directory server.
 - b. Port - Enter the port number of your LDAP directory host. The default is 389.
 - c. Use SSL - Choose whether to use SSL to bind to the LDAP directory. If SSL with Authentication is chosen, a wallet must be configured for the Application Express instance.
 - d. Distinguished Name (DN) String - Enter the pattern used to construct the fully qualified distinguished name (DN) string to `DBMS_LDAP.SIMPLE_BIND_S` if using

exact DN or the search base if using non-exact DN. Use `%LDAP_USER%` as a placeholder for the username. For example:

Exact DN:

```
cn=%LDAP_USER%,l=amer,dc=yourdomain,dc=com
```

Non-Exact DN (Search Base):

Non-Exact DN (Search Base)

- e. Use Distinguished Name (DN) - Choose whether the LDAP Distinguished Name (DN) String is exact or non-exact. If non-exact, LDAP Distinguished Name (DN) is the search base and you must supply a Search Filter.
- f. LDAP Username Edit Function - You may provide additional code to be executed to transform the username into a format perfectly suited to the LDAP directory entry or LDAP username. The bind variable `:USERNAME` contains the name the end user specified. For example, the following code calls a function which replaces all periods (.) with underscores (_) in the DN string:

```
return apex_custom_auth.ldap_dnprep(p_username => :USERNAME);
```
- g. Username Escaping - Choose how Oracle Application Express escapes special characters in `%LDAP_USER%`. The correct value for this attribute depends on the used LDAP server and whether a LDAP Username Edit Function already escapes special characters.

To learn more about a specific field, see field-level Help.

9. Click **Create Authentication Scheme**.

 **Note:**

If you choose SSL with Authentication as the SSL mode, a wallet must be set up using the Oracle Application Express instance settings. Additionally, the root certification of the LDAP server must be imported into that wallet as a trusted certificate.

 **See Also:**

- "Configuring Wallet Information" in *Oracle Application Express Administration Guide*
- "About Oracle Wallet Manager" in *Oracle Database Security Guide*

20.4.3.6 No Authentication (using DAD)

Adopts the current database user. This approach can be used in combination with a `mod_plsql` Database Access Descriptor (DAD) configuration that uses basic authentication to set the database session user.

- [About DAD Credentials Verification](#)
- [Setting Up DAD Credentials Verification](#)

20.4.3.6.1 About DAD Credentials Verification

DAD credentials verification uses the Oracle database native authentication and user mechanisms to authenticate users using a basic authentication scheme. This authentication scheme gets the user name from the DAD either as the value stored in the DAD configuration or, if the account information is not stored in the DAD configuration, as the user name captured using the basic authentication challenge.

To use DAD credentials verification:

- Each application user must have a user account in the Oracle database.
- You must configure a PL/SQL DAD for basic authentication (without account information).

This results in one user name/password challenge for browser session for your application users. The user identity token is then made available in the `APP_USER` item.

DAD database authentication is useful when you must implement an authentication method that requires minimal setup for a manageable number of users. Ideally these users would have self-managed accounts in the database and your use of this authentication method would be short lived (for example, during the demonstration or prototyping stages of development).

The main drawback of this approach is burdensome account maintenance, especially if users do not administer their own passwords, or if their database accounts exist only to facilitate authentication to your application.

20.4.3.6.2 Setting Up DAD Credentials Verification

1. To set up DAD Credentials Verification:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 4. Under Security, select **Authentication Schemes**.
 5. On the Authentication Schemes page, click **Create**.
 6. Select **Based on a pre-configured scheme from the gallery** and click **Next**.
 7. Under Name:
 - a. Name - Enter the name used to reference the authentication scheme by other application developers.
 - b. Scheme Type - Select **No Authentication**.
 8. Click **Create Authentication Scheme**.

20.4.3.7 Open Door Credentials

Enable anyone to access your application using a built-in login page that captures a user name.

Open Door Credentials enables anyone to access your application using a login page that captures a user name. This authentication scheme is useful during application development.

- [Setting Up Open Door Credentials](#)

20.4.3.7.1 Setting Up Open Door Credentials

1. To set up Open Door Credentials:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 4. Under Security, select **Authentication Schemes**.
 5. On the Authentication Schemes page, click **Create**.
 6. Select **Based on a pre-configured scheme from the gallery** and click **Next**.
 7. Under Name:
 - a. Name - Enter the name used to reference the authentication scheme by other application developers.
 - b. Scheme Type - Select **Open Door Credentials**.
 8. Click **Create Authentication Scheme**.

20.4.3.8 Oracle Application Server Single Sign-On Server

Delegates authentication to the Oracle AS Single Sign-On (SSO) Server. To use this authentication scheme, your site must have been registered as a partner application with the SSO server.



Note:

To ensure the security and performance of your development environment, this functionality is not available in Application Express instances running in Oracle Cloud.

- [About Application Server Single Sign-On Server](#)
- [Setting Up Oracle Application Server Single Sign-On](#)

20.4.3.8.1 About Application Server Single Sign-On Server

Oracle Application Express applications can operate as partner applications with Oracle Application Server's Single Sign-On (SSO) infrastructure. You must register your application (or register the Application Express engine) as the partner application by following the Oracle Application Server instructions for registering partner applications and install the Oracle 9iAS SSO Software Developer Kit (SDK).

If you choose this approach, your application will not use an integrated login page. Instead, when a user accesses your application in a new browser session, the Application Express engine redirects to the Single Sign-On login page. After the user is authenticated by SSO, the SSO components redirect back to your application, passing the user identity and other

information to the Application Express engine. The user can then continue to use the application until they log off, terminate their browser session, or until some other session-terminating event occurs.

20.4.3.8.2 Setting Up Oracle Application Server Single Sign-On

1. To set up Oracle Application Server Single Sign-On:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 4. Under Security, select **Authentication Schemes**.
 5. On the Authentication Schemes page, click **Create**.
 6. Select **Based on a pre-configured scheme from the gallery** and click **Next**.
 7. Under Name:
 - a. Name - Enter the name used to reference the authentication scheme by other application developers.
 - b. Scheme Type - Select **Oracle Application Server Single Sign-On**.
 8. Fill in the appropriate fields.
To learn more about a specific field, see field-level Help.
 9. Click **Create Authentication Scheme**.



See Also:

["Viewing Help"](#)

20.4.3.9 Social Sign-In

Social Sign-In supports authentication with Google, Facebook, and other social network that supports OpenID Connect or OAuth2 standards.

- [About Social Sign-In](#)
- [Setting Up Social Sign-In Authentication](#)

20.4.3.9.1 About Social Sign-In

Social Sign-In authentication is primarily useful for the following use cases:

- Your application is internet facing and you expect an unknown number of users from social networks to use your application.
- Your company has standardized on one of these identity providers for authentication: Oracle Identity Cloud Service, an internal OpenID Connect or OAuth2.

Since these identity providers perform user credential verification, be aware that anyone who registers with the provider can use your application, unless you use authorization schemes for protection.

When registering your application with the identity provider, you need to use the full URI for one of the predefined Oracle Application Express callback URLs. For example, suppose your application URI is:

```
https://www.example.com/apex/f?p=100
```

Then, you can register one of the following:

```
https://www.example.com/apex/apex_authentication.callback
```

or

```
https://www.example.com/apex/apex_authentication.callback2
```

Social network authentication providers store a multitude of information about users. You can configure the Social Login authentication scheme to request this information, using the Scope attribute (see Item Help). In the authentication scheme's Post-Authentication procedure, you can access this information using `APEX_JSON.GET_%` function calls.

You can use multiple authentication schemes in your application, to support more than one Social Login provider and other schemes.



See Also:

"[Authorization](#)" for the authentication scheme attribute `Switch in Session` for details.

20.4.3.9.2 Setting Up Social Sign-In Authentication



Note:

As a prerequisite for creating the Social Sign-In Authentication, you have to request `OAuth2` credentials from the authentication provider and configure your account to support redirects to your application. Check your authentication provider's documentation for the details. The steps below assume that this has been done and that you saved the `OAuth2` credentials in the application's shared components.

1. To set up Social Sign-In Authentication:
 1. On the Workspace home page, click the **App Builder** icon.
 2. Select an application.
 3. On the Application home page, click **Shared Components**.

The Shared Components page appears.

4. Under Security, select **Authentication Schemes**.
5. On the Authentication Schemes page, click **Create**.
6. Select **Based on a pre-configured scheme from the gallery** and click **Next**.
7. Under Name:
 - a. Name - Enter the name used to reference the authentication scheme by other application developers.
 - b. Scheme Type - Select **Social Sign-In**.
8. Fill in the appropriate fields.

To learn more about a specific field, see field-level Help.
9. Click **Create Authentication Scheme**.

20.4.4 Configuring an Existing Authentication Scheme

Configure various settings and program hooks in an existing authentication scheme.

The current Authentication Scheme determines how your application identifies and verifies the end user. Depending on the selected Authentication Scheme, you can configure various settings and program hooks to fine-tune your application's authentication such as login processing, post-logout URL, and session sharing.

To configure an existing authentication scheme:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.

The Shared Components page appears.
4. Under Security, select **Authentication Schemes**.

Customize the appearance the page using the Search bar at the top of the page.
5. To configure an authentication scheme, click the authentication scheme name.

The Authentication Scheme page appears.
6. Edit the appropriate attributes.

To learn more about a specific attribute, see field-level Help.
7. Edit the appropriate attributes and click **Apply Changes**.

 **See Also:**
["Viewing Help"](#)

20.4.5 Viewing the Authentication Scheme Associated with an Application

View the current authentication scheme associated with an application.

To view the current authentication scheme for an application:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click **Shared Components**.
4. Under Security, click **Security Attributes**.
5. Locate the Authentication section. The current authentication scheme displays next to **Authentication Scheme**.
6. To edit the Authentication Scheme, **Define Authentication Schemes**.

20.4.6 Changing the Authentication Scheme Associated with an Application

Change the authentication scheme associated with an application.

To change the authentication scheme for an application:

1. Navigate to the Authentication Schemes:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 - d. Under Security, select **Authentication Schemes**.
2. Select the authentication scheme you want to activate.
The Create/Edit page appears.
3. Click **Make Current Scheme**.



See Also:

["Understanding Preconfigured Authentication Schemes"](#)

20.4.7 Creating a Login Page

Create an application login page.

When you create an application in Oracle Application Express, a login page is created. The alias for the page is 'LOGIN'. You can use this page as the "invalid session page" in an authentication scheme. The page is constructed with processes that call the Oracle Application Express login API to perform credentials verification and session registration.

You can also build your own login pages using the pre-built pages as models and tailoring all of the user interface and processing logic to your requirements.

To create a login page for your application:

1. On the Workspace home page, click the App Builder icon.
2. Select an application.
3. Click **Create Page**.
4. For Create a Page:
 - a. User Interface - Select a user interface for the page.
 - b. Select a page type - Select **Login Page**.
 - c. Click **Next**.
5. Select **Login Page**.
6. Specify Login page attributes and click **Create**.

20.4.8 Viewing Authentication Scheme Reports

View authentication scheme reports.

To view authentication scheme reports:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
4. Under Security, select **Authentication Schemes**.
5. Click the appropriate tab at the top of the page:
 - **Subscription** - Use the Authentication Scheme Subscription report to view subscribed authentication schemes in your application.
 - **History** - Use the Authentication Scheme History report to view recent modifications made to items in this application.

20.5 Providing Security Through Authorization

Extend the security of your application by creating an authorization scheme.

Authorization is a broad term for controlling access to resources based on user privileges. While conditions control the rendering and processing of specific page controls or components, authorization schemes control user access to specific controls or components.

- [How Authorization Schemes Work](#)
Learn about how an authorization scheme extends the security of your application's authentication scheme.
- [Creating and Editing an Authorization Scheme](#)
Learn how to create and edit an authorization scheme. Before you can attach an authorization scheme to an application or an application component or control, you must first create it.

- [Attaching an Authorization Scheme to an Application, Page, or Components](#)
Attach an authorization scheme to an entire application, page, control, or component.
- [Viewing Authorization Reports](#)
View the Authorization Scheme Subscription and Authorization Scheme Utilization reports to better manage authorization schemes within your application.

20.5.1 How Authorization Schemes Work

Learn about how an authorization scheme extends the security of your application's authentication scheme.

You can specify an authorization scheme for an entire application, page, or specific control such as a region, item, or button. For example, you could use an authorization scheme to selectively determine which tabs, regions, or navigation bars a user sees. An authorization scheme either succeeds or fails. Common authorization scheme types include Exists, Not Exists SQL Queries, and PL/SQL Function Returning Boolean. If a component or control level authorization scheme succeeds, the user can view the component or control. If it fails, the user cannot view the component or control. If an application or page-level authorization scheme fails, then Oracle Application Express displays a previously defined message.

When you define an authorization scheme, you give it a unique name. Once defined, you can attach it to any component or control in your application. To attach an authorization scheme to a component or control in your application, simply navigate to the appropriate attributes page and select an authorization scheme from the Authorization Scheme list.

20.5.2 Creating and Editing an Authorization Scheme

Learn how to create and edit an authorization scheme. Before you can attach an authorization scheme to an application or an application component or control, you must first create it.

- [About Authorization Scheme Types](#)
Select an authorization scheme type when you create an authorization scheme.
- [Creating an Authorization Scheme](#)
Create an authorization scheme on the Shared Components page.
- [Editing Attributes of an Existing Authorization Scheme](#)
Edit attributes of an existing authorization scheme.
- [Changing the Evaluation Point Attribute](#)
Control when an authorization scheme is validated using the Evaluation Point, Validate authorization scheme attribute.
- [About Resetting Authorization Scheme State](#)
Call an API to reset a session's authorization scheme state.

20.5.2.1 About Authorization Scheme Types

Select an authorization scheme type when you create an authorization scheme.

The authorization scheme type determines how an authorization scheme is applied. Developers can create new authorization type plug-ins to extend this list.

Table 20-1 Authorization Scheme Types

Authorization Scheme Types	Description
Exists SQL Query	Enter a query that causes the authorization scheme to pass if it returns at least one row and causes the scheme to fail if it returns no rows
NOT Exists SQL Query	Enter a query that causes the authorization scheme to pass if it returns no rows and causes the scheme to fail if it returns one or more rows
PL/SQL Function Returning Boolean	Enter a function body. If the function returns true, the authorization succeeds.
Item in Expression 1 is NULL	Enter an item name. If the item is null, the authorization succeeds.
Item in Expression1 is NOT NULL	Enter an item name. If the item is not null, the authorization succeeds.
Value of Item in Expression 1 Equals Expression 2	Enter an item name and a value. The authorization succeeds if the item's value equals the authorization value.
Value of Item in Expression 1 Does NOT Equal Expression 2	Enter an item name and a value. The authorization succeeds if the item's value is not equal to the authorization value.
Value of Preference in Expression 1 Does NOT Equal Expression 2	Enter an preference name and a value. The authorization succeeds if the preference's value is not equal to the authorization value.
Value of Preference in Expression 1 Equals Expression 2	Enter an preference name and a value. The authorization succeeds if the preference's value equal the authorization value.
Is In Group	Enter a group name. The authorization succeeds if the group is enabled as a dynamic group for the session. See "APEX_AUTHORIZATION.ENABLE_DYNAMIC_GROUPS" in <i>Oracle Application Express API Reference</i> . If the application uses Application Express Accounts Authentication, this check also includes workspace groups that are granted to the user. If the application uses Database Authentication, this check also includes database roles that are granted to the user.
Is Not In Group	Enter a group name. The authorization succeeds if the group is not enabled as a dynamic group for the session.

20.5.2.2 Creating an Authorization Scheme

Create an authorization scheme on the Shared Components page.

To create an authorization scheme:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.
The Shared Components page appears.
4. Under Security, select Authorization Schemes.
5. Click **Create**.
6. Specify how to create an authorization scheme by selecting one of the following:
 - **From Scratch**
 - **As a Copy of an Existing Authorization Scheme**
7. On Create Authorization Scheme - Details:

- a. Name - Enter an unique name that identifies this authorization scheme.
- b. Scheme Type - Select how this authorization scheme will be applied. See "[About Authorization Scheme Types](#)."
- c. Identify error message displayed when scheme violated - Enter error text that displays if the authorization scheme fails (that is, the current user fails the security check).
- d. Validate Authorization Scheme - Authorization schemes are evaluated on first use in a session. Use this option to controls if future uses cause re-evaluations and when a memorized result can be taken instead.

For more details, see field-level Help.

8. Click **Create Authorization Scheme**.



See Also:

- "[Attaching an Authorization Scheme to an Application, Page, or Components](#)"
- "[Changing the Evaluation Point Attribute](#)"
- "[About Resetting Authorization Scheme State](#)"

20.5.2.3 Editing Attributes of an Existing Authorization Scheme

Edit attributes of an existing authorization scheme.

To edit attributes of an existing authorization scheme:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.

The Shared Components page appears.

4. Under Security, select **Authorization Schemes**.

The Authorization Schemes page appears. By default, each scheme displays as an icon. You can customize the appearance the page using the Search bar at the top of the page.

5. Select an authorization scheme.
6. Edit the appropriate attributes.

To learn more, see field-level Help.

7. To save your changes, click **Apply Changes**.

20.5.2.4 Changing the Evaluation Point Attribute

Control when an authorization scheme is validated using the Evaluation Point, Validate authorization scheme attribute.

Authorization schemes are evaluated on first use in a session. The Validate authorization scheme attribute controls if future uses cause re-evaluations and when a memorized result can be taken instead.

To change the authorization scheme evaluation point:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.

The Shared Components page appears.

4. Under Security, select **Authorization Schemes**.

The Authorization Schemes page appears.

By default, each scheme displays as an icon. You can customize the appearance the page using the Search bar at the top of the page.

5. Select an authorization scheme.
6. Scroll down to Evaluation Point and edit the Validate authorization scheme attribute. Options include:
 - **Once per session** - Evaluate only once and always use the memorized result afterwards.
 - **Once per page view** - Evaluate once for each request that is processed. Use the memorized result if the authorization scheme is referenced in more than one component on the page.
 - **Once per component** - Evaluate once for each component that references the authorization scheme, but save the result in the session. Further requests to render or process the scheme use the result that was memorized for the component.
 - **Always (No Caching)** - The authorization scheme will always be evaluated.

To learn more, see field-level Help.

7. To save your changes, click **Apply Changes**.

 **Tip:**

The default value **Once per session** is the most efficient. You should choose another value if the authorization check depends on changing session state or other factors that are not consistent over an entire session.

20.5.2.5 About Resetting Authorization Scheme State

Call an API to reset a session's authorization scheme state.

If an authorization scheme is validated once for each session, Oracle Application Express caches the validation results in each user's session cache. You can reset a session's authorization scheme state by calling the `APEX_AUTHORIZATION.RESET_CACHE` API.



See Also:

"APEX_AUTHORIZATION.RESET_CACHE Procedure" in *Oracle Application Express API Reference*

20.5.3 Attaching an Authorization Scheme to an Application, Page, or Components

Attach an authorization scheme to an entire application, page, control, or component.

- [Attaching an Authorization Scheme to an Application](#)
- [Attaching an Authorization Scheme to a Page](#)
- [Attaching an Authorization Scheme to a Control or Component](#)

20.5.3.1 Attaching an Authorization Scheme to an Application

To attach an authorization scheme to an application:

1. On the Workspace home page, click the App Builder icon.
2. Select an application.
3. Click the **Shared Components** icon.
The Shared Components page appears.
4. Under Security, click **Security Attributes**.
5. Scroll down to Authorization and make a selection from the Authorization Scheme list.
6. For Run on Public Pages, select **On** or **Off** to specify whether the application-level authorization scheme is checked on public pages (that is, pages that do not require authorization). To learn more, see "[Authorization](#)."
7. To define a new authorization scheme, click **Define Authorization Schemes**.

20.5.3.2 Attaching an Authorization Scheme to a Page

To attach an authorization scheme to a page:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Select a page.
Page Designer appears.
4. In the Rendering tab on the left side, click the page title at the top of the tree.
5. In the Property Editor, locate Security and make a selection from the Authorization Scheme attribute.

 **Tip:**

To find a group or attribute:

- **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
- **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.

6. Click **Save**.

20.5.3.3 Attaching an Authorization Scheme to a Control or Component

To attach an authorization scheme to a page component or control:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Select a page.
Page Designer appears.
4. Select the component or control to which you want to apply the authorization scheme.
5. In the Property Editor, locate Security and make a selection from the Authorization Scheme attribute.

 **Tip:**

To find a group or attribute:

- **Search for the group or attribute** - Enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. To return to the default display, delete the keywords.
- **Use Go to Group** - Click **Go to Group** and select the group. To return the default display, click **Go to Group** again and select **Expand All**.

6. Click **Save**.

20.5.4 Viewing Authorization Reports

View the Authorization Scheme Subscription and Authorization Scheme Utilization reports to better manage authorization schemes within your application.

To view authorization scheme reports:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.

The Shared Components page appears.

4. Under Security, select **Authorization Schemes**.
5. Click the appropriate tab at the top of the page:
 - **Subscription** - Use the Authorization Scheme Subscription report to view details about authorization schemes subscription.
 - **By Component** - Use the By Component report to view all components within this application which have an associated authorization scheme. For a component to be rendered it must pass authorization schemes placed on the component level, the page level, and at the application level.
 - **Utilization** - Use the Authorization Scheme Utilization report to view details about authorization schemes utilization.

To view additional reports indicating which pages having authorization schemes and which do not, select one of the following from the Tasks list:

- **Report Pages With Authorization Schemes**
- **Report Pages Without Authorization Schemes**
- **History** - Use the Authorization Scheme History report to view recent modifications made to Authorization Schemes in this application.

21

Managing Application Globalization

You can run applications built in App Builder concurrently in different languages.

This section describes how to translate an application built in App Builder.

- [Understanding Application Translation and Globalization Support](#)
A single Oracle database instance and Oracle Application Express can support multiple database sessions customized to support different languages.
- [Specifying the Primary Language for an Application](#)
Globalization attributes specify how the Application Express engine determines the primary language of an application.
- [About Apply Format Masks to Items](#)
The Application Express engine applies globalization settings for each rendered page. This default behavior can impact the display of certain items such as numbers and dates.
- [About Translating Applications for Multibyte Languages](#)
If your application must run in several languages simultaneously (such as Chinese and Japanese), consider configuring your database with a character set to support all of the languages.
- [Understanding the Translation Process](#)
To translate an application developed in App Builder, you must map the primary and target language, seed and export text to a translation file, translate the text, apply the translation file, and publish the translated application.
- [Translating Messages](#)
Learn when and how to translate messages is an Oracle Application Express application.
- [Translating Data That Supports List of Values](#)
You create a dynamic translation to translate dynamic pieces of data. For example, you might use a dynamic translation on a list of values based on a database query.
- [Understanding Supported Globalization Codes](#)
If you are building a multilingual application, it is important to understand how globalization codes affect the way in which your application runs. These codes are set automatically based on the application-level Globalization attributes you select.



See Also:

"Viewing Installed Translations" in *Oracle Application Express Administration Guide*

21.3 About Apply Format Masks to Items

The Application Express engine applies globalization settings for each rendered page. This default behavior can impact the display of certain items such as numbers and dates.

For example, suppose your application determines the application language based on the user's browser language preference. If the Application Express engine determines the user's browser language preference is French, it displays dates and numbers in a format that conforms to French standards. You can override this default behavior and explicitly control how items display by applying a format mask. You apply a format mask by making a selection from the Display As list:

- When you create the item.
- After you create the item by editing the item attributes.

21.1 Understanding Application Translation and Globalization Support

A single Oracle database instance and Oracle Application Express can support multiple database sessions customized to support different languages.

You can develop applications in App Builder that can run concurrently in different languages.

- [About the Translation Process](#)
Learn about translating an application built in App Builder.
- [About Language Identification](#)
After you create an application, you specify a language preference. Then you select a primary application language and determine how the Application Express engine determines the application language. The application primary language can be static, derived from the Web browser language, or determined from a user preference or item.
- [About the Rules for Translating Database Applications](#)
Learn about rules for translating database applications.
- [How Translated Applications Are Rendered](#)
After Oracle Application Express determines the language for an application, the Application Express engine alters the database language for a specific page request. It then looks for a translated application in the appropriate language. If the Application Express engine finds that language, it renders the application using that definition. Otherwise, it renders the application in the base (or primary) application language.
- [Making Application Attributes Translatable](#)
Learn about best practices to make application attributes within your application translatable.

21.1.1 About the Translation Process

Learn about translating an application built in App Builder.

In general, translating an application built in App Builder involves the following steps:

1. Map the primary and target application IDs.
2. Seed and export the text to a file for translation.
3. Translate the text in the file.
4. Apply the translated file.

5. Publish the translated file.



See Also:

["Understanding the Translation Process"](#)

21.1.2 About Language Identification

After you create an application, you specify a language preference. Then you select a primary application language and determine how the Application Express engine determines the application language. The application primary language can be static, derived from the Web browser language, or determined from a user preference or item.



See Also:

["Specifying the Primary Language for an Application"](#)

21.1.3 About the Rules for Translating Database Applications

Learn about rules for translating database applications.

Use the following rules to determine which translated version to use:

- Look for an exact match between the user language preference and the language code of the translated application.
- Look for a truncated match. That is, see if the language and locale exist. For example, if the user language preference is `en-us` and the translated version of `en-us` does not exist, look for a translated application that has the language code `en`.
- Use the primary application language.

For example, suppose you create an application with the primary language of German, `de`, and you create a translated version of the application with a language code of `en-us`. Users accessing this application with a browser language of `en-us` execute the English `en-us` version of the application. Users accessing the application with a browser language of `en-gb` view the application in the application's primary language, that is, in German. For this example, you should create the translated English version using language code `en` to encompass all variations of `en`.

21.1.4 How Translated Applications Are Rendered

After Oracle Application Express determines the language for an application, the Application Express engine alters the database language for a specific page request. It then looks for a translated application in the appropriate language. If the Application Express engine finds that language, it renders the application using that definition. Otherwise, it renders the application in the base (or primary) application language.

Note that the text that displays within an application is not translated on the fly. Oracle Application Express dynamically collects page attributes from either a base language application definition or an alternative application definition.

 **See Also:**

- ["About Dynamic Translation Text Strings"](#)
- ["Translating Data That Supports List of Values"](#)

21.1.5 Making Application Attributes Translatable

Learn about best practices to make application attributes within your application translatable.

When you build an application in App Builder, you define a large number of declarative attributes such as field labels, region headings, page header text, and so on.

- [About Shortcuts that Support Translatable Messages](#)
- [About Messages](#)
- [About Dynamic Translation Text Strings](#)
- [About Translating Region Titles](#)
- [About Translating Templates](#)

21.1.5.1 About Shortcuts that Support Translatable Messages

App Builder includes two shortcut types that enable you to reference translatable messages:

- **Message.** Use this shortcut to reference a translatable message at runtime. Note that the name of the shortcut must match the corresponding message name. At runtime, the name of the shortcut expands to the text of the translatable message for the current language.
- **Message with JavaScript Escaped Single Quotes.** Use this shortcut to reference a shortcut inside of a JavaScript literal string and reference a translatable message at runtime. This shortcut defines a text string. When the shortcut is referenced, it escapes the single quotation marks required for JavaScript.

 **See Also:**

- ["Using Shortcuts"](#)

21.1.5.2 About Messages

If your application includes PL/SQL regions or PL/SQL processes, you must translate any generated HTML or text. You may also need to translate messages used in reports if your application uses a language that is not one of the ten languages into which Oracle Application Express is translated.



See Also:

["Translating Messages"](#)

21.1.5.3 About Dynamic Translation Text Strings

Dynamic translations are used for database data that must be translated at runtime. For example, you might use a dynamic translation to translate a list of values based on a database query. A dynamic translation consists of a translate-from language string, a language code, and a translate-to string. You can also use the `APEX_LANG.LANG` API to retrieve dynamic translations programmatically.



See Also:

["Translating Data That Supports List of Values"](#)

21.1.5.4 About Translating Region Titles

By default, page region titles are included in the generated translation file. However, you can mark a region title as not translatable.

- [Marking a Region as Not Translatable in Page Designer](#)

21.1.5.4.1 Marking a Region as Not Translatable in Page Designer

To mark a region title as not translatable:

1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. In the Rendering tab, select the region.

The Property Editor displays the region attributes. Attributes are organized in groups.
3. Find and expand the **Advanced** group.

4. For **For Exclude Title from Translation**, select **On** to exclude this title from translation. This attribute has no effect, except when translating the application into another language.
5. Click **Save**.

21.1.5.5 About Translating Templates

By default, templates are not translatable, and therefore are not included in the generated translation file. Generally, templates do not and should not contain translatable text. However, if you must mark a template as translatable, select the Translatable check box on the Edit Page Template page.

To identify a template as translatable:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.
4. Under User Interface, select **Templates**.
The Templates page appears.
5. Locate the template you want to edit and select the template name.
6. Under Name, select **Translatable**.

You can include translatable text at the application-level by defining the translatable text using static substitution strings. Because application-level attributes are translated, any text defined as a static substitution string is included in the generated translation file.



See Also:

- ["Creating Custom Themes"](#)
- ["Substitutions"](#)

21.2 Specifying the Primary Language for an Application

Globalization attributes specify how the Application Express engine determines the primary language of an application.

To edit globalization attributes:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click **Shared Components**.
4. Under Globalization, select **Globalization Attributes**.
5. For **Application Primary Language**, select the language in which the application is being developed.

- For **Application Language Derived From**, specify how the Application Express engine determines (or derives) the application language. The application primary language can be static, derived from the Web browser language, or determined from a user preference or item. [Table 21-1](#) describes available options:

Table 21-1 Application Language Derived From Options

Option	Description
No NLS (Application not translated)	Select this option if the application will not be translated.
Application Primary Language	Determines the application's primary language based on the Application Primary Language attribute. (See step 5.)
Browser (use browser language preference)	Determines the application's primary language based on the user's browser language preference.
Application Preference (use FSP_LANGUAGE_PREFERENCE)	Determines the application's primary language based on a value defined using the <code>APEX_UTIL.SET_PREFERENCE</code> API. Select this option to maintain the selected language preference across multiple logins. See Also: "SET_PREFERENCE Procedure" in <i>Oracle Application Express API Reference</i>
Item Preference (use item containing preference)	Determines the application's primary language based on an application-level item called <code>FSP_LANGUAGE_PREFERENCE</code> . Using this option requires Oracle Application Express to determine the appropriate language preference every time the user logs in.
Session	Determines the translated application language from the session setting. The Application Express session language can be set through either the <code>APEX_UTIL.SET_SESSION_LANG</code> procedure or by using the <code>p_lang</code> parameter of the "f" procedure in the URL.

- Configure other options as appropriate. To learn more about an attribute, see field-level Help.
- Click **Apply Changes**.

 **See Also:**

- ["Editing the Application Definition"](#)
- ["Configuring Security Attributes"](#)
- ["Understanding Supported Globalization Codes"](#)

21.4 About Translating Applications for Multibyte Languages

If your application must run in several languages simultaneously (such as Chinese and Japanese), consider configuring your database with a character set to support all of the languages.

UTF8 and AL32UTF8 are the character sets you can use to support almost all languages around the world.

21.5 Understanding the Translation Process

To translate an application developed in App Builder, you must map the primary and target language, seed and export text to a translation file, translate the text, apply the translation file, and publish the translated application.

This section describes the process of translating an application.

- [Step 1: Define Application Language](#)
The first step in translating an application is to map the primary and target application language. The primary application is the application to be translated. The target application is the resulting translated application.
- [Step 2: Seed and Download to a Translation File](#)
Seed the translation table and then export the translation text to a translation file.
- [Step 3: Translate the XLIFF File](#)
After you export a translatable file to XLIFF format, you can translate it into the appropriate languages.
- [Step 4: Upload and Apply a Translated XLIFF Document](#)
After your XLIFF document has been translated, the next step is to upload and then apply it.
- [Step 5: Publish the Application](#)
Publishing your application creates a copy of the base language application, substituting the translated text strings from your translations table. This published application can then be used to render your application in alternate languages.
- [Manually Editing a Translation](#)
Once you have mapped the target language and seeded the translatable text, you manually edit a translation.



See Also:

- ["Translating Messages"](#)
- ["Translating Data That Supports List of Values"](#)

21.5.1 Step 1: Define Application Language

The first step in translating an application is to map the primary and target application language. The primary application is the application to be translated. The target application is the resulting translated application.

To map the primary and target application language:

1. Navigate to the Translate Application page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.

- d. Under Globalization, click **Translate Application**.
The Translate page appears.
2. Click **Define application languages**.
The Mappings page appears.
3. Click **Create**.
4. On the Create/Edit Language Application Mapping:
 - **Translation Application** - Enter a unique integer value that identifies an application. The application ID must be unique on your instance of Oracle Application Express.
 - **Language** - Select the language to be translated.
 - **Image Directory** - Enter the directory where images are obtained. Unless you are using static files from the images directory which are translated, leave this field blank. This is the default and most common option.
5. Click **Create**.



See Also:

["Step 2: Seed and Download to a Translation File"](#)

21.5.2 Step 2: Seed and Download to a Translation File

Seed the translation table and then export the translation text to a translation file.

- [Seeding Translatable Text](#)
- [Downloading an XLIFF File](#)

21.5.2.1 Seeding Translatable Text

Seeding the translation copies all translatable text into the Translation Text repository. After you specify the language and seed the Translation Text, you can then generate and export an XLIFF file for translation.

The seeding process keeps your primary language application synchronized with the Translation Text repository. You should run the seed process any time your primary language application changes.

To seed translatable text:

1. Navigate to the Translate Application page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Globalization, click **Translate Application**.
The Translate page appears.
2. Click **Seed translatable text**.

3. Select the appropriate target application.
4. Click **Seed**.

When completed, the following message displays:

```
Successfully seeded translatable text.
```

21.5.2.2 Downloading an XLIFF File

Once the translation mappings are established the translatable text within the application is seeded into a translation repository. This repository is then exported to an XML Localization Interchange File Format (XLIFF) file for translation.

- [About the XLIFF Export Page](#)
- [Downloading a XLIFF file for an Application](#)
- [Downloading an XLIFF File for an Application Page](#)
- [About Including XLIFF Target Elements](#)

21.5.2.2.1 About the XLIFF Export Page

The XLIFF Export page is divided into two sections. Use the upper section to export translatable text for an entire application (that is, all pages, lists of values, messages, and so on). Use the lower section to export translatable text for a specific page.



Note:

XML Localization Interchange File Format (XLIFF) is an XML-based format for exchanging localization data. For more information about XLIFF and the XLIFF 1.0 specification, see:

https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=xliff

21.5.2.2.2 Downloading a XLIFF file for an Application

To download an XLIFF file for an complete application:

1. Seed the translatable text.
2. Navigate to the Translate Application page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Globalization, click **Translate Application**.
The Translate page appears.
3. On the Translate page, click **Download XLIFF translation files**.
4. Under Download XLIFF file for complete Application:
 - a. **Language** - Choose the language to be downloaded in the XLIFF file.
 - b. **Include XLIFF Target Elements** - Specify whether to include XLIFF target elements. To include then, select **Include XLIFF Target Elements**.

- c. **Export** - Choose to export all translatable elements of the application or only those elements which are new or have been updated.
 - d. Click **Export XLIFF**.
5. Follow the on-screen instructions.



See Also:

"Seeding Translatable Text"

21.5.2.2.3 Downloading an XLIFF File for an Application Page

To download an XLIFF file for a specific page:

1. Seed the translatable text.
2. Navigate to the Translate Application page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Globalization, click **Translate Application**.
The Translate page appears.
3. On the Translate page, click **Download XLIFF translation files**.
4. Under Download XLIFF file for Application Page:
 - a. **Language** - Choose the language to be downloaded in the XLIFF file.
 - b. **Page** - Select a page.
 - c. **Include XLIFF Target Elements** - Specify whether to include XLIFF target elements. To include then, select **Include XLIFF Target Elements**.
 - d. **Export** - Choose to export all translatable elements of the page or only those elements which are new or have been updated.
 - e. Click **Export XLIFF**.
5. Follow the on-screen instructions.



See Also:

"Seeding Translatable Text"

21.5.2.2.4 About Including XLIFF Target Elements

When Oracle Application Express generates an XLIFF document, each document contains multiple translation units. Each translation unit consists of a source element and a target element. The XLIFF document can be generated with both the source and target elements for each translation unit. You have the option of generating a file containing only source

elements. The updated translations will be applied from the target elements of the translation units.

21.5.3 Step 3: Translate the XLIFF File

After you export a translatable file to XLIFF format, you can translate it into the appropriate languages.

Because XLIFF is an open standard XML file for exchanging translations, most translation vendors should support it. Oracle Application Express only supports XLIFF files encoded in UTF-8 character sets. In other words, it exports XLIFF files for translation in UTF-8 and assumes that the translated XLIFF files are in the same character set.

Translation is a time-consuming task. Oracle Application Express supports incremental translation so that application development can be done in parallel with the translation. An XLIFF file can be translated and uploaded to Oracle Application Express even when only part of the XLIFF file is translated. For strings that have no translation in the corresponding translated application, Oracle Application Express uses the corresponding ones in the primary language.

See Also:

For more information about the XLIFF and the XLIFF 1.0 specification, see:

https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=xliff

21.5.4 Step 4: Upload and Apply a Translated XLIFF Document

After your XLIFF document has been translated, the next step is to upload and then apply it.

- [Uploading a Translated XLIFF Document](#)
- [Applying an Uploaded XLIFF Document](#)
- [Deleting an Uploaded XLIFF Document](#)

21.5.4.1 Uploading a Translated XLIFF Document

To upload a translated XLIFF document:

1. Navigate to the Translate Application page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Globalization, click **Translate Application**.

The Translate page appears.

2. Click **Apply XLIFF translation files**.

The XLIFF Translation Files page appears.

3. Click **Upload Files**.
4. On the XLIFF Upload page:
 - a. Locate the file to be uploaded.
 - b. Click **Upload**.

The uploaded document appears on the XLIFF Translation Files page.

21.5.4.2 Applying an Uploaded XLIFF Document

After you upload an XLIFF document, the next step is to apply the XLIFF document and then publish the translated application. When you apply an XLIFF document, the Application Express engine parses the file and then updates the translation tables with the new translatable text.

Publishing your application creates a copy of the base language application, substituting the translated text strings from your translations table. This published application can then be used to render your application in alternate languages.

Remember that to run an application in an alternative language, you must run it with globalization settings that cause an alternative language version to display. For example, if the language is derived from the browser language, you must set the browser language to the same language as the translated application.

To apply a translated XLIFF document:

1. Navigate to the Translate Application page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Globalization, click **Translate Application**.

The Translate Application page appears.

2. Click **Apply XLIFF translation files**.
The XLIFF Translation Files page appears.
3. To apply the XLIFF files:
 - a. Select the XLIFF files you want to apply.
 - b. From Apply to Translation, choose a translation mapping.
 - c. Click **Apply Checked**.

The XLIFF file is parsed and the contents is applied to the translation repository. Once this process is complete, you must publish the application for each translation.

See Also:

- ["Specifying the Primary Language for an Application"](#)
- ["Step 5: Publish the Application"](#)

21.5.4.3 Deleting an Uploaded XLIFF Document

To delete an uploaded XLIFF document:

1. Navigate to the Translate Application page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Globalization, click **Translate Application**.
The Translate page appears.
2. Click **Apply XLIFF translation files**.
The XLIFF Translation Files page appears.
3. In the XLIFF Files repository, select the check box to the left of the Filename column.
4. Click **Delete Checked**.



See Also:

["Specifying the Primary Language for an Application"](#)

21.5.5 Step 5: Publish the Application

Publishing your application creates a copy of the base language application, substituting the translated text strings from your translations table. This published application can then be used to render your application in alternate languages.

Remember that to run an application in an alternative language, you must run it with globalization settings that cause an alternative language version to display. For example, if the language is derived from the browser language, you must set the browser language to the same language as the translated application.

To publish an application:

1. Navigate to the Translate Application page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Globalization, click **Translate Application**.
The Translate Application page appears.
2. Click **Publish translated applications**.
The XLIFF Translation Files page appears
3. Select the items you want to publish and click **Publish**.

You should verify the existence of the translated application after it is published. Translated applications do not display in the Available Applications list on the App Builder home page. Instead, use the Application Navigate list on the left side of the page.

Note that in order for a translated application to appear in App Builder, you must ensure that you have correctly configured the application Globalization attributes.



See Also:

["Specifying the Primary Language for an Application"](#)

21.5.6 Manually Editing a Translation

Once you have mapped the target language and seeded the translatable text, you manually edit a translation.

To manually edit a translation:

1. Define the application language.
2. Seed the translatable text.
3. Navigate to the Translatable Text:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Globalization, click **Translate Application**.
4. Under Translation Utilities, click **Translation Repository**.
The Translatable Text page appears.
5. Select a Language Mapping or page and click **Set**.
6. To further customize the report, use the Search bar at the top of the page.
7. To edit translatable text:
 - a. Click the **Edit** icon.
The Translatable Text page appears.
 - b. Translate From Text - Identifies the primary language text.
 - c. Translate to Text - Identifies the translated text.
 - d. Update all occurrences of this string - Enable this option to update all occurrences of the string in the Translation Repository.
 - e. Click **Apply Changes**.
8. To access a Grid Edit page:
 - a. Click **Grid Edit**.
The Translatable Text - Grid Edit page appears.
 - b. Click the **Edit** button.

- c. In the **Translate To** column, select and then edit the string.
- d. Click the **Save** button.



See Also:

- ["Step 1: Define Application Language"](#)
- ["Seeding Translatable Text"](#)
- ["Customizing Interactive Reports in a Running Application"](#)

21.6 Translating Messages

Learn when and how to translate messages in an Oracle Application Express application.

- [About Translating Messages](#)
You translate messages when your application includes PL/SQL regions, processes, package, procedure or function.
- [Translating Messages Used in PL/SQL Procedures](#)
Learn about how to translate messages used in PL/SQL procedures.
- [Translating Messages Used Internally by Oracle Application Express](#)
If your application uses a language that is not among the ten languages into which Oracle Application Express is translated, you must translate messages displayed by the Application Express reporting engine.

21.6.1 About Translating Messages

You translate messages when your application includes PL/SQL regions, processes, package, procedure or function.

You may need to translate messages if your application:

- Includes PL/SQL regions or PL/SQL processes, or calls a PL/SQL package, procedure, or function. If it does, you may need to translate the generated HTML.
- Uses a language that is not one of the ten languages into which Oracle Application Express is translated. If it does, you may need to translate messages used in reports.

21.6.2 Translating Messages Used in PL/SQL Procedures

Learn about how to translate messages used in PL/SQL procedures.

- [About Translating Messages Used in PL/SQL Procedures](#)
- [Defining a Translation Message](#)

**See Also:**

`APEX_LANG` in *Oracle Application Express API Reference*

21.6.2.1 About Translating Messages Used in PL/SQL Procedures

If your application includes PL/SQL regions or PL/SQL processes or calls PL/SQL package, procedures, or functions, you may need to translate generated HTML. First, you define each message on the Translatable Messages page. Second, you use the `APEX_LANG.MESSAGE` API to translate the messages from PL/SQL stored procedures, functions, triggers, or packaged procedures and functions.

21.6.2.2 Defining a Translation Message

You create translatable messages on the Translate Messages page.

To define a new translation message:

1. Navigate to the Translate Application page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Globalization, click **Text Messages**.
2. On the Translate Messages page, click **Create Text Message**.
3. On Identify Text Message:
 - a. **Name** - Enter a name to identify the message.
 - b. **Language** - Select the language for which the message would be used.
 - c. **Used in JavaScript** - Select **On** if the message is used in `APEX_LANG` API calls in JavaScript code.
 - d. **Text** - Enter the text to be returned when the text message is called.

For example, you could define the message `GREETING_MSG` in English as:

```
Good morning %0
```

Or, you could define the message `GREETING_MSG` in German as:

```
Guten Tag %0
```

4. Click **Create Text Message**.

21.6.3 Translating Messages Used Internally by Oracle Application Express

If your application uses a language that is not among the ten languages into which Oracle Application Express is translated, you must translate messages displayed by the Application Express reporting engine.

Oracle Application Express is translated into German, Spanish, French, Italian, Japanese, Korean, Brazilian Portuguese, Simplified Chinese, and Traditional Chinese.

For example, if you develop a Russian application and want to include report messages, such as pagination, in Russian, you must translate the strings used in messages displayed in reports.

- [Creating Text Messages](#)
Create translation messages by selecting the application and navigating to Shared Components, Globalization, Text Messages.
- [Editing Text Messages](#)
Edit translation messages by selecting the application and navigating to Shared Components, Globalization, Text Messages.
- [Internal Messages Requiring Translation](#)
- [Interactive Grid Messages Requiring Translation](#)
Interactive Grid Messages Requiring Translation lists the interactive grid messages that require translation.
- [Interactive Report Messages Requiring Translation](#)
- [Faceted Search Messages Requiring Translation](#)
The following faceted search messages require translation.

21.6.3.1 Creating Text Messages

Create translation messages by selecting the application and navigating to Shared Components, Globalization, Text Messages.

1. To create a translation message:
 1. Navigate to the Translate Application page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Globalization, click **Text Messages**.
 2. On the Translate Messages page, click **Create Text Message**.
 3. On Identify Text Message, specify the following:
 - a. **Name** - Enter the name of each message that must be translated.
 - b. **Language** - Select the language for which the message will be used.
 - c. **Text** - Enter the text to be returned when the text message is called. If the English text message contains positional substitution values (for example, %0, %1), ensure that your defined message also contains the same named and number of positional substitution values.
 4. Click **Create Text Message**.

 **See Also:**

- ["Internal Messages Requiring Translation"](#)
- ["Interactive Report Messages Requiring Translation"](#)

21.6.3.2 Editing Text Messages

Edit translation messages by selecting the application and navigating to Shared Components, Globalization, Text Messages.

To edit text messages:

1. Navigate to the Translate Application page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Globalization, click **Text Messages**.
2. On edit a text message:
 - a. Click the message name.
 - b. Make the appropriate edits.

If the English text message contains positional substitution values (for example, %0, %1), ensure that your defined message also contains the same named and number of positional substitution values.
 - c. Click **Apply Changes**.
3. To access a Grid Edit page:
 - a. Click **Grid Edit**.

The Grid Edit page appears.
 - b. Make the appropriate edits.

If the English text message contains positional substitution values (for example, %0, %1), ensure that your defined message also contains the same named and number of positional substitution values.
 - c. Click **Apply Changes**.

 **Tip:**

To add a new message from the Grid Edit page, click **Add Text Message** at the bottom of the page.

21.6.3.3 Internal Messages Requiring Translation

Internal Messages Requiring Translation lists the internal messages that require translation.

Table 21-2 Internal Messages Requiring Translation

Message Name	English Text
APEX.ACTIONS.TOGGLE	Toggle %0
APEX.ACTIVE_STATE	(Active)
APEX.AUTHENTICATION.LOGIN_THROTTLE.COUNTER	Please wait %0 seconds to login again.
APEX.AUTHENTICATION.LOGIN_THROTTLE.ERROR	The login attempt has been blocked.
APEX.COMBOBOX.LIST_OF_VALUES	List of Values
APEX.COMBOBOX.SHOW_ALL_VALUES	Open list for: %0
APEX.COMPLETED_STATE	(Completed)
APEX.CORRECT_ERRORS	Correct errors before saving.
APEX.DATA_HAS_CHANGED	Current version of data in database has changed since user initiated update process. current checksum = "%0" application checksum = "%1".
APEX.DATEPICKER.ICON_TEXT	Popup Calendar: %0
APEX.DATEPICKER.VALUE_GREATER_MAX_DATE	#LABEL# is greater than specified maximum date %0.
APEX.DATEPICKER.VALUE_INVALID	#LABEL# does not match format %0.
APEX.DATEPICKER.VALUE_LESS_MIN_DATE	#LABEL# is less than specified minimum date %0.
APEX.DATEPICKER.VALUE_NOT_BETWEEN_MIN_MAX	#LABEL# is not between the valid range of %0 and %1.
APEX.DATEPICKER.VALUE_NOT_IN_YEAR_RANGE	#LABEL# is not within valid year range of %0 and %1.
APEX.DIALOG.CANCEL	Cancel
APEX.DIALOG.CLOSE	Close
APEX.DIALOG.HELP	Help
APEX.DIALOG.OK	OK
APEX.DIALOG.SAVE	Save
APEX.ERROR.PAGE_NOT_AVAILABLE	Sorry, this page isn't available
APEX.ERROR_MESSAGE_HEADING	Error Message
APEX.FILE_BROWSE.DOWNLOAD_LINK_TEXT	Download
APEX.GO_TO_ERROR	Go to error
APEX.ITEM.HELP_TEXT	Help Text: %0
APEX.ITEM.NOT_FOUND	Item %0 not found.
APEX.ITEM_TYPE.SLIDER.VALUE_NOT_BETWEEN_MIN_MAX	#LABEL# is not between the valid range of %0 and %1.
APEX.ITEM_TYPE.SLIDER.VALUE_NOT_MULTIPLE_OF_STEP	#LABEL# is not a multiple of %0.

Table 21-2 (Cont.) Internal Messages Requiring Translation

Message Name	English Text
APEX.ITEM_TYPE.YES_NO.INVALID_VALUE	#LABEL# must match to the values %0 and %1.
APEX.ITEM_TYPE.YES_NO.NO_LABEL	No
APEX.ITEM_TYPE.YES_NO.YES_LABEL	Yes
APEX.MENU.CURRENT_MENU	current
APEX.MENU.OVERFLOW_LABEL	More...
APEX.MENU.PROCESSING	Loading
APEX.NUMBER_FIELD.VALUE_GREATER_MAX_VALUE	#LABEL# is greater than specified maximum %0.
APEX.NUMBER_FIELD.VALUE_INVALID	#LABEL# must be Numeric.
APEX.NUMBER_FIELD.VALUE_INVALID2	#LABEL# does not match number format %0 (For example, %1).
APEX.NUMBER_FIELD.VALUE_LESS_MIN_VALUE	#LABEL# is less than specified minimum %0.
APEX.NUMBER_FIELD.VALUE_NOT_BETWEEN_MIN_MAX	#LABEL# is not between the valid range of %0 and %1.
APEX.PAGE.DUPLICATE_SUBMIT	This page was already submitted and can not be re-submitted.
APEX.PAGE_ITEM_IS_REQUIRED	#LABEL# must have some value.
APEX.POPUP_LOV.ICON_TEXT	Popup List of Values: %0.
APEX.PROCESSING	Processing
APEX.REGION.JQM_LIST_VIEW.LOAD_MORE	Load more
APEX.REGION.JQM_LIST_VIEW.SEARCH	Search
APEX.RICH_TEXT_EDITOR.ACCESSIBLE_LABEL	%0, rich text editor
APEX.SINCE.SHORT.DAYS_AGO	%0d
APEX.SINCE.SHORT.DAYS_FROM_NOW	in %0d
APEX.SINCE.SHORT.HOURS_AGO	%0h
APEX.SINCE.SHORT.HOURS_FROM_NOW	in %0h
APEX.SINCE.SHORT.MINUTES_AGO	%0m
APEX.SINCE.SHORT.MINUTES_FROM_NOW	in %0m
APEX.SINCE.SHORT.MONTHS_AGO	%0mo
APEX.SINCE.SHORT.MONTHS_FROM_NOW	in %0mo
APEX.SINCE.SHORT.SECONDS_AGO	%0s
APEX.SINCE.SHORT.SECONDS_FROM_NOW	in %0s
APEX.SINCE.SHORT.WEEKS_AGO	%0w
APEX.SINCE.SHORT.WEEKS_FROM_NOW	in %0w
APEX.SINCE.SHORT.YEARS_AGO	%0y
APEX.SINCE.SHORT.YEARS_FROM_NOW	in %0y

Table 21-2 (Cont.) Internal Messages Requiring Translation

Message Name	English Text
APEX.SUCCESS_MESSAGE_HEADING	Success Message
APEX.TABS.NEXT	Next
APEX.TABS.PREVIOUS	Previous
APEX.TB.TOOLBAR	Toolbar
APEX.TEMPLATE.EXPAND_COLLAPSE_NAV_LABEL	Expand / Collapse Navigation
APEX.TEMPLATE.EXPAND_COLLAPSE_SIDE_COLUMN_LABEL	Expand / Collapse Side Column
APEX.THEMES.INVALID_THEME_NUMBER	Theme number is invalid or theme is not a current UI theme.
APEX.UI.BACK_TO_TOP	Start of page
APEX.VALUE_REQUIRED	Value Required
APEX.WAIT_UNTIL_PAGE_LOADED	Please wait until the page is fully loaded and try again.
CHART_SERIES_ERROR	Chart series error %0 for %1.
FLOW.SINGLE_VALIDATION_ERROR	1 error has occurred.
FLOW.VALIDATION_ERROR	%0 errors have occurred.
INVALID_CREDENTIALS	Invalid Login Credentials .
LAYOUT.CHART	Chart
LAYOUT.T_#EXPAND_COLLAPSE_NAV_LABEL#	Label for Expand / Collapse Navigation
LAYOUT.T_#EXPAND_COLLAPSE_SIDE_COLUMN_LABEL#	Label for Expand / Collapse Side Column
OUT_OF_RANGE	Invalid set of rows requested, the source data of the report has been modified.
PAGINATION.NEXT	Next
PAGINATION.NEXT_SET	Next Set
PAGINATION.PREVIOUS	Previous
PAGINATION.PREVIOUS_SET	Previous Set
REGION_NAME.NATIVE_JET_CHART	Chart
REPORT_TOTAL	report total
RESET	reset pagination
SHOW_ALL	Show All
SINCE_DAYS_AGO	%0 days ago
SINCE_DAYS_FROM_NOW	%0 days from now
SINCE_HOURS_AGO	%0 hours ago
SINCE_HOURS_FROM_NOW	%0 hours from now
SINCE_MINUTES_AGO	%0 minutes ago
SINCE_MINUTES_FROM_NOW	%0 minutes from now
SINCE_MONTHS_AGO	%0 months ago

Table 21-2 (Cont.) Internal Messages Requiring Translation

Message Name	English Text
SINCE_MONTHS_FROM_NOW	%0 months from now
SINCE_NOW	Now
SINCE_SECONDS_AGO	%0 seconds ago
SINCE_SECONDS_FROM_NOW	%0 seconds from now
SINCE_WEEKS_AGO	%0 weeks ago
SINCE_WEEKS_FROM_NOW	%0 weeks from now
SINCE_YEARS_AGO	%0 years ago
SINCE_YEARS_FROM_NOW	%0 years from now
TOTAL	Total
UPGRADE_CANDLESTICK_CHART	After upgrading, ensure the series attribute Label Column is mapped to a Date / Timestamp column.
WWV_FLOW_CREATE_MODEL_APP.CREATE_IG	Unable to create interactive grid page. %0
WWV_FLOW_CUSTOMIZE.T_MESSAGE3	You can personalize the appearance of this application by changing the Theme Style. Please select a Theme Style from the list below and click on Apply Changes.
WWV_FLOW_CUSTOMIZE.T_REGION_DISP	Region Display
WWV_FLOW_CUSTOMIZE.T_REMOVE_STYLE	Use Application Default Style
WWV_FLOW_CUSTOMIZE.T_THEME_STYLE	Appearance
WWV_FLOW_DATA_EXPORT.AGG_COLUMN_IDX_NOT_EXIST	The column index referenced in the aggregate %0 does not exist.
WWV_FLOW_DATA_EXPORT.COLUMN_BREAK_MUST_BE_IN_THE_BEGGINING	The column break needs to be in the beggining of the columns array.
WWV_FLOW_DATA_EXPORT.COLUMN_GROUP_ID_X_NOT_EXIST	The column group index referenced in %0 does not exist.
WWV_FLOW_DATA_EXPORT.HIGHLIGHT_COLUMN_IDX_NOT_EXIST	The column index referenced in the highlight %0 does not exist.
WWV_FLOW_DATA_EXPORT.PARENT_GROUP_ID_X_NOT_EXIST	The parent group index referenced in %0 does not exist.
WWV_FLOW_UTILITIES.CAL	Calendar
WWV_FLOW_UTILITIES.CLOSE	Close
WWV_FLOW_UTILITIES.OK	Ok
WWV_FLOW_WEB_SERVICES.AUTHENTICATION_FAILED	Authentication failed.
WWV_FLOW_WEB_SERVICES.NO_VALID_OAUTH_TOKEN	OAuth access token not available or expired.
WWV_FLOW_WEB_SERVICES.UNSUPPORTED_OAUTH_TOKEN	Server responded with unsupported OAuth token type.
WWV_RENDER_REPORT3.FOUND_BUT_NOT_DISPLAYED	Minimum row requested: %0, rows found but not displayed: %1

Table 21-2 (Cont.) Internal Messages Requiring Translation

Message Name	English Text
WWV_RENDER_REPORT3.SORT_BY_THIS_COLU MN	Sort by this column.
WWV_RENDER_REPORT3.UNSAVED_DATA	This form contains unsaved changes. Press Ok to proceed without saving your changes.
WWV_RENDER_REPORT3.X_Y_OF_MORE_THAN_ Z	row(s) %0 - %1 of more than %2
WWV_RENDER_REPORT3.X_Y_OF_Z	row(s)%0 - %1 of %2
WWV_RENDER_REPORT3.X_Y_OF_Z_2	%0 - %1 of %2

21.6.3.4 Interactive Grid Messages Requiring Translation

Interactive Grid Messages Requiring Translation lists the interactive grid messages that require translation.

Table 21-3 Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.GV.BREAK_COLLAPSE	Collapse control break
APEX.GV.BREAK_EXPAND	Expand control break
APEX.GV.DELETED_COUNT	%0 rows deleted
APEX.GV.DUP_REC_ID	Duplicate identity
APEX.GV.FIRST_PAGE	First
APEX.GV.LAST_PAGE	Last
APEX.GV.LOAD_MORE	Load More Rows
APEX.GV.NEXT_PAGE	Next
APEX.GV.PAGE_RANGE_XY	%0 - %1
APEX.GV.PAGE_RANGE_XYZ	%0 - %1 of %2
APEX.GV.PREV_PAGE	Previous
APEX.GV.ROW_ADDED	Added
APEX.GV.ROW_CHANGED	Changed
APEX.GV.ROW_DELETED	Deleted
APEX.GV.SELECT_PAGE_N	Page %0
APEX.GV.SELECTION_COUNT	%0 rows selected
APEX.GV.SORT_ASCENDING	Sort Ascending
APEX.GV.SORT_ASCENDING_ORDER	Sort Ascending %0
APEX.GV.SORT_DESCENDING	Sort Descending
APEX.GV.SORT_DESCENDING_ORDER	Sort Descending %0
APEX.GV.SORT_OFF	Don't Sort
APEX.GV.TOTAL_PAGES	Total %0

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.ACC_LABEL	Interactive Grid %0
APEX.IG.ACTIONS	Actions
APEX.IG.ADD	Add
APEX.IG.ADD_ROW	Add Row
APEX.IG.AGGREGATE	Aggregate
APEX.IG.AGGREGATION	Aggregation
APEX.IG.ALL	All
APEX.IG.ALL_TEXT_COLUMNS	All Text Columns
APEX.IG.ALTERNATIVE	Alternative
APEX.IG.AND	and
APEX.IG.APPROX_COUNT_DISTINCT	Approx. Count Distinct
APEX.IG.APPROX_COUNT_DISTINCT_OVERALL	Overall Approx. Count Distinct
APEX.IG.AREA	Area
APEX.IG.ASCENDING	Ascending
APEX.IG.AUTHORIZATION	Authorization
APEX.IG.AUTO	Auto
APEX.IG.AVG	Average
APEX.IG.AVG_OVERALL	Overall Average
APEX.IG.AXIS_LABEL_TITLE	Label Axis Title
APEX.IG.AXIS_VALUE_DECIMAL	Decimal Places
APEX.IG.AXIS_VALUE_TITLE	Value Axis Title
APEX.IG.BACKGROUND_COLOR	Background Color
APEX.IG.BAR	Bar
APEX.IG.BETWEEN	between
APEX.IG.BOTH	Both
APEX.IG.BUBBLE	Bubble
APEX.IG.CANCEL	Cancel
APEX.IG.CASE_SENSITIVE	Case Sensitive
APEX.IG.CASE_SENSITIVE_WITH_BRACKETS	(Case Sensitive)
APEX.IG.CHANGE_VIEW	Change View
APEX.IG.CHANGES_SAVED	Changes saved
APEX.IG.CHART	Chart
APEX.IG.CHART_VIEW	Chart View
APEX.IG.CLOSE_COLUMN	Close
APEX.IG.COLOR_BLUE	Blue
APEX.IG.COLOR_GREEN	Green

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.COLOR_ORANGE	Orange
APEX.IG.COLOR_RED	Red
APEX.IG.COLOR_YELLOW	Yellow
APEX.IG.COLORS	Colors
APEX.IG.COLUMN	Column
APEX.IG.COLUMN_CONTEXT	Column %0
APEX.IG.COLUMN_TYPE	Column Purpose
APEX.IG.COLUMNS	Columns
APEX.IG.COMPLEX	Complex
APEX.IG.COMPUTE	Compute
APEX.IG.CONTAINS	contains
APEX.IG.CONTROL_BREAK	Control Break
APEX.IG.COUNT	Count
APEX.IG.COUNT_DISTINCT	Count Distinct
APEX.IG.COUNT_DISTINCT_OVERALL	Overall Count Distinct
APEX.IG.COUNT_OVERALL	Overall Count
APEX.IG.CREATE_X	Create %0
APEX.IG.DATA	Data
APEX.IG.DATA_TYPE	Data Type
APEX.IG.DATE	Date
APEX.IG.DAYS	days
APEX.IG.DEFAULT_SETTINGS	Default Settings
APEX.IG.DEFAULT_TYPE	Default Type
APEX.IG.DELETE	Delete
APEX.IG.DELETE_REPORT_CONFIRM	Are you sure you would like to delete this report?
APEX.IG.DELETE_ROW	Delete Row
APEX.IG.DELETE_ROWS	Delete Rows
APEX.IG.DESCENDING	Descending
APEX.IG.DETAIL	Detail
APEX.IG.DETAIL_VIEW	Detail View
APEX.IG.DIRECTION	Direction
APEX.IG.DISABLED	Disabled
APEX.IG.DOES_NOT_CONTAIN	does not contain
APEX.IG.DOES_NOT_START_WITH	does not start with
APEX.IG.DONUT	Donut
APEX.IG.DOWNLOAD	Download

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.DOWNLOAD_FORMAT	Choose Format
APEX.IG.DUPLICATE_AGGREGATION	Duplicate Aggregation
APEX.IG.DUPLICATE_CONTROLBREAK	Duplicate Control Break
APEX.IG.DUPLICATE_ROW	Duplicate Row
APEX.IG.DUPLICATE_ROWS	Duplicate Rows
APEX.IG.EDIT	Edit
APEX.IG.EDIT_CHART	Edit Chart
APEX.IG.EDIT_GROUP_BY	Edit Group By
APEX.IG.EMAIL_BCC	Blind Copy (bcc)
APEX.IG.EMAIL_BODY	Message
APEX.IG.EMAIL_CC	Copy (cc)
APEX.IG.EMAIL_SENT	Email sent.
APEX.IG.EMAIL_SUBJECT	Subject
APEX.IG.EMAIL_TO	Recipient (to)
APEX.IG.ENABLED	Enabled
APEX.IG.EQUALS	equals
APEX.IG.EXAMPLE	Example
APEX.IG.EXPRESSION	Expression
APEX.IG.FD_TYPE	Type
APEX.IG.FILTER	Filter
APEX.IG.FILTER_WITH_DOTS	Filter...
APEX.IG.FILTERS	Filters
APEX.IG.FIRST	First
APEX.IG.FLASHBACK	Flashback
APEX.IG.FORMAT	Format
APEX.IG.FORMAT_CSV	CSV
APEX.IG.FORMAT_HTML	HTML
APEX.IG.FORMATMASK	Format Mask
APEX.IG.FREEZE	Freeze
APEX.IG.FUNCTIONS_AND_OPERATORS	Functions and Operators
APEX.IG.FUNNEL	Funnel
APEX.IG.GO	Go
APEX.IG.GREATER_THAN	greater than
APEX.IG.GREATER_THAN_OR_EQUALS	greater than or equals
APEX.IG.GRID	Grid
APEX.IG.GRID_VIEW	Grid View
APEX.IG.GROUP	Group

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.GROUP_BY	Group By
APEX.IG.GROUP_BY_VIEW	Group By View
APEX.IG.HD_TYPE	Condition Type
APEX.IG.HEADING	Heading
APEX.IG.HEADING_ALIGN	Heading Alignment
APEX.IG.HELP	Help
APEX.IG.HELP.ACTIONS.EDITING	<p><p>You can insert, update, and delete data directly within this interactive grid.</p></p> <p><p>Insert a new row by clicking the Add Row button.</p></p> <p><p>Edit existing data by double-clicking a specific cell. For larger editing work, click Edit to enter editing mode. In editing mode, you can single-click or use the keyboard to edit specific cells.</p></p> <p><p>Use the Change menu to duplicate and delete rows. To enable the Change menu, use the check boxes to select one or more rows.</p></p> <p><p>Duplicate a selected row by clicking the Change menu and selecting Duplicate Rows. Delete a selected row by clicking the Change menu and selecting Delete Row.</p></p>
APEX.IG.HELP.ACTIONS.EDITING_HEADING	Editing Capabilities
APEX.IG.HELP.ACTIONS.INTRO	<p><p>An interactive grid presents a set of data in a searchable, customizable report. You can perform numerous operations to limit the records returned, and change the way the data is displayed.</p></p> <p><p>Use the Search field to filter the records returned. Click Actions to access numerous options for modifying the report layout, or use the Column Heading menus on displayed columns.</p></p> <p><p>Use Report Settings to save your customizations to a report. You can also download the data from the report to an external file or email the data to yourself or others.</p></p> <p><p>To learn more, see Using Interactive Grids" in Oracle Application Express End User's Guide</p></p>
APEX.IG.HELP.ACTIONS.INTRO_HEADING	Overview

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.HELP.ACTIONS.REPORTING	<p><p>You can customize the interactive grid to display data in various different ways using the built-in capabilities.</p></p> <p><p>Use the Column Heading menus or the Actions menu to determine which columns to display, in what sequence, and freeze columns. You can also define various data filters and sort the data returned.</p></p> <p><p>Use the View button (adjacent to the Search field) to access other data views that may have been defined by the application developer. You can also create a chart or view an existing chart.</p></p> <p><p>Note: Click Help in the interactive grid dialogs to obtain more detailed information on the selected function.</p></p>
APEX.IG.HELP.ACTIONS.REPORTING_HEADI NG	Reporting Capabilities
APEX.IG.HELP.ACTIONS_TITLE	Interactive Grid Help
APEX.IG.HELP.AGGREGATE	<p><p>Use this dialog to aggregate columns. Aggregated values display at the bottom of the data, or if Control Breaks are defined, at the bottom of each break.</p></p> <p><p>Aggregation List
</p> <p>The Aggregation list displays defined aggregations. Disable an existing aggregation by deselecting it.
</p> <p>Click Add (&plus;) to create a new aggregation, or Delete (&minus;) to remove an existing aggregation.</p></p> <p><p>Aggregation Settings
</p> <p>Use the form on the right to define the aggregation.
</p> <p>Select the Column name and Aggregation type.
</p> <p>Optionally, enter a tooltip for the aggregation.
</p> <p>If you have defined a Control Break, selecting Show Overall Value displays the overall average, total, or similar value at the bottom of the data.</p></p> <p><p>Note: Access the Aggregation dialog in the Actions menu or by clicking the column heading and sum(&sum;).</p></p>
APEX.IG.HELP.AGGREGATE_TITLE	Aggregation Help

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.HELP.CHART	<p><p>Use this dialog to define a chart which displays as a separate data view.
Select a chart Type, configure the chart settings, and click Save.</p></p> <p><p>Chart Settings</br>The chart attributes that display vary depending on the chart type. A number of attributes can be entered to define the chart. Attributes marked with a red asterisk are mandatory.</p></p> <p><p>Below are all available attributes across the different chart types (in alphabetical order):</p></p> <ul style="list-style-type: none"> Aggregation - Select how to aggregate the associated chart values. Close - Select the column that contains the daily stock close price (Stock chart only). Decimal Places - Enter the number of decimal places to which the values are rounded. Direction - In relation to the Sort By attribute, specify whether the data is sorted in ascending or descending values. High - Select the column that contains the high value (Range and Stock charts only). Label - Select the column that contains the text for each data point. Label Axis Title - Enter the title that displays on the label axis. Low - Select the column that contains the low value (Range and Stock charts only). Nulls - In relation to the Sort By attribute, specify how you want records with null values to be sorted in relation to records with non null values. Open - Select the column that contains the daily stock opening price (Stock chart only). Orientation - Select whether the chart elements, such as bars, display vertically or horizontally. Series - Select the column used for defining your multi-series dynamic query. Stack - Specify whether the data items are stacked. Sort By - Select whether the chart is sorted by the label or the value(s). Target - Select the column to be used for defining the target value on this chart. When set, the Value attribute defines the filled area

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
	<p>within the slice and the Target represents the value of the whole slice (Funnel chart only).</p> <p>Value - Select the column that contains the data to be plotted.</p> <p>Value Axis Title - Enter the title that displays on the value axis.</p> <p>Volume - Select the column that contains the daily stock volume (Stock chart only).</p> <p>X - Select the column that contains the x-axis value for this chart (Bubble and Scatter charts only).</p> <p>Y - Select the column that contains the y-axis value for this chart (Bubble and Scatter charts only).</p> <p>Z - Select the column that contains the bar width or bubble radius (Bar, Bubble, and Range charts only)</p>
APEX.IG.HELP.CHART_TITLE	Chart Help
APEX.IG.HELP.COLUMNS	<p><p> Use this dialog to choose which columns display and in what order.</p></p> <p><p>Hide a column by deselecting it.
Reorder columns by clicking Move Up (&uarr;) or Move Down (&darr;).
Use the drop down selector to list All columns, Displayed columns, or Not Displayed columns.</p></p> <p><p>Optionally, use the form to specify the minimum width of a column in pixels.</p></p> <p><p> Note: You can also reorder displayed columns by clicking the drag handle (at the start of the column heading) and dragging the column left or right. You can also change the column width of displayed columns by selecting the column separator, between headings, and moving it left or right.</p></p>
APEX.IG.HELP.COLUMNS_TITLE	Columns Help

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.HELP.COMPUTE	<p><p> Use this dialog to define additional columns based on mathematical and functional computations performed against existing columns.</p></p> <p><p>Computation List
The Computation list displays defined computations. Disable an existing computation by deselecting it.
Click Add (&plus;) to add a new computation, or Delete (&minus;) to remove an existing computation.</p></p> <p><p>Computation Settings
Use the form to define the computation.
Enter the column details such as heading, label, and select alignment settings.
Use the Expression textarea to enter the column(s) and associated functions for the computation.
Select the appropriate data type, and optionally a format mask, for the new column.</p></p>
APEX.IG.HELP.COMPUTE_TITLE	Compute Help
APEX.IG.HELP.CONTROL_BREAK	<p><p>Use this dialog to define a control break on one or more columns.</p></p> <p><p>Control Break List
The Control Break list displays defined control breaks. Disable an existing control break column by deselecting it.
Click Add (&plus;) to include a new column in the control break, or Delete (&minus;) to remove an existing column from the control break.
To reorder columns, click Move Up (&uarr;) or Move Down (&darr;) to move the selected column up and down relative to other columns.</p></p> <p><p>Control Break Settings
Use the form to define the control break column.
Selected a control break column, the sort direction, and how to order null columns (columns with no value).</p></p> <p><p> Note: When viewing the interactive grid, you can define a control break by clicking a Column Heading and selecting the control break icon.</p></p>
APEX.IG.HELP.CONTROL_BREAK_TITLE	Control Break Help

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.HELP.DOWNLOAD	<p><p>Use this dialog to download all the current rows to an external file. The file will contain only the currently displayed columns, using any filters and sorts applied to the data.</p></p> <p><p>Select the file format and click Download.
</p> <p>Note: CSV will not include text formatting such as aggregates and control breaks.</p></p> <p><p>To email the file, select Send as Email and enter the email details (Recipient, Subject and Message).</p></p>
APEX.IG.HELP.DOWNLOAD_TITLE	Download Help
APEX.IG.HELP.FILTER	<p><p>Use this dialog to configure data filters which limit the rows returned.</p></p> <p><p>Filter List
</p> <p>The Filter list displays defined filters. Disable an existing filter by deselecting it.
</p> <p>Click Add (&plus;) to create a new filter, or Delete (&minus;) to remove an existing filter.</p></p> <p><p>Filter Settings
</p> <p>Use the form to define the filter properties.
</p> <p>Select the appropriate filter type:
</p> <p>&nbsp; ; &nbsp; ; &nbsp; ; Row - filter for a term in any filterable column.
</p> <p>&nbsp; ; &nbsp; ; &nbsp; ; Column - filter a specific column with a specified operator and value.</p></p> <p><p> Note: When viewing the interactive grid, you can define row filters by typing directly into the Search field. Click Select Columns to Search to limit the search to a specific column. Alternately, open a Column Heading menu and select a value to create a column filter.</p></p>
APEX.IG.HELP.FILTER_TITLE	Filter Help
APEX.IG.HELP.FLASHBACK	<p><p>Use this dialog to view the data as it existed at a previous point in time. </p></p> <p><p>Enter the number of minutes in the past to execute the flashback query.</p></p>
APEX.IG.HELP.FLASHBACK_TITLE	Flashback Help
APEX.IG.HELP.GROUP_BY_TITLE	Group By Help

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.HELP.HIGHLIGHT	<p><p>Use this dialog to highlight rows or columns of data based on the condition entered.</p></p> <p><p>Highlight List
The Highlight list displays defined highlights. Disable an existing highlight by deselecting it.
</p> <p>Click Add (&plus;) to create a new highlight, or Delete (&minus;) to remove an existing highlight.
</p> <p><p>Highlight Settings
Use the form to define the highlight properties.
</p> <p>Enter the name, select Row or Column, and select the HTML color codes for the background and text.
</p> <p>Select the appropriate Condition Type to highlight specific data:
</p> <p>&nbsp; ; &nbsp; ; &nbsp; ; Row - highlight the term in any column.
</p> <p>&nbsp; ; &nbsp; ; &nbsp; ; Column - highlight within a specific column based on the specified operator and value.</p></p>
APEX.IG.HELP.HIGHLIGHT_TITLE	Highlight Help
APEX.IG.HELP.REPORT	<p><p>Use this dialog to save changes you have made to the current grid layout and configuration.
</p> <p>Application developers can define multiple alternate report layouts. Where permissible, you and other end users can save a report as Public, which makes the report available to all other users of the grid. You can also save a report as a Private report that only you can view.</p></p> <p><p>Select from the available types and enter a name for the saved report.</p></p>
APEX.IG.HELP.REPORT_TITLE	Report Help

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.HELP.SORT	<p><p>Use this dialog to set the display order.</p></p> <p><p>Sort List</p></p> <p>The Sort dialog displays a list of configured sorting rules.
</p> <p>Click Add (&plus) to create a sort column, or Delete (&minus;) to remove a sort column.
</p> <p>Click Move Up (&uarr;) and Move Down (&darr;) to move the selected sort column up and down relative to the other sort columns.</p></p> <p><p>Sort Settings</p></p> <p>Select a sort column, the sort direction, and how to order null columns (columns with no value).</p></p> <p><p> Note: Data can be sorted by columns which are not displayed; however, not all columns may be sortable.
</p> <p> Displayed columns can be sorted by pressing the up (ascending) or down (descending) arrows at the end of the column headings. To add a subsequent column to an existing sort, hold the Shift key and click the up or down arrow.</p></p>
APEX.IG.HELP.SORT_TITLE	Sort Help
APEX.IG.HELP.SUBSCRIPTION_TITLE	Subscription Help
APEX.IG.HIDE	Hide
APEX.IG.HIGH_COLUMN	High
APEX.IG.HIGHLIGHT	Highlight
APEX.IG.HORIZONTAL	Horizontal
APEX.IG.HOURS	hours
APEX.IG.ICON	Icon
APEX.IG.ICON_VIEW	Icon View
APEX.IG.IN	in
APEX.IG.IN_THE_LAST	in the last
APEX.IG.IN_THE_NEXT	in the next
APEX.IG.INACTIVE_SETTING	Inactive Setting
APEX.IG.INACTIVE_SETTINGS	Inactive Settings
APEX.IG.INTERNAL_ERROR	An internal error has occurred while processing the Interactive Grid request.
APEX.IG.INVALID_DATE_FORMAT	Invalid Date Format
APEX.IG.INVALID_SETTING	Invalid Setting
APEX.IG.INVALID_SETTINGS	Invalid Settings

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.INVALID_SORT_BY	Sort By has been set to %0, but no column as been selected for %0.
APEX.IG.INVALID_VALUE	Invalid Value
APEX.IG.INVISIBLE	Not Displayed
APEX.IG.IS_NOT_NULL	is not empty
APEX.IG.IS_NULL	is empty
APEX.IG.LABEL	Label
APEX.IG.LABEL_COLUMN	Label
APEX.IG.LAST	Last
APEX.IG.LAST.DAY	Last Day
APEX.IG.LAST.HOUR	Last Hour
APEX.IG.LAST.MINUTE	Last Minute
APEX.IG.LAST.MONTH	Last Month
APEX.IG.LAST.WEEK	Last Week
APEX.IG.LAST.X_DAYS	Last %0 Days
APEX.IG.LAST.X_HOURS	Last %0 Hours
APEX.IG.LAST.X_MINUTES	Last %0 Minutes
APEX.IG.LAST.X_MONTHS	Last %0 Months
APEX.IG.LAST.X_WEEKS	Last %0 Weeks
APEX.IG.LAST.X_YEARS	Last %0 Years
APEX.IG.LAST.YEAR	Last Year
APEX.IG.LAYOUT_ALIGN	Cell Alignment
APEX.IG.LAYOUT_USEGROUPFOR	Use Group For
APEX.IG.LESS_THAN	less than
APEX.IG.LESS_THAN_OR_EQUALS	less than or equals
APEX.IG.LINE	Line
APEX.IG.LINE_WITH_AREA	Line with Area
APEX.IG.LISTAGG	Listagg
APEX.IG.LOW_COLUMN	Low
APEX.IG.MAILADDRESSES_COMMASEP	Separate multiple Addresses with commas
APEX.IG.MATCHES_REGULAR_EXPRESSION	matches regular expression
APEX.IG.MAX	Maximum
APEX.IG.MAX_OVERALL	Overall Maximum
APEX.IG.MEDIAN	Median
APEX.IG.MEDIAN_OVERALL	Overall Median
APEX.IG.MIN	Minimum
APEX.IG.MIN_OVERALL	Overall Minimum

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.MINUTES	minutes
APEX.IG.MINUTES_AGO	Minutes ago
APEX.IG.MONTHS	months
APEX.IG.MORE_DATA_FOUND	The data contains more than %0 rows which exceeds the maximum allowed. Please apply additional filters in order to view the results.
APEX.IG.NAME	Name
APEX.IG.NAMED_REPORT	Named Report
APEX.IG.NEXT.DAY	Next Day
APEX.IG.NEXT.HOUR	Next Hour
APEX.IG.NEXT.MINUTE	Next Minute
APEX.IG.NEXT.MONTH	Next Month
APEX.IG.NEXT.WEEK	Next Week
APEX.IG.NEXT.X_DAYS	Next %0 Days
APEX.IG.NEXT.X_HOURS	Next %0 Hours
APEX.IG.NEXT.X_MINUTES	Next %0 Minutes
APEX.IG.NEXT.X_MONTHS	Next %0 Months
APEX.IG.NEXT.X_WEEKS	Next %0 Weeks
APEX.IG.NEXT.X_YEARS	Next %0 Years
APEX.IG.NEXT.YEAR	Next Year
APEX.IG.NO_DATA_FOUND	No data found
APEX.IG.NOT_BETWEEN	not between
APEX.IG.NOT_EQUALS	not equals
APEX.IG.NOT_EXIST	Region with ID %0 is not an Interactive Grid region or does not exist in application %1.
APEX.IG.NOT_IN	not in
APEX.IG.NOT_IN_THE_LAST	not in the last
APEX.IG.NOT_IN_THE_NEXT	not in the next
APEX.IG.NULLS	Nulls
APEX.IG.NUMBER	Numeric
APEX.IG.OFF	Off
APEX.IG.ON	On
APEX.IG.ONE_MINUTE_AGO	1 minute ago
APEX.IG.OPEN_COLORPICKER	Open Color Picker: %0
APEX.IG.OPEN_COLUMN	Open
APEX.IG.OPERATOR	Operator
APEX.IG.ORIENTATION	Orientation
APEX.IG.PIE	Pie

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.PIVOT	Pivot
APEX.IG.PIVOT_VIEW	Pivot View
APEX.IG.PLACEHOLDER_INVALUES	Separate values with "%0"
APEX.IG.POLAR	Polar
APEX.IG.POSITION_CENTER	Center
APEX.IG.POSITION_END	End
APEX.IG.POSITION_START	Start
APEX.IG.PRIMARY	Primary
APEX.IG.PRIMARY_DEFAULT	Primary Default
APEX.IG.PRIMARY_REPORT	Primary Report
APEX.IG.RADAR	Radar
APEX.IG.RANGE	Range
APEX.IG.REFRESH	Refresh
APEX.IG.REFRESH_ROW	Refresh Row
APEX.IG.REFRESH_ROWS	Refresh Rows
APEX.IG.REMOVE_CONTROL	Remove %0
APEX.IG.REPORT	Report
APEX.IG.REPORT.DELETED	Report deleted
APEX.IG.REPORT.SAVED.ALTERNATIVE	Alternative report saved for all users
APEX.IG.REPORT.SAVED.DEFAULT	Default report saved for all users
APEX.IG.REPORT.SAVED.PRIVATE	Private report saved
APEX.IG.REPORT.SAVED.PUBLIC	Public report saved for all users
APEX.IG.REPORT_DATA_AS_OF.X.MINUTES_AGO	Report data as of %0 minutes ago
APEX.IG.REPORT_DATA_AS_OF.ONE.MINUTE_AGO	Report data as of 1 minute ago
APEX.IG.REPORT_EDIT	Report - Edit
APEX.IG.REPORT_SAVE_AS	Report - Save As
APEX.IG.REPORT_SETTINGS	Report Settings
APEX.IG.REPORT_STATIC_ID_DOES_NOT_EXIST	Saved Interactive Grid with static ID %0 does not exist.
APEX.IG.REPORT_VIEW	Report View
APEX.IG.RESET	Reset
APEX.IG.REVERT_CHANGES	Revert Changes
APEX.IG.REVERT_ROWS	Revert Rows
APEX.IG.ROW	Row
APEX.IG.ROW_ACTIONS	Row Actions

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.ROW_ACTIONS_FOR	Actions for row %0
APEX.IG.ROW_COLUMN_CONTEXT	Row %0 Column %1
APEX.IG.ROW_CONTEXT	Row %0
APEX.IG.ROWS_PER_PAGE	Rows Per Page
APEX.IG.SAVE	Save
APEX.IG.SAVE_AS	Save As
APEX.IG.SAVE_REPORT_SETTINGS	Save Report Settings
APEX.IG.SAVED_REPORT_DEFAULT	Default
APEX.IG.SAVED_REPORT_PRIVATE	Private
APEX.IG.SAVED_REPORT_PUBLIC	Public
APEX.IG.SAVED_REPORTS	Saved Reports
APEX.IG.SCATTER	Scatter
APEX.IG.SEARCH	Search
APEX.IG.SEARCH.ALL_COLUMNS	Search: All Text Columns
APEX.IG.SEARCH.COLUMN	Search: %0
APEX.IG.SEARCH.ORACLE_TEXT	Search: Full Text
APEX.IG.SEARCH_FOR.X	Search for '%0'
APEX.IG.SEL_ACTIONS	Selection Actions
APEX.IG.SELECT	- Select -
APEX.IG.SELECT_1_ROW_IN_MASTER	Select 1 row in the master region
APEX.IG.SELECT_COLUMNS_TO_SEARCH	Select columns to search
APEX.IG.SEND_AS_EMAIL	Send as Email
APEX.IG.SERIES_COLUMN	Series
APEX.IG.SHOW_OVERALL_VALUE	Show Overall Value
APEX.IG.SINGLE_ROW_VIEW	Single Row View
APEX.IG.SORT	Sort
APEX.IG.SORT_BY	Sort By
APEX.IG.SORT_ONLY_ONE_PER_COLUMN	You can define only one sort per column.
APEX.IG.SRV_CHANGE_MENU	Change Menu
APEX.IG.STACK	Stack
APEX.IG.STARTS_WITH	starts with
APEX.IG.STOCK	Stock
APEX.IG.SUBSCRIPTION	Subscription
APEX.IG.SUM	Sum
APEX.IG.SUM_OVERALL	Overall Sum
APEX.IG.SUMMARY	Interactive Grid. Report: %0, View: %1.
APEX.IG.TARGET_COLUMN	Target

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.TEXT_COLOR	Text Color
APEX.IG.TOGGLE	Toggle
APEX.IG.TOOLTIP	Tooltip
APEX.IG.TYPE	Type
APEX.IG.UNFREEZE	Unfreeze
APEX.IG.UNIT	Unit
APEX.IG.UNSAVED_CHANGES_CONTINUE_CONFIRM	There are unsaved changes. Do you want to continue?
APEX.IG.VALUE	Value
APEX.IG.VALUE_COLUMN	Value
APEX.IG.VALUE_REQUIRED	A value is required.
APEX.IG.VARCHAR2	Text
APEX.IG.VERTICAL	Vertical
APEX.IG.VIEW	View
APEX.IG.VISIBLE	Displayed
APEX.IG.VOLUME_COLUMN	Volume
APEX.IG.WEEKS	weeks
APEX.IG.WIDTH	Minimum Column Width (Pixel)
APEX.IG.X.BETWEEN.Y.AND.Z	%0 between %1 and %2
APEX.IG.X.CONTAINS.Y	%0 contains %1
APEX.IG.X.DOES_NOT_CONTAIN.Y	%0 does not contain %1
APEX.IG.X.EQUALS.Y	%0 equals %1
APEX.IG.X.GREATER_THAN.Y	%0 greater than %1
APEX.IG.X.GREATER_THAN_OR_EQUALS.Y	%0 greater than or equal to %1
APEX.IG.X.IN.Y	%0 in %1
APEX.IG.X.IN_THE_LAST.Y.DAYS	%0 in the last %1 days
APEX.IG.X.IN_THE_LAST.Y.HOURS	%0 in the last %1 hours
APEX.IG.X.IN_THE_LAST.Y.MINUTES	%0 in the last %1 minutes
APEX.IG.X.IN_THE_LAST.Y.MONTHS	%0 in the last %1 months
APEX.IG.X.IN_THE_LAST.Y.WEEKS	%0 in the last %1 weeks
APEX.IG.X.IN_THE_LAST.Y.YEARS	%0 in the last %1 years
APEX.IG.X.IN_THE_LAST_DAY	%0 in the last day
APEX.IG.X.IN_THE_LAST_HOUR	%0 in the last hour
APEX.IG.X.IN_THE_LAST_MINUTE	%0 in the last minute
APEX.IG.X.IN_THE_LAST_MONTH	%0 in the last month
APEX.IG.X.IN_THE_LAST_WEEK	%0 in the last week
APEX.IG.X.IN_THE_LAST_YEAR	%0 in the last year

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.X.IN_THE_NEXT.Y.DAYS	%0 in the next %1 days
APEX.IG.X.IN_THE_NEXT.Y.HOURS	%0 in the next %1 hours
APEX.IG.X.IN_THE_NEXT.Y.MINUTES	%0 in the next %1 minutes
APEX.IG.X.IN_THE_NEXT.Y.MONTHS	%0 in the next %1 months
APEX.IG.X.IN_THE_NEXT.Y.WEEKS	%0 in the next %1 weeks
APEX.IG.X.IN_THE_NEXT.Y.YEARS	%0 in the next %1 years
APEX.IG.X.IN_THE_NEXT_DAY	%0 in the next day
APEX.IG.X.IN_THE_NEXT_HOUR	%0 in the next hour
APEX.IG.X.IN_THE_NEXT_MINUTE	%0 in the next minute
APEX.IG.X.IN_THE_NEXT_MONTH	%0 in the next month
APEX.IG.X.IN_THE_NEXT_WEEK	%0 in the next week
APEX.IG.X.IN_THE_NEXT_YEAR	%0 in the next year
APEX.IG.X.IS_NOT_NULL	%0 is not empty
APEX.IG.X.IS_NULL	%0 is empty
APEX.IG.X.LESS_THAN.Y	%0 less than %1
APEX.IG.X.LESS_THAN_OR_EQUALS.Y	%0 less than or equal to %1
APEX.IG.X.LIKE.Y	%0 like %1
APEX.IG.X.MATCHES_REGULAR_EXPRESSION.Y	%0 matches regular expression %1
APEX.IG.X.MINUTES_AGO	%0 minutes ago
APEX.IG.X.NOT_BETWEEN.Y.AND.Z	%0 not between %1 and %2
APEX.IG.X.NOT_EQUALS.Y	%0 not equals %1
APEX.IG.X.NOT_IN.Y	%0 not in %1
APEX.IG.X.NOT_IN_THE_LAST.Y.DAYS	%0 not in the last %1 days
APEX.IG.X.NOT_IN_THE_LAST.Y.HOURS	%0 not in the last %1 hours
APEX.IG.X.NOT_IN_THE_LAST.Y.MINUTES	%0 not in the last %1 minutes
APEX.IG.X.NOT_IN_THE_LAST.Y.MONTHS	%0 not in the last %1 months
APEX.IG.X.NOT_IN_THE_LAST.Y.WEEKS	%0 not in the last %1 weeks
APEX.IG.X.NOT_IN_THE_LAST.Y.YEARS	%0 not in the last %1 years
APEX.IG.X.NOT_IN_THE_LAST_DAY	%0 not in the last day
APEX.IG.X.NOT_IN_THE_LAST_HOUR	%0 not in the last hour
APEX.IG.X.NOT_IN_THE_LAST_MINUTE	%0 not in the last minute
APEX.IG.X.NOT_IN_THE_LAST_MONTH	%0 not in the last month
APEX.IG.X.NOT_IN_THE_LAST_WEEK	%0 not in the last week
APEX.IG.X.NOT_IN_THE_LAST_YEAR	%0 not in the last year
APEX.IG.X.NOT_IN_THE_NEXT.Y.DAYS	%0 not in the next %1 days
APEX.IG.X.NOT_IN_THE_NEXT.Y.HOURS	%0 not in the next %1 hours

Table 21-3 (Cont.) Interactive Grid Messages Requiring Translation

Message Name	English Text
APEX.IG.X.NOT_IN_THE_NEXT.Y.MINUTES	%0 not in the next %1 minutes
APEX.IG.X.NOT_IN_THE_NEXT.Y.MONTHS	%0 not in the next %1 months
APEX.IG.X.NOT_IN_THE_NEXT.Y.WEEKS	%0 not in the next %1 weeks
APEX.IG.X.NOT_IN_THE_NEXT.Y.YEARS	%0 not in the next %1 years
APEX.IG.X.NOT_IN_THE_NEXT_DAY	%0 not in the next day
APEX.IG.X.NOT_IN_THE_NEXT_HOUR	%0 not in the next hour
APEX.IG.X.NOT_IN_THE_NEXT_MINUTE	%0 not in the next minute
APEX.IG.X.NOT_IN_THE_NEXT_MONTH	%0 not in the next month
APEX.IG.X.NOT_IN_THE_NEXT_WEEK	%0 not in the next week
APEX.IG.X.NOT_IN_THE_NEXT_YEAR	%0 not in the next year
APEX.IG.X.NOT_LIKE.Y	%0 not like %1
APEX.IG.X.STARTS_WITH.Y	%0 starts with %1
APEX.IG.X.COLUMN	X
APEX.IG.Y.COLUMN	Y
APEX.IG.YEARS	years
APEX.IG.Z.COLUMN	Z
APEX.IG.FORMAT_SAMPLE_1	Monday, 12 January, 2016
APEX.IG.FORMAT_SAMPLE_2	January
APEX.IG.FORMAT_SAMPLE_3	16 hours ago
APEX.IG.FORMAT_SAMPLE_4	in 16h
APEX.RV.NOT_GROUPED_LABEL	Other Columns
APEX.RV.REC_XY	Row %0 of %1
APEX.RV.REC_X	Row %0
APEX.RV.EXCLUDE_HIDDEN	Displayed Columns
APEX.RV.EXCLUDE_NULL	Exclude Null Values
APEX.RV.PREV_RECORD	Previous
APEX.RV.NEXT_RECORD	Next
APEX.RV.SETTINGS_MENU	Settings Menu
APEX.RV.INSERT	Add
APEX.RV.DELETE	Delete

21.6.3.5 Interactive Report Messages Requiring Translation

Table 21-4 lists the interactive report messages that require translation.

Table 21-4 Interactive Report Messages Requiring Translation

Message Name	English Text
4150_COLUMN_NUMBER	Column %0
APEXIR_3D	3D
APEXIR_ACTIONS	Actions
APEXIR_ACTIONS_MENU	Actions Menu
APEXIR_ADD	Add
APEXIR_ADD_FUNCTION	Add Function
APEXIR_ADD_GROUP_BY_COLUMN	Add Group By Column
APEXIR_ADD_PIVOT_COLUMN	Add Pivot Column
APEXIR_ADD_ROW_COLUMN	Add Row Column
APEXIR_ADD_SUBSCRIPTION	Add Subscription
APEXIR_AGG_AVG	Average
APEXIR_AGG_COUNT	Count
APEXIR_AGG_MAX	Maximum
APEXIR_AGG_MEDIAN	Median
APEXIR_AGG_MIN	Minimum
APEXIR_AGG_MODE	Mode
APEXIR_AGG_SUM	Sum
APEXIR_AGGREGATE	Aggregate
APEXIR_AGGREGATE_DESCRIPTION	Aggregates are displayed after each control break and at the end of the report.
APEXIR_AGGREGATION	Aggregation
APEXIR_ALL	All
APEXIR_ALL_COLUMNS	All Columns
APEXIR_ALL_ROWS	All Rows
APEXIR_ALTERNATIVE	Alternative
APEXIR_ALTERNATIVE_DEFAULT_NAME	Alternative Default: %0
APEXIR_AND	and
APEXIR_APPLY	Apply
APEXIR_AS_OF	As of %0
APEXIR_ASCENDING	Ascending
APEXIR_AVERAGE_X	Average %0
APEXIR_BETWEEN	between
APEXIR_BGCOLOR	Background Color
APEXIR_BLUE	blue
APEXIR_BOTTOM	Bottom
APEXIR_CALENDAR	Calendar
APEXIR_CANCEL	Cancel

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_CATEGORY	Category
APEXIR_CELL	Cell
APEXIR_CHART	Chart
APEXIR_CHART_INITIALIZING	Initializing...
APEXIR_CHART_LABEL_NOT_NULL	Chart label must be specified
APEXIR_CHART_MAX_ROW_CNT	The maximum row count for a chart query limits the number of rows in the base query, not the number of rows displayed. Your base query exceeds the maximum row count of %0. Please apply a filter to reduce the number of records in your base query.
APEXIR_CHART_TYPE	Chart Type
APEXIR_CHECK_ALL	Check All
APEXIR_CHOOSE_DOWNLOAD_FORMAT	Choose report download format
APEXIR_CLEAR	clear
APEXIR_COLUMN	Column
APEXIR_COLUMN_FILTER	Filter...
APEXIR_COLUMN_HEADING_MENU	Column Heading Menu
APEXIR_COLUMN_INFO	Column Information
APEXIR_COLUMN_LABEL	Column Label
APEXIR_COLUMN_N	Column %0
APEXIR_COLUMNS	Columns
APEXIR_COMPARISON_CONTAINS	contains
APEXIR_COMPARISON_DOESNOT_CONTAIN	does not contain
APEXIR_COMPARISON_IN	in
APEXIR_COMPARISON_IS_IN_LAST	is in the last
APEXIR_COMPARISON_IS_IN_NEXT	is in the next
APEXIR_COMPARISON_IS_NOT_NULL	is not null
APEXIR_COMPARISON_IS_NULL	is null
APEXIR_COMPARISON_ISNOT_IN_LAST	is not in the last
APEXIR_COMPARISON_ISNOT_IN_NEXT	is not in the next
APEXIR_COMPARISON_LIKE	like
APEXIR_COMPARISON_NOT_IN	not in
APEXIR_COMPARISON_NOT_LIKE	not like
APEXIR_COMPARISON_REGEXP_LIKE	matches regular expression
APEXIR_COMPUTATION	Computation
APEXIR_COMPUTATION_EXPRESSION	Computation Expression
APEXIR_COMPUTATION_FOOTER	Create a computation using column aliases.
APEXIR_COMPUTATION_FOOTER_E1	(B+C)*100

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_COMPUTATION_FOOTER_E2	INITCAP(B) ', ' INITCAP(C)
APEXIR_COMPUTATION_FOOTER_E3	CASE WHEN A = 10 THEN B + C ELSE B END
APEXIR_COMPUTE	Compute
APEXIR_CONTROL_BREAK	Control Break
APEXIR_CONTROL_BREAK_COLUMNS	Control Break Columns
APEXIR_CONTROL_BREAKS	Control Breaks
APEXIR_COUNT_DISTINCT	Count Distinct
APEXIR_COUNT_DISTINCT_X	Count Distinct
APEXIR_COUNT_X	Count %0
APEXIR_DAILY	Daily
APEXIR_DATA	Data
APEXIR_DATA_AS_OF	Report data as of %0 minutes ago.
APEXIR_DATE	Date
APEXIR_DAY	Day
APEXIR_DEFAULT	Default
APEXIR_DEFAULT_REPORT_TYPE	Default Report Type
APEXIR_DELETE	Delete
APEXIR_DELETE_CHECKED	Delete Checked
APEXIR_DELETE_CONFIRM	Would you like to delete these report settings?
APEXIR_DELETE_CONFIRM_JS_DIALOG	Would you like to perform this delete action?
APEXIR_DELETE_DEFAULT_REPORT	Delete Default Report
APEXIR_DELETE_REPORT	Delete Report
APEXIR_DESCENDING	Descending
APEXIR_DESCRIPTION	Description
APEXIR_DETAIL_VIEW	Single Row View
APEXIR_DIRECTION	Direction
APEXIR_DISABLE	Disable
APEXIR_DISABLED	Disabled
APEXIR_DISPLAY	Display
APEXIR_DISPLAY_IN_REPORT	Display in Report
APEXIR_DISPLAYED	Displayed
APEXIR_DISPLAYED_COLUMNS	Displayed Columns
APEXIR_DO_NOT_AGGREGATE	- Do not aggregate -
APEXIR_DO_NOT_DISPLAY	Do Not Display
APEXIR_DOWN	Down
APEXIR_DOWNLOAD	Download

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_DUPLICATE_PIVOT_COLUMN	Duplicate pivot column. Pivot column list must be unique.
APEXIR_EDIT	Edit
APEXIR_EDIT_ALTERNATIVE_DEFAULT	Edit Alternative Default
APEXIR_EDIT_CHART	Edit Chart Settings
APEXIR_EDIT_CHART2	Edit Chart
APEXIR_EDIT_FILTER	Edit Filter
APEXIR_EDIT_GROUP_BY	Edit Group By
APEXIR_EDIT_HIGHLIGHT	Edit Highlight
APEXIR_EDIT_PIVOT	Edit Pivot
APEXIR_EMAIL	Email
APEXIR_EMAIL_ADDRESS	Email Address
APEXIR_EMAIL_BCC	Bcc
APEXIR_EMAIL_BODY	Body
APEXIR_EMAIL_CC	Cc
APEXIR_EMAIL_FREQUENCY	Frequency
APEXIR_EMAIL_NOT_CONFIGURED	Email has not been configured for this application. Please contact your administrator.
APEXIR_EMAIL_REQUIRED	Email Address must be specified.
APEXIR_EMAIL_SEE_ATTACHED	See attached.
APEXIR_EMAIL_SUBJECT	Subject
APEXIR_EMAIL_SUBJECT_REQUIRED	Email Subject must be specified.
APEXIR_EMAIL_TO	To
APEXIR_ENABLE	Enable
APEXIR_ENABLE_DISABLE_ALT	Enable/Disable
APEXIR_ENABLED	Enabled
APEXIR_ERROR	Error
APEXIR_EXAMPLES	Examples
APEXIR_EXAMPLES_WITH_COLON	Examples:
APEXIR_EXCLUDE_NULL	Exclude Null Values
APEXIR_EXPAND_COLLAPSE_ALT	Expand/Collapse
APEXIR_EXPRESSION	Expression
APEXIR_FILTER	Filter
APEXIR_FILTER_EXPRESSION	Filter Expression
APEXIR_FILTER_EXPR_TOO_LONG	The filter expression is too long.
APEXIR_FILTER_TYPE	Filter Type
APEXIR_FILTERS	Filters

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_FINDER_ALT	Select columns to search.
APEXIR_FLASHBACK	Flashback
APEXIR_FLASHBACK_DESCRIPTION	A flashback query enables you to view the data as it existed at a previous point in time.
APEXIR_FLASHBACK_ERROR_MSG	Unable to perform flashback request.
APEXIR_FORMAT	Format
APEXIR_FORMAT_MASK	Format Mask
APEXIR_FUNCTION	Function
APEXIR_FUNCTION_N	Function %0
APEXIR_FUNCTIONS	Functions
APEXIR_FUNCTIONS_OPERATORS	Functions / Operators
APEXIR_GO	Go
APEXIR_GREEN	green
APEXIR_GROUP_BY	Group By
APEXIR_GROUP_BY_COL_NOT_NULL	Group by column must be specified
APEXIR_GROUP_BY_COLUMN	Group By Column
APEXIR_GROUP_BY_MAX_ROW_CNT	The maximum row count for a Group By query limits the number of rows in the base query, not the number of rows displayed. Your base query exceeds the maximum row count of %0. Please apply a filter to reduce the number of records in your base query.
APEXIR_GROUP_BY_SORT	Group By Sort
APEXIR_GROUP_BY_SORT_ORDER	Group By Sort Order
APEXIR_HCOLUMN	Horizontal Column
APEXIR_HELP	Help
APEXIR_HELP_01	An Interactive Report displays a predetermined set of columns. The report may be further customized with an initial filter clause, a default sort order, control breaks, highlighting, computations, aggregates and a chart. Each Interactive Report can then be further customized and the results can be viewed, or downloaded, and the report definition can be stored for later use. <p/> An Interactive Report can be customized in three ways: the search bar, actions menu and column heading menu.
APEXIR_HELP_ACTIONS_MENU	The actions menu is used to customize the display of your Interactive Report.

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_HELP_AGGREGATE	<p>Aggregates are mathematical computations performed against a column. Aggregates are displayed after each control break and at the end of the report within the column they are defined.</p> <p><p/></p> <ul style="list-style-type: none"> Aggregation allows you to select a previously defined aggregation to edit. Function is the function to be performed (e.g. SUM, MIN). Column is used to select the column to apply the mathematical function to. Only numeric columns will be displayed.
APEXIR_HELP_CHART	<p>You can include one chart per Interactive Report. Once defined, you can switch between the chart and report views using links below the search bar.</p> <p><p/></p> <ul style="list-style-type: none"> Chart Type identifies the chart type to include. Select from horizontal bar, vertical bar, pie or line. Label allows you to select the column to be used as the label. Axis Title for Label is the title that will display on the axis associated with the column selected for Label. This is not available for pie chart. Value allows you to select the column to be used as the value. If your function is a COUNT, a Value does not need to be selected. Axis Title for Value is the title that will display on the axis associated with the column selected for Value. This is not available for pie chart. Function is an optional function to be performed on the column selected for Value.

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_HELP_COLUMN_HEADING_MENU	<p>Clicking on any column heading exposes a column heading menu.</p> <p><p/></p> <ul style="list-style-type: none">Sort Ascending icon sorts the report by the column in ascending order.Sort Descending icon sorts the report by the column in descending order.Hide Column hides the column.Break Column creates a break group on the column. This pulls the column out of the report as a master record.Column Information displays help text about the column, if available.Text Area is used to enter case insensitive search criteria (no need for wild cards). Entering a value will reduce the list of values at the bottom of the menu. You can then select a value from the bottom and the selected value will be created as a filter using '=' (e.g. column = 'ABC'). Alternatively, you can click the flashlight icon and the entered value will be created as a filter with the 'LIKE' modifier (e.g. column LIKE '%ABC%').List of Unique Values contains the first 500 unique values that meet your filters. If the column is a date, a list of date ranges is displayed instead. If you select a value, a filter will be created using '=' (e.g. column = 'ABC').

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_HELP_COMPUTE	<p>Computations allow you to add computed columns to your report. These can be mathematical computations (e.g. NBR_HOURS/24) or standard Oracle functions applied to existing columns (some have been displayed for example, others, like TO_DATE, can also be used).</p> <p><p/></p> <ul style="list-style-type: none"> Computation allows you to select a previously defined computation to edit. Column Heading is the column heading for the new column. Format Mask is an Oracle format mask to be applied against the column (e.g. S9999). Format Mask is an Oracle format mask to be applied against the column (e.g. S9999). Computation is the computation to be performed. Within the computation, columns are referenced using the aliases displayed. <p></p> <p><p/></p> <p>Below computation, the columns in your query are displayed with their associated alias. Clicking on the column name or alias will write them into the Computation. Next to Columns is a Keypad. These are simply shortcuts of commonly used keys. On the far right are Functions.</p> <p><p/></p> <p>An example computation to display Total Compensation is:</p> <p><p/></p> <pre>CASE WHEN A = 'SALES' THEN B + C ELSE B END</pre> <p>(where A is ORGANIZATION, B is SALARY and C is COMMISSION)</p>
APEXIR_HELP_CONTROL_BREAK	Used to create a break group on one or several columns. This pulls the columns out of the Interactive Report and displays them as a master record.
APEXIR_HELP_DETAIL_VIEW	To view the details of a single row at a time, click the single row view icon on the row you want to view. If available, the single row view will always be the first column. Depending on the customization of the Interactive Report, the single row view may be the standard view or a custom page that may allow update.
APEXIR_HELP_DOWNLOAD	Allows the current result set to be downloaded. The download formats will differ depending upon your installation and report definition but may include CSV, XLS, PDF, or RTF.

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_HELP_FILTER	Used to add or modify the where clause on the query. You first select a column (it does not need to be one that is displayed), select from a list of standard Oracle operators (=, !=, not in, between), and enter an expression to compare against. The expression is case sensitive and you can use % as a wildcard (for example, STATE_NAME like A%).
APEXIR_HELP_FLASHBACK	Performs a flashback query to allow you to view the data as it existed at a previous point in time. The default amount of time that you can flashback is 3 hours (or 180 minutes) but the actual amount will differ per database.
APEXIR_HELP_FORMAT	<p>Format enable you to customize the display of the report. Format contains the following submenu:</p> <ul style="list-style-type: none"> Sort Control Break Highlight Compute Aggregate Chart Group By Pivot
APEXIR_HELP_GROUP_BY	You can define one Group By view per saved report. Once defined, you can switch between the group by and report views using view icons on the Search bar. To create a Group By view, you select: <p></p> the columns on which to group the columns to aggregate along with the function to be performed (average, sum, count, etc.)
APEXIR_HELP_HIGHLIGHT	Highlighting allows you to define a filter. The rows that meet the filter are highlighted using the characteristics associated with the filter. <p><p/></p> <ul style="list-style-type: none"> Name is used only for display. Sequence identifies the sequence in which the rules will be evaluated. Enabled identifies if the rule is enabled or disabled. Highlight Type identifies whether the Row or Cell should be highlighted. If Cell is selected, the column referenced in the Highlight Condition is highlighted. Background Color is the new color for the background of the highlighted area. Text Color is the new color for the text in the highlighted area. Highlight Condition defines your filter condition.
APEXIR_HELP_PIVOT	You can define one Pivot view per saved report. Once defined, you can switch between the pivot and report views using view icons on the Search bar. To create a Pivot view, you select: <p></p> <ul style="list-style-type: none"> the columns on which to pivot the columns to display as rows the columns to aggregate along with the function to be performed (average, sum, count, etc.)

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_HELP_REPORT_SETTINGS	<p>If you have customized your Interactive Report, the report settings will be displayed below the Search Bar and above the report. If you have saved customized reports, they will be shown as tabs. You can access your alternate views by clicking the tabs. Below the tabs are the report settings for the current report. This area can be collapsed and expanded using the icon on the left.</p> <p><p/></p> <p>For each report setting, you can:</p> <ul style="list-style-type: none"> Edit by clicking the name. Disable/Enable by unchecking or checking the Enable/Disable check box. This is used to temporarily turn off and on the setting. Remove by click the Remove icon. This permanently removes the setting. <p><p/></p> <p>If you have created a chart, you can toggle between the report and chart using the Report View and Chart View links shown on the right. If you are viewing the chart, you can also use the Edit Chart link to edit the chart settings.</p>
APEXIR_HELP_RESET	Resets the report back to the default settings, removing any customizations that you have made.
APEXIR_HELP_ROWS_PER_PAGE	Sets the number of records to display per page.
APEXIR_HELP_SAVE_REPORT	<p>Saves the customized report for future use. You provide a name and optional description and can make the report accessible to the public (that is, all users who can access the primary default report). You can save four types of interactive reports:</p> <ul style="list-style-type: none"> • Primary Default (Developer Only). The Primary Default is the report that initially displays. Primary Default reports cannot be renamed or deleted. • Alternative Report (Developer Only). Enables developers to create multiple report layouts. Only developers can save, rename, or delete an Alternative Report. • Public Report (End user). Can be saved, renamed, or deleted by the end user who created it. Other users can view and save the layout as another report. • Private Report (End user). Only the end user that created the report can view, save, rename or delete the report. <p>If you save customized reports, a Reports selector displays in the Search bar to the left of the Rows selector (if this feature is enabled).</p>

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_HELP_SEARCH_BAR	<p>At the top of each report page is a search region. The region provides the following features:</p> <p><p/></p> <ul style="list-style-type: none"> Select columns icon allows you to identify which column to search (or all). Text area allows for case insensitive search criteria (no need for wild cards). Rows selects the number of records to display per page. [Go] button executes the search. Actions Menu icon displays the actions menu (discussed next). <p><p/></p> <p>Please note that all features may not be available for each report.</p>
APEXIR_HELP_SEARCH_BAR_ACTIONS_MENU	<ul style="list-style-type: none"> Actions Menu enables you to customize a report. See the sections that follow.
APEXIR_HELP_SEARCH_BAR_FINDER	<ul style="list-style-type: none"> Select columns icon enables you to identify which column to search (or all).
APEXIR_HELP_SEARCH_BAR_REPORTS	<ul style="list-style-type: none"> Reports displays alternate default and saved private or public reports.
APEXIR_HELP_SEARCH_BAR_ROWS	<ul style="list-style-type: none"> Rows sets the number of records to display per page.
APEXIR_HELP_SEARCH_BAR_TEXTBOX	<ul style="list-style-type: none"> Text area enables you to enter case insensitive search criteria (wild card characters are implied). Go button executes the search. Hitting the enter key will also execute the search when the cursor is in the search text area.
APEXIR_HELP_SEARCH_BAR_VIEW	<ul style="list-style-type: none"> View Icons switches between the icon, report, detail, chart, group by, and pivot views of the report if they are defined.
APEXIR_HELP_SELECT_COLUMNS	<p>Used to modify the columns displayed. The columns on the right are displayed. The columns on the left are hidden. You can reorder the displayed columns using the arrows on the far right. Computed columns are prefixed with *.</p>
APEXIR_HELP_SORT	<p>Used to change the column(s) to sort on and whether to sort ascending or descending. You can also specify how to handle nulls (use the default setting, always display them last or always display them first). The resulting sorting is displayed to the right of column headings in the report.</p>
APEXIR_HELP_SUBSCRIPTION	<p>When you add a subscription, you provide an email address (or multiple email addresses, separated by commas), email subject, frequency, and start and end dates. The resulting emails include an HTML version of the interactive report containing the current data using the report setting that were present when the subscription was added.</p>

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_HIDE_COLUMN	Hide Column
APEXIR_HIGHLIGHT	Highlight
APEXIR_HIGHLIGHT_CONDITION	Highlight Condition
APEXIR_HIGHLIGHT_TYPE	Highlight Type
APEXIR_HIGHLIGHT_WHEN	Highlight When
APEXIR_HIGHLIGHTS	Highlights
APEXIR_INACTIVE_SETTING	1 inactive setting
APEXIR_INACTIVE_SETTINGS	%0 inactive settings
APEXIR_INTERACTIVE_REPORT_HELP	Interactive Report Help
APEXIR_INVALID	Invalid
APEXIR_INVALID_COMPUTATION	Invalid computation expression. %0
APEXIR_INVALID_END_DATE	The end date must be greater than the start date.
APEXIR_INVALID_END_DATE	The end date must be greater than the start date.
APEXIR_INVALID_FILTER	Invalid filter expression. %0
APEXIR_INVALID_FILTER_QUERY	Invalid filter query
APEXIR_INVALID_SETTING	1 invalid setting
APEXIR_INVALID_SETTINGS	%0 invalid settings
APEXIR_IS_IN_THE_LAST	%0 is in the last %1
APEXIR_IS_IN_THE_NEXT	%0 is in the next %1
APEXIR_IS_NOT_IN_THE_LAST	%0 is not in the last %1
APEXIR_IS_NOT_IN_THE_NEXT	%0 is not in the next %1
APEXIR_KEYPAD	Keypad
APEXIR_LABEL	Label
APEXIR_LABEL_AXIS_TITLE	Axis Title for Label
APEXIR_LABEL_PREFIX	Label Prefix
APEXIR_LAST_DAY	Last Day
APEXIR_LAST_HOUR	Last Hour
APEXIR_LAST_MONTH	Last Month
APEXIR_LAST_WEEK	Last Week
APEXIR_LAST_X_DAYS	Last %0 Days
APEXIR_LAST_X_HOURS	Last %0 Hours
APEXIR_LAST_X_YEARS	Last %0 Years
APEXIR_LAST_YEAR	Last Year
APEXIR_LINE	Line
APEXIR_MAX_QUERY_COST	The query is estimated to exceed the maximum allowed resources. Please modify your report settings and try again.

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_MAX_ROW_CNT	This query returns more then %0 rows, please filter your data to ensure complete results.
APEXIR_MAX_X	Maximum %0
APEXIR_MEDIAN_X	Median %0
APEXIR_MIN_AGO	%0 minutes ago
APEXIR_MIN_X	Minimum %0
APEXIR_MONTH	Month
APEXIR_MONTHLY	Monthly
APEXIR_MORE_DATA	More Data
APEXIR_MOVE	Move
APEXIR_MOVE_ALL	Move All
APEXIR_MULTIIR_PAGE_REGION_STATIC_ID_REQUIRE D	Region Static ID must be specified as the page contains multiple interactive reports.
APEXIR_NAME	Name
APEXIR_NEW_AGGREGATION	New Aggregation
APEXIR_NEW_CATEGORY	- New Category -
APEXIR_NEW_CATEGORY_LABEL	New Category
APEXIR_NEW_COMPUTATION	New Computation
APEXIR_NEXT	>
APEXIR_NEXT_DAY	Next Day
APEXIR_NEXT_HOUR	Next Hour
APEXIR_NEXT_MONTH	Next Month
APEXIR_NEXT_WEEK	Next Week
APEXIR_NEXT_X_DAYS	Next %0 Days
APEXIR_NEXT_X_HOURS	Next %0 Hours
APEXIR_NEXT_X_YEARS	Next %0 Years
APEXIR_NEXT_YEAR	Next Year
APEXIR_NO	No
APEXIR_NO_AGGREGATION_DEFINED	No aggregation defined.
APEXIR_NO_COLUMN_INFO	No column information available.
APEXIR_NO_COMPUTATION_DEFINED	No computation defined.
APEXIR_NO_END_DATE	- No End Date -
APEXIR_NONE	- None -
APEXIR_NOT_VALID_EMAIL	Not a valid email address.
APEXIR_NULL_SORTING	Null Sorting
APEXIR_NULLS_ALWAYS_FIRST	Nulls Always First
APEXIR_NULLS_ALWAYS_LAST	Nulls Always Last

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_NUMERIC_FLASHBACK_TIME	Flashback time must be numeric.
APEXIR_NUMERIC_SEQUENCE	Sequence must be numeric.
APEXIR_OPERATOR	Operator
APEXIR_ORANGE	orange
APEXIR_OTHER	Other
APEXIR_PERCENT_OF_TOTAL_COUNT_X	Percent of Total Count %0 (%)
APEXIR_PERCENT_OF_TOTAL_SUM_X	Percent of Total Sum %0 (%)
APEXIR_PERCENT_TOTAL_COUNT	Percent of Total Count
APEXIR_PERCENT_TOTAL_SUM	Percent of Total Sum
APEXIR_PIE	Pie
APEXIR_PIVOT	Add Pivot Column
APEXIR_PIVOT_AGG_NOT_NULL	Aggregate must be specified.
APEXIR_PIVOT_AGG_NOT_ON_ROW_COL	You cannot aggregate on a column selected to as row column.
APEXIR_PIVOT_COLUMN_N	Pivot Column %0
APEXIR_PIVOT_COLUMN_NOT_NULL	Pivot column must be specified.
APEXIR_PIVOT_COLUMNS	Pivot Columns
APEXIR_PIVOT_MAX_ROW_CNT	The maximum row count for a Pivot query limits the number of rows in the base query, not the number of rows displayed. Your base query exceeds the maximum row count of %0. Please apply a filter to reduce the number of records in your base query.
APEXIR_PIVOT_ROW_COLUMN_INVALID	Select different row column. The HTML expression or link in the row column contains column defined as pivot or aggregate column.
APEXIR_PIVOT_SORT	Pivot Sort
APEXIR_PREVIOUS	<
APEXIR_PRIMARY	Primary
APEXIR_PRIMARY_REPORT	Primary Report
APEXIR_PRIVATE	Private
APEXIR_PUBLIC	Public
APEXIR_RED	red
APEXIR_REGION_STATIC_ID_DOES_NOT_EXIST	Region Static ID %0 does not exist.
APEXIR_REMOVE	Remove
APEXIR_REMOVE_AGGREGATE	Remove Aggregate
APEXIR_REMOVE_ALL	Remove All
APEXIR_REMOVE_CHART	Remove Chart
APEXIR_REMOVE_CONTROL_BREAK	Remove Control Break
APEXIR_REMOVE_FILTER	Remove Filter

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_REMOVE_FLASHBACK	Remove Flashback
APEXIR_REMOVE_GROUP_BY	Remove Group By
APEXIR_REMOVE_HIGHLIGHT	Remove Highlight
APEXIR_REMOVE_PIVOT	Remove Pivot
APEXIR_REMOVE_REPORT	Remove Report
APEXIR_RENAME_DEFAULT_REPORT	Rename Default Report
APEXIR_RENAME_REPORT	Rename Report
APEXIR_REPORT	Report
APEXIR_REPORT_ALIAS_DOES_NOT_EXIST	Saved Interactive report with alias %0 does not exist.
APEXIR_REPORT_DISPLAY_COLUMN_LIMIT_REACHED	The number of display columns in the report reached the limit. Please click Select Columns under Actions menu to minimize the report display column list.
APEXIR_REPORT_DOES_NOT_EXIST	Report does not exist.
APEXIR_REPORT_ID_DOES_NOT_EXIST	Saved Interactive Report ID %0 does not exist.
APEXIR_REPORT_SETTINGS	Report Settings
APEXIR_REPORT_VIEW	< Report View
APEXIR_REPORTS	Reports
APEXIR_RESET	Reset
APEXIR_RESET_CONFIRM	Restore report to the default settings.
APEXIR_ROW	Row
APEXIR_ROW_COL_DIFF_FROM_PIVOT_COL	Row column must be different from the pivot column.
APEXIR_ROW_COLUMN_N	Row Column %0
APEXIR_ROW_COLUMN_NOT_NULL	Row column must be specified.
APEXIR_ROW_COLUMNS	Row Columns
APEXIR_ROW_FILTER	Row Filter
APEXIR_ROW_OF	Row %0 of %1
APEXIR_ROW_ORDER	Row Order
APEXIR_ROW_TEXT_CONTAINS	Row text contains
APEXIR_ROWS	Rows
APEXIR_ROWS_PER_PAGE	Rows Per Page
APEXIR_RPT_DISP_COL_EXCEED	The number of display columns in the report reached the limit. Please click Select Columns under Actions menu to minimize the report display column list.
APEXIR_SAVE	Save
APEXIR_SAVE_AS_DEFAULT	Save as Default
APEXIR_SAVE_DEFAULT_CONFIRM	The current report settings are used as the default for all users.
APEXIR_SAVE_DEFAULT_REPORT	Save Default Report

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_SAVE_REPORT	Save Report
APEXIR_SAVE_REPORT_DEFAULT	Save Report *
APEXIR_SAVED_REPORT	Saved Report
APEXIR_SAVED_REPORT_MSG	Saved Report = "%0"
APEXIR_SEARCH	Search
APEXIR_SEARCH_BAR	Search Bar
APEXIR_SEARCH_COLUMN	Search: %0
APEXIR_SEARCH_REPORT	Search Report
APEXIR_SELECT_CATEGORY	- Select Category -
APEXIR_SELECT_COLUMN	- Select Column -
APEXIR_SELECT_COLUMNS	Select Columns
APEXIR_SELECT_COLUMNS_FOOTER	Computed columns are prefixed with **.
APEXIR_SELECT_FUNCTION	- Select Function -
APEXIR_SELECT_GROUP_BY_COLUMN	- Select Group By Column -
APEXIR_SELECT_PIVOT_COLUMN	- Select Pivot Column -
APEXIR_SELECT_ROW	Select Row
APEXIR_SELECT_ROW_COLUMN	- Select Row Column -
APEXIR_SELECT_SORT_COLUMN	- Select Sort Column -
APEXIR_SELECT_VALUE	Select Value
APEXIR_SELECTED_COLUMNS	Selected Columns
APEXIR_SEND	Send
APEXIR_SEQUENCE	Sequence
APEXIR_SORT	Sort
APEXIR_SORT_ASCENDING	Sort Ascending
APEXIR_SORT_COLUMN	Sort Column
APEXIR_SORT_DESCENDING	Sort Descending
APEXIR_SORT_ORDER	Sort Order
APEXIR_SPACE_AS_IN_ONE_EMPTY_STRING	space
APEXIR_STATUS	Status
APEXIR_SUBSCRIPTION	Subscription
APEXIR_SUBSCRIPTION_ENDING	Ending
APEXIR_SUBSCRIPTION_STARTING_FROM	Starting From
APEXIR_SUM_X	Sum %0
APEXIR_TABLE_SUMMARY	Region = %0, Report = %1, View = %2, Displayed Rows Start = %3, Displayed Rows End = %4, Total Rows = %5
APEXIR_TEXT_COLOR	Text Color

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_TIME_DAYS	days
APEXIR_TIME_HOURS	hours
APEXIR_TIME_MINS	minutes
APEXIR_TIME_MONTHS	months
APEXIR_TIME_WEEKS	weeks
APEXIR_TIME_YEARS	years
APEXIR_TOGGLE	Toggle
APEXIR_TOP	Top
APEXIR_UNAUTHORIZED	Unauthorized
APEXIR_UNGROUPED_COLUMN	Ungrouped Column
APEXIR_UNIQUE_COLUMN_HEADING	Column Heading must be unique.
APEXIR_UNIQUE_HIGHLIGHT_NAME	Highlight Name must be unique.
APEXIR_UNSUPPORTED_DATA_TYPE	unsupported data type
APEXIR_UP	Up
APEXIR_VALID_COLOR	Please enter a valid color.
APEXIR_VALID_FORMAT_MASK	Please enter a valid format mask.
APEXIR_VALUE	Value
APEXIR_VALUE_AXIS_TITLE	Axis Title for Value
APEXIR_VALUE_REQUIRED	Value Required
APEXIR_VCOLUMN	Vertical Column
APEXIR_VIEW_CHART	View Chart
APEXIR_VIEW_DETAIL	View Detail
APEXIR_VIEW_GROUP_BY	View Group By
APEXIR_VIEW_ICONS	View Icons
APEXIR_VIEW_PIVOT	View Pivot
APEXIR_VIEW_REPORT	View Report
APEXIR_WEEK	Week
APEXIR_WEEKLY	Weekly
APEXIR_WORKING_REPORT	Working Report
APEXIR_X_DAYS	%0 days
APEXIR_X_HOURS	%0 hours
APEXIR_X_MINS	%0 minutes
APEXIR_X_MONTHS	%0 months
APEXIR_X_WEEKS	%0 weeks
APEXIR_X_YEARS	%0 years
APEXIR_YEAR	Year
APEXIR_YELLOW	yellow

Table 21-4 (Cont.) Interactive Report Messages Requiring Translation

Message Name	English Text
APEXIR_YES	Yes
IR_AS_DEFAULT_REPORT_SETTING	As Default Report Settings
IR_AS_NAMED_REPORT	As Named Report
IR_STAR	Only displayed for developers
LAYOUT.T.CONDITION_EXPR2	Expression 2
OUT_OF_RANGE	Invalid set of rows requested, the source data of the report has been modified.
REPORT	Report
REPORTING_PERIOD	Reporting Period
RESET	Reset Pagination
SAVED_REPORTS.PRIMARY.DEFAULT	Primary Default
WWV_RENDER_REPORT3.X_Y_OF_Z_2	%0 - %1 of %2

21.6.3.6 Faceted Search Messages Requiring Translation

The following faceted search messages require translation.

Table 21-5 Faceted Search Messages Requiring Translation

Message Name	English Text
APEX.FS.RANGE_TEXT	to
APEX.FS.GO	Go
APEX.FS.CLEAR	Clear
APEX.FS.BATCH_APPLY	Apply
APEX.FS.RESET	Reset
APEX.FS.SEARCH_LABEL	Search
APEX.FS.RANGE_CURRENT_LABEL_OPEN_HI	Above %0
APEX.FS.RANGE_CURRENT_LABEL	%0 to %1
APEX.FS.CLEAR_VALUE	Clear %0
APEX.FS.RANGE_CURRENT_LABEL_OPEN_LO	Below %0
APEX.FS.SHOW_LESS	Show Less
APEX.FS.SHOW_MORE	Show More
APEX.FS.INPUT_CURRENT_LABEL	equals %0
APEX.FS.FILTER	Filter %0
APEX.FS.CLEAR_ALL	Clear All
APEX.FS.SEARCH_PLACEHOLDER	Search...
APEX.FS.SELECT_PLACEHOLDER	- Select -
APEX.FS.STAR_RATING_LABEL	%0 stars and up

Table 21-5 (Cont.) Faceted Search Messages Requiring Translation

Message Name	English Text
APEX.FS.TOTAL_ROW_COUNT_LABEL	Total Row Count

21.7 Translating Data That Supports List of Values

You create a dynamic translation to translate dynamic pieces of data. For example, you might use a dynamic translation on a list of values based on a database query.

Dynamic translations differ from messages in that you query a specific string rather than a message name. You define dynamic translations on the Dynamic Translations page. You then use the `APEX_LANG.LANG` API to return the dynamic translation string identified by the `p_primary_text_string` parameter.

- [Defining a Dynamic Translation](#)
You define dynamic translations on the Dynamic Translations page. A dynamic translation consists of a translate-from language string, a language code, and a translate-to string.



See Also:

`APEX_LANG` in *Oracle Application Express API Reference*

21.7.1 Defining a Dynamic Translation

You define dynamic translations on the Dynamic Translations page. A dynamic translation consists of a translate-from language string, a language code, and a translate-to string.

To define a dynamic translation:

1. Navigate to the Translate Application page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. Under Globalization, click **Translate Application**.
2. On the Translate Application page under Translation Utilities, select **Dynamic Translations**.
3. On the Dynamic Translations page, click **Create** and specify the following:
 - a. **Language** - Select a target language.
 - b. **Translate From Text** - Enter the source text to be translated.
 - c. **Translate To Text** - Enter the translated text.
4. Click **Create**.

21.8 Understanding Supported Globalization Codes

If you are building a multilingual application, it is important to understand how globalization codes affect the way in which your application runs. These codes are set automatically based on the application-level Globalization attributes you select.

- [Oracle Application Express Globalization Codes](#)
NLS_LANGUAGE and NLS_TERRITORY determine the default presentation of numbers, dates, and currencies.



See Also:

["Specifying the Primary Language for an Application"](#)

21.8.1 Oracle Application Express Globalization Codes

NLS_LANGUAGE and NLS_TERRITORY determine the default presentation of numbers, dates, and currencies.

[Table 21-6](#) describes the globalization codes in Oracle Application Express.

Table 21-6 Oracle Application Express Globalization Codes

Language Name	Language Code	NLS_LANGUAGE	NLS_TERRITORY
Afrikaans	af	ENGLISH	SOUTH AFRICA
Arabic	ar	ARABIC	UNITED ARAB EMIRATES
Arabic (Algeria)	ar-dz	ARABIC	ALGERIA
Arabic (Bahrain)	ar-bh	ARABIC	BAHRAIN
Arabic (Egypt)	ar-eg	EGYPTIAN	EGYPT
Arabic (Iraq)	ar-iq	ARABIC	IRAQ
Arabic (Jordan)	ar-jo	ARABIC	JORDAN
Arabic (Kuwait)	ar-kw	ARABIC	KUWAIT
Arabic (Lebanon)	ar-lb	ARABIC	LEBANNON
Arabic (Libya)	ar-ly	ARABIC	LIBYA
Arabic (Morocco)	ar-ma	ARABIC	MOROCCO
Arabic (Oman)	ar-om	ARABIC	OMAN
Arabic (Qatar)	ar-qa	ARABIC	QATAR
Arabic (Saudi Arabia)	ar-sa	ARABIC	SAUDI ARABIA
Arabic (Syria)	ar-sy	ARABIC	SYRIA
Arabic (Tunisia)	ar-tn	ARABIC	TUNISIA
Arabic (U.A.E.)	ar-ae	ARABIC	UNITED ARAB EMIRATES
Arabic (YEMEN)	ar-ye	ARABIC	YEMEN

Table 21-6 (Cont.) Oracle Application Express Globalization Codes

Language Name	Language Code	NLS_LANGUAGE	NLS_TERRITORY
Assamese	as	ASSAMESE	INDIA
Basque	eu	FRENCH	FRANCE
Belarusian	be	RUSSIAN	RUSSIA
Bengali	bn	BANGLA	BANGLADESH
Bulgarian	bg	BULGARIAN	BULGARIA
Catalan	ca	CATALAN	CATALONIA
Chinese	zh	SIMPLIFIED CHINESE	CHINA
Chinese (China)	zh-cn	SIMPLIFIED CHINESE	CHINA
Chinese (Hong Kong SAR)	zh-hk	TRADITIONAL CHINESE	HONG KONG
Chinese (Macau SAR)	zh-mo	TRADITIONAL CHINESE	HONG KONG
Chinese (Singapore)	zh-sg	SIMPLIFIED CHINESE	SINGAPORE
Chinese (Taiwan)	zh-tw	TRADITIONAL CHINESE	TAIWAN
Croatian	hr	CROATIAN	CROATIA
Czech	cs	CZECH	CZECH REPUBLIC
Danish	da	DANISH	DENMARK
Dutch (Belgium)	nl-be	DUTCH	BELGIUM
Dutch (Netherlands)	nl	DUTCH	THE NETHERLANDS
English	en	AMERICAN	AMERICA
English (Australia)	en-au	ENGLISH	AUSTRALIA
English (Belize)	en-bz	ENGLISH	UNITED KINGDOM
English (Canada)	en-ca	ENGLISH	CANADA
English (Ireland)	en-ie	ENGLISH	IRELAND
English (Jamaica)	en-jm	ENGLISH	UNITED KINGDOM
English (New Zealand)	en-nz	ENGLISH	NEW ZEALAND
English (Philippines)	en-ph	ENGLISH	PHILIPPINES
English (South Africa)	en-za	ENGLISH	SOUTH AFRICA
English (Trinidad)	en-tt	ENGLISH	UNITED KINGDOM
English (United Kingdom)	en-gb	ENGLISH	UNITED KINGDOM
English (United States)	en-us	AMERICAN	AMERICA
English (Zimbabwe)	en-zw	ENGLISH	UNITED KINGDOM
Estonian	et	ESTONIAN	ESTONIA
Faeroese	fo	ENGLISH	UNITED KINGDOM
Farsi	fa	ENGLISH	UNITED KINGDOM
Finnish	fi	FINNISH	FINLAND
French (Belgium)	fr-be	FRENCH	BELGIUM
French (Canada)	fr-ca	CANADIAN FRENCH	CANADA

Table 21-6 (Cont.) Oracle Application Express Globalization Codes

Language Name	Language Code	NLS_LANGUAGE	NLS_TERRITORY
French (France)	fr	FRENCH	FRANCE
French (Luxembourg)	fr-lu	FRENCH	LUXEMBOURG
French (Monaco)	fr-mc	FRENCH	FRANCE
French (Switzerland)	fr-ch	FRANCH	SWITZERLAND
FYRO Macedonian	mk	MACEDONIAN	FYR MACEDONIA
Gaelic	gd	ENGLISH	UNITED KINGDOM
Galician	gl	SPANISH	SPAIN
German (Austria)	de-at	GERMAN	AUSTRIA
German (Germany)	de	GERMAN	GERMANY
German (Liechtenstein)	de-li	GERMAN	GERMANY
German (Luxemgourg)	de-lu	GERMAN	LUXEMBOURG
German (Switzerland)	de-ch	GERMAN	SWITZERLAND
Greek	el	GREEK	GREECE
Gujarati	gu	GUJARATI	INDIA
Hebrew	he	HEBREW	ISRAEL
Hindi	hi	HINDI	INDIA
Hungarian	hu	HUNGARIAN	HUNGARY
Icelandic	is	ICELANDIC	ICELAND
Indonesian	id	INDONESIAN	INDONESIA
Italian (Italy)	it	ITALIAN	ITALY
Italian (Switzerland)	it-ch	ITALIAN	SWITZERLAND
Japanese	ja	JAPANESE	JAPAN
Kannada	kn	KANNADA	INDIA
Kazakh	kk	CYRILLIC KAZAKH	KAZAKHSTAN
Konkani	kok	KOREAN	KOREA
Korean	ko	KOREAN	KOREA
Kyrgyz	kz	RUSSIAN	RUSSIA
Latvian	lv	LATVIAN	LATVIA
Lithuanian	lt	LITHUANIAN	LITHUANIANA
Malay (Malaysia)	ms	MALAY	MALAYSIA
Malayalam	ml	MALAYALAM	INDIA
Maltese	mt	ENGLISH	UNITED KINGDOM
Marathi	mr	ENGLISH	INDIA
Nepali (India)	ne	ENGLISH	UNITED KINGDOM
Norwegian (Bokmal)	nb-no	NORWEGIAN	NORWAY
Norwegian (Bokmal)	no	NORWEGIAN	NORWAY

Table 21-6 (Cont.) Oracle Application Express Globalization Codes

Language Name	Language Code	NLS_LANGUAGE	NLS_TERRITORY
Norwegian (Nynorsk)	nn-no	NORWEGIAN	NORWAY
Oriya	or	ORIYA	INDIA
Polish	pl	POLISH	POLAND
Portuguese (Brazil)	pt-br	BRAZILIAN PORTUGUESE	BRAZIL
Portuguese (Portugal)	pt	PORTUGUESE	PORTUGAL
Punjabi	pa	PUNJABI	INDIA
Romanian	ro	ROMANIAN	ROMANIA
Russian	ru	RUSSIAN	RUSSIA
Russian (Moldova)	ru-md	RUSSIAN	RUSSIA
Serbia	sr	CYRILLIC SERBIAN	SERBIA AND MONTENEGRO
Slovak	sk	SLOVAK	SLOVAKIA
Slovenian	sl	SLOVENIAN	SLOVENIA
Spanish (Argentina)	es-ar	LATIN AMERICAN SPANISH	ARGENTINA
Spanish (Bolivia)	es-bo	LATIN AMERICAN SPANISH	ARGENTINA
Spanish (Chile)	es-cl	LATIN AMERICAN SPANISH	CHILE
Spanish (Colombia)	ec-co	LATIN AMERICAN SPANISH	COLOMBIA
Spanish (Costa Rica)	es-cr	LATIN AMERICAN SPANISH	COSTA RICA
Spanish (Dominican Republic)	es-do	LATIN AMERICAN SPANISH	PUERTO RICO
Spanish (Ecuador)	es-ec	LATIN AMERICAN SPANISH	ECUDOR
Spanish (El Salvador)	es-sv	LATIN AMERICAN SPANISH	EL SALVADOR
Spanish (Guatemala)	es-gt	LATIN AMERICAN SPANISH	GUATEMALA
Spanish (Honduras)	es-hn	LATIN AMERICAN SPANISH	GUATEMALA
Spanish (Mexico)	es-mx	MEXICAN SPANISH	MEXICO
Spanish (Nicaragua)	es-ni	LATIN AMERICAN SPANISH	Nicaragua
Spanish (Panama)	es-pa	LATIN AMERICAN SPANISH	Panama
Spanish (Paraguay)	es-py	LATIN AMERICAN SPANISH	ARGENTINA
Spanish (Peru)	es-pe	LATIN AMERICAN SPANISH	PERU
Spanish (Puerto Rico)	es-pr	LATIN AMERICAN SPANISH	PUERTO RICO
Spanish (Traditional Sort)	es	LATIN AMERICAN SPANISH	SPAIN
Spanish (United States)	es-us	LATIN AMERICAN SPANISH	AMERICAN
Spanish (Uruguay)	es-uy	LATIN AMERICAN SPANISH	ARGENTINA
Spanish (Venezuela)	es-ve	LATIN AMERICAN SPANISH	VENEZUELA
Swedish	sv	SWEDISH	SWEDEN
Swedish	sv-fi	SWEDISH	FINLAND
Tamil	ta	TAMIL	INDIA

Table 21-6 (Cont.) Oracle Application Express Globalization Codes

Language Name	Language Code	NLS_LANGUAGE	NLS_TERRITORY
Telugu	te	TELUGU	INDIA
Thai	th	THAI	THAILAND
Turkish	tr	TURKISH	TURKEY
Ukrainian	uk	UKRAINIAN	UKRAINE
Urdu	ur	ENGLISH	UNITED KINGDOM
Uzbek	uz	LATIN UZBEK	UZBEKISTAN
Vietnamese	vi	VIETNAMESE	VIETNAM

Managing Application Performance

Learn about how to improve application performance.

This section describes how to improve application performance.

- [About Best Practices to Improve Performance](#)
Improve performance by using bind variables and including a #TIMING# substitution string in the region footer.
- [Identifying Performance Issues](#)
Consider the following key strategies to help identify and resolve performance issues with your Oracle Application Express application.
- [Utilizing Logs and Reports](#)
Review application logs and reports to help identify problematic pages.
- [About Utilizing Database Reporting](#)
Improve application performance by utilizing database reporting.
- [About Database Parameters that Impact Performance](#)
Evaluate whether or not database parameters are impacting performance.
- [About Limiting Resources](#)
Use Resource Manager to limit the types of system resources available to each user request.
- [About Uploading Static Files to Your Web Server](#)
To improve performance you should place static files on the Web server.
- [Creating Custom Activity Reports Using APEX_ACTIVITY_LOG](#)
Learn how to use the APEX_ACTIVITY_LOG view to query activity for the current workspace.



See Also:

["Debugging an Application"](#)

22.1 About Best Practices to Improve Performance

Improve performance by using bind variables and including a #TIMING# substitution string in the region footer.

For applications having a large number of concurrent users, maintaining optimal performance is critical. Best practices to consider include:

- Use bind variables within your application whenever possible. You can reference session state values using bind variable syntax in SQL queries and application logic such as PL/SQL executed from processes and validations. Accessing session state using bind variables is the most efficient way to reference session state.

- Include a #TIMING# substitution string in the region footer so that you can view the timing of each region.

 **See Also:**

- ["Referencing Session State Using Bind Variable Syntax"](#)
- ["Using Substitution Strings"](#)

22.2 Identifying Performance Issues

Consider the following key strategies to help identify and resolve performance issues with your Oracle Application Express application.

- [About Troubleshooting Slow Running Applications](#)
- [Diagnosing Performance Issues](#)
- [About Debugging Problematic SQL Queries](#)
- [About Addressing Slow Queries](#)

22.2.1 About Troubleshooting Slow Running Applications

The first step in troubleshooting a slow running application is to determine the location of the bottleneck. You can evaluate application performance by reviewing the time it takes for the database to return a specific page request or submission. If this time is shorter than the time it takes to render the page on the user's browser, then other components are likely causing the perception that the application is slow. As a best practice, always check all of the components involved including client machines, the network, the middle-tier, the database, and disk and storage devices. Regarding the database, check the System Global Area (SGA), CPU utilization, locks, and database parameters. It is also important to determine if anything else is running within the database such as legacy applications, data warehouse, batch programs, and database jobs.

The majority of the time, performance issues with Oracle Application Express applications are due to developer-authored SQL and PL/SQL. You should utilize standard database performance tuning techniques to address these issues. Performance issues are rarely related to a bug with Oracle Application Express or the Oracle database.

 **See Also:**

Oracle Database Performance Tuning Guide

22.2.2 Diagnosing Performance Issues

To diagnose performance issues, follow these steps:

1. Identify the time window.
2. Isolate the largest consumers of database time.
3. Identify the Oracle Application Express workspace and application.
4. Correlate the offending SQL with a specific location within the application.

Once you have identified the slow running pages, you should run the application in debug mode to identify the specific components consuming the most time.

22.2.3 About Debugging Problematic SQL Queries

If your query does not seem to be running correctly, try running it in SQL*Plus, SQL Developer, or in SQL Commands. Any of these approaches will test your query outside the context of your application, making it easier to define the problem.

22.2.4 About Addressing Slow Queries

For optimized queries that still take more than a second to process, consider implementing a progress bar and preventing multiple page submissions. Users expect instant results and often resubmit a page if it does not return immediately. Unless managed properly, each page submission instigates a new session in the database and continues until completion. Multiple page submissions often degrade performance and may lead to database locks. This is especially true with interactive reports. As an alternative approach, try using Oracle Application Express collections to hold query results. By using collections, expensive and time consuming queries are only executed once for each user rather than each time they perform pagination or create a filter.

Tip:

You control whether end users may submit the same page more than once by configuring the page attribute, **Advanced, Enable duplicate page submissions**.

See Also:

- ["Editing Page Attributes "](#)
- ["About Using Collections"](#)

22.3 Utilizing Logs and Reports

Review application logs and reports to help identify problematic pages.

The Application Express engine records activity logs to capture usage and performance data. This information displays in various reports. If a particular page is accessed extensively or a page renders slowly then these reports can help you identify problematic pages.

You can then further analyze the problematic pages. For example, you can run a report query in SQL Developer to review the Explain Plan.

 **Tip:**

Another method of determining expensive elements within a page or process is to review the Application Express Debug mode.

- [How to Manage Log Files](#)
An Instance administrator can delete activity log files and manage the interval at which log file information is retained.
- [Viewing the Application Dashboard Report](#)
Learn how to view the Application Dashboard report.
- [Accessing the Monitor Activity Page](#)
Use the Monitor Activity page to view developer activity and application change information.
- [Instance Activity Reports](#)
Instance administrators are superusers that manage an entire hosted instance using the Application Express Administration Services application.

 **See Also:**

- "APEX_DEBUG" in *Oracle Application Express API Reference*
- ["Utilizing Debug Mode"](#)

22.3.1 How to Manage Log Files

An Instance administrator can delete activity log files and manage the interval at which log file information is retained.

If you wish to keep the activity log files indefinitely, you must create a batch job to copy records from the activity log table to another table.

 **See Also:**

"Managing Logs and Files" in *Oracle Application Express Administration Guide*

22.3.2 Viewing the Application Dashboard Report

Learn how to view the Application Dashboard report.

To view the Application Dashboard:

1. Navigate to the Workspace home page.

2. Click the **App Builder** icon.
3. Select an application.

The Application home page appears.

4. Click **Utilities**.
5. Click **Application Dashboard**.

The Application Dashboard appears and is divided into the following regions:

- **Application Overview** list application details such as the ID, Parsing Schema, Alias, Group, and Pages.
 - **Security** lists the current authentication scheme, number of public and non public pages, and the number of authorization schemes used within the current application.
 - **Templates** contains links to reports of templates used within the current application.
 - **Pages by Type** lists pages by type.
 - **Application Components** contains links to reports of application-level controls and logic, including lists of values, tabs, lists, application items, application processes, and application computations.
 - **Page Components** contains links to reports of page-level controls and logic, including items, buttons, processes, regions, branches, validations, and dynamic actions.
6. To view a specific report, click the number to the right of the component type or template.

22.3.3 Accessing the Monitor Activity Page

Use the Monitor Activity page to view developer activity and application change information.

To access the Monitor Activity page:

1. Navigate to the Workspace Administration page:
 - a. Sign in to Oracle Application Express.
 - b. At the top of the Workspace home page, click the **Administration** menu and select **Administration**.

The Workspace Administration home page appears.

2. Click **Monitor Activity**.

The Monitor Activity page appears and is divided into the following sections:

- **Page Views** - Contains reports of page views organized by view, user, application, application and page, day, hour, and by interactive report.
- **Developer Activity** - Offers reports of developer activity organized by developer, day, application, application changes, and day or month.
- **Sessions** - Lists active sessions with the current workspace (report or chart).
- **Page View Analysis** - Contains reports analyzing page views, such most viewed pages, page views by day, usage by day (chart), and weighted page performance.
- **Environment** - Contains reports of environments organized by user agent, browser, external clicks, or operating system.
- **Login Attempts** - Offers reports listing login attempts, login attempts by authentication result, and a developer login summary.

- **Application Errors** - Contains a report of application errors.
 - **Workspace Schema Reports and Other Reports** - Offers summaries of schema tablespace utilization and database privileges by schema, workspace schemas, and report tablespace utilization.
3. Select a report to review.

22.3.4 Instance Activity Reports

Instance administrators are superusers that manage an entire hosted instance using the Application Express Administration Services application.



See Also:

- [Monitoring Activity Across a Development Instance in *Oracle Application Express Administration Guide*](#)
- [About Oracle Application Express Administrator Roles](#)

22.4 About Utilizing Database Reporting

Improve application performance by utilizing database reporting.

Oracle Application Express establishes a physical connection from the database pool as `APEX_PUBLIC_USER`, which calls the Application Express engine. The Application Express engine utilizes `SQL.DBMS_SYS_SQL` to parse SQL as another user, the parsing schema. Database `V$SESSION` records contain useful information for each SQL executed including Oracle Application Express specific information for the client information, client identifier, and module. You can use this information to identify the associated SQL when you generate Oracle Trace files and use `TKPROF` to analyze them. You can also add `&p_trace=YES` to the end of the Application Express URL or use `ALTER SESSION`.

Automatic Workload Repository (AWR) reports collect performance statistics every hour, by default. Active Session History (ASH) reports are a system-wide record of database activity. You can use these reports to identify resource intensive SQL statements. For PL/SQL packages, procedures and functions that in turn call other PL/SQL programs, you can use PL/SQL hierarchical profiler in Oracle Database 11g. These subprograms account for execution times separately.

Oracle Application Express also includes views which catalog everything related to Oracle Application Express. You can use these views to access information from Oracle Application Express using tools such as SQL Developer, SQL*Plus and SQL Commands (Oracle Application Express SQL Workshop). If you are granted the `APEX_ADMINISTRATOR_READ_ROLE` or `APEX_ADMINISTRATOR_ROLE` then you can query across the entire instance, rather than just the workspace your schema user is associated with. You should grant `APEX_ADMINISTRATOR_READ_ROLE` to monitoring users, while `APEX_ADMINISTRATOR_ROLE` should be used for instance administrators, who manage instance parameters, workspaces, and so on.

 **See Also:**

- ["Enabling SQL Tracing and Using TKPROF"](#)
- *Oracle Database Performance Tuning Guide*
- *Oracle Application Express SQL Workshop Guide*

22.5 About Database Parameters that Impact Performance

Evaluate whether or not database parameters are impacting performance.

There are certain database parameters that can impact performance. In particular, you should review the memory related parameters (`MEMORY_TARGET`, `SGA_TARGET`, `PGA_AGGREGATE_TARGET`, `SHARED_POOL_SIZE`) parameters to ensure they are sized correctly. You should also check that the database System Global Area (SGA) fits in real memory. An undersized SGA can dramatically impact Application Express performance. There needs to be sufficient memory in the Shared Pool for PL/SQL and in Buffer Cache for the Application Express metadata. If the SGA is sized correctly it should not be necessary to pin PL/SQL programs from the Application Express engine as they are accessed regularly and should not be swapped out of memory. Because the Application Express engine resides in the database, it is strongly recommended that you gather statistics on the `APEX_210100` schema. Accurate statistics allow the cost-based optimizer to develop better query plans for accessing the application metadata.

22.6 About Limiting Resources

Use Resource Manager to limit the types of system resources available to each user request.

Database Resource Manager, an Oracle Database Enterprise Edition option, is exceedingly useful for maintaining an Oracle Application Express instance. Using Resource Manager you can limit the types of system resources (`CPU_PER_CALL` and `LOGICAL_READS_PER_CALL`) available to each user request. By setting up multiple resource profiles, with automatic switches between the profiles, as a user request exceeds a certain threshold you can reduce the CPU available to that transaction. For example you may define a default profile `APEX_HIGH` which can utilize 70% of CPU for 10 seconds, `APEX_MEDIUM` with 8% CPU for 120 seconds, `APEX_LOW` with 2% CPU for 1800 seconds, and `OTHERS` with 20% CPU. When a specific transaction exceeds 10 seconds, it is switched to the `APEX_MEDIUM` profile which drastically reduces the CPU available. If the transaction switches to `APEX_LOW` and exceeds 1800 seconds then you can cancel the SQL or kill the session. This approach ensures that one specific user or poorly written application cannot monopolize the CPU causing other users and applications to respond poorly.

 **Tip:**

Instance administrators can define Resource Manager profiles for individual workspaces.

 **See Also:**

- "Isolating a Workspace to Prevent Browser Attacks" and "Configuring Instance-Level Workspace Isolation Attributes" in *Oracle Application Express Administration Guide*
- "Managing Resources with Oracle Database Resource Manager" in *Oracle Database Administrator's Guide*

22.7 About Uploading Static Files to Your Web Server

To improve performance you should place static files on the Web server.

As a best practice, you should also enable gzip compression on the Web server so that the file size is minimized when transmitting the static files to the browser. Furthermore, you should also enable file caching for browsers by sending expiration headers.

 **See Also:**

- ["Managing Static Application Files"](#)
- ["Managing Static Workspace Files"](#)

22.8 Creating Custom Activity Reports Using APEX_ACTIVITY_LOG

Learn how to use the `APEX_ACTIVITY_LOG` view to query activity for the current workspace.

- [Enabling Logging for an Application](#)
You enable logging for an application on the Edit Application Definition page.
- [APEX_ACTIVITY_LOG](#)
Use `APEX_ACTIVITY_LOG` to view and query all activity for the current workspace.
- [APEX_ACTIVITY_LOG Sample Query](#)

22.8.1 Enabling Logging for an Application

You enable logging for an application on the Edit Application Definition page.

To edit the application definition:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click the **Edit Application Properties** button to the right of the application name.

The Edit Application Definition page appears.

4. Under Properties, locate Logging. Select **Yes** or **No**.

When set to **Yes**, every page view is logged, enabling an administrator to monitor user activity for each application. Disabling logging may be advisable for high volume applications.



Tip:

You can only modify the Logging attribute if the Application Activity Logging attribute in Oracle Application Express Administration Services is set to **Use Application Setting**.



See Also:

"Enabling Application Activity" in Logging in *Oracle Application Express Administration Guide*

22.8.2 APEX_ACTIVITY_LOG

Use APEX_ACTIVITY_LOG to view and query all activity for the current workspace.

The APEX_ACTIVITY_LOG view records all activity in a workspace, including developer activity and application runtime activity. You can use APEX_ACTIVITY_LOG to view and query all activity for the current workspace. For example, you can use this view to develop monitoring reports within a specific application to provide real-time performance statistics.

Table 22-1 describes the columns in the APEX_ACTIVITY_LOG view.

Table 22-1 Columns in APEX_ACTIVITY_LOG

Column	Type	Description
time_stamp	DATE	Date and time that activity was logged at the end of the page view.
component_type	VARCHAR2(255)	Reserved for future use.
component_name	VARCHAR2(255)	Reserved for future use.
component_attribute	VARCHAR2(4000)	Title of page.
information	VARCHAR2(4000)	Reserved for future use.
elap	NUMBER	Elapsed time of page view in seconds.
num_rows	NUMBER	Number of rows processed on page.
userid	VARCHAR2(255)	User ID performing page view.
ip_address	VARCHAR2(4000)	IP address of client.
ir_report_id	NUMBER	Interactive report ID

Table 22-1 (Cont.) Columns in APEX_ACTIVITY_LOG

Column	Type	Description
ir_search	VARCHAR2	Interactive report search criteria entered by users.
user_agent	VARCHAR2(4000)	web browser user agent of client.
flow_id	NUMBER	Application ID.
step_id	NUMBER	Page number.
session_id	NUMBER	Oracle Application Express session identifier.
sqlerrm	VARCHAR2(4000)	SQL Error message.
sqlerrm_component_type	VARCHAR2(255)	Reserved for future use.
sqlerrm_component_name	VARCHAR2(255)	Reserved for future use.

To conserve space in the activity log, only the first log entry of each unique session contains the IP address and web browser user agent.

22.8.3 APEX_ACTIVITY_LOG Sample Query

The following example demonstrates how to create a report that displays the total number of page views and the average page view time in the past 24 hours for application 9529, and grouped by userid:

```
SELECT COUNT(*), AVG(elap), userid
  FROM APEX_ACTIVITY_LOG
 WHERE time_stamp > (SYSDATE-1)
    AND flow_id = 9529
 GROUP BY userid
```

Keep in mind that activity logging in an Oracle Application Express instance is rotated between two different log tables. Because there are two log tables, logging information is only as current as the oldest available entry in the logs. To persist your application specific log information for all time, you must either copy the log information into your own application table or implement logging directly in your application.

23

Debugging an Application

Learn about best practices for debugging an Oracle Application Express application.

- [Running Advisor to Check Application Integrity](#)
Use Oracle Application Express Advisor (Advisor) to check the integrity and quality of your Oracle Application Express application.
- [Reviewing Session State](#)
View current session state for your application by clicking the Session link on the Runtime Developer Toolbar.
- [About Monitoring Application and Page Resource Use](#)
Query the `V$SESSION` and `V$SQLAREA` views to monitor application and page resource use..
- [Enabling SQL Tracing and Using TKPROF](#)
Enable SQL tracing and then analyze the temporary file Oracle Application Express creates using the TKPROF utility.
- [Utilizing Debug Mode](#)
Use Debug mode to track down unexpected application behavior.
- [About Removing Controls and Components to Isolate a Problem](#)
If you have problems running a page, try removing controls and components one at a time.

See Also:

- "APEX_DEBUG" in *Oracle Application Express API Reference*
- "Managing Application Performance"

23.1 Running Advisor to Check Application Integrity

Use Oracle Application Express Advisor (Advisor) to check the integrity and quality of your Oracle Application Express application.

Oracle Application Express Advisor functions like a compiler or LINT and flags suspicious behavior or errors. Running Advisor checks the integrity of your application based on the underlying metadata.

- [About Oracle Application Express Advisor](#)
- [Running Advisor on an Entire Application](#)
- [Running Advisor on a Single Page](#)

23.1.1 About Oracle Application Express Advisor

Before deploying your application, you can use the Oracle Application Express Advisor to perform various sanity checks on your application. The Advisor checks for errors, security issues, performance bottlenecks, quality assurance, and other best practices.

 **Tip:**

Oracle Application Express Advisor includes checks specific to ensuring application accessibility. To learn more, see *Oracle Application Express Accessibility Guide*.

23.1.2 Running Advisor on an Entire Application

1. To run Advisor on an entire application:
1. Navigate to the appropriate application:
 - a. On the Workspace home page, click the **App Builder** icon.
The App Builder home page appears.
 - b. Select the application.
The Application home page appears.
2. Click **Utilities**.
3. Click **Advisor**.
The Advisor page appears.
4. Under Checks to Perform:
 - a. Expand Checks to Perform.
 - b. Review the selected options. Select and deselect options as appropriate.
5. In Pages(s), enter a comma separated list of pages in the field provided. To check all pages, leave this option blank.
6. Click **Perform Check** at the top of the page.
A Results page appears.

 **Tip:**

Current Advisor settings are used next time the check is performed.

7. To alter the existing preferences:
 - a. Under Filter Result, deselect the appropriate options.
 - b. Click **Apply Filter**.
8. To run Advisor again, click **Perform Check**.

23.1.3 Running Advisor on a Single Page

1. To run Advisor on a single page:
 1. Navigate to the appropriate page.
 2. Click the **Utilities** menu and select **Advisor**.
Advisor appears.
 3. Under Checks to Perform, review the selected options. Select and deselect options as appropriate.
 4. Click **Perform Check** at the top of the page.
A Results page appears.
 5. To alter the existing preferences:
 - a. Under Filter Result, deselect the appropriate options.
 - b. Click **Apply Filter**
 6. To re-run the Advisor and see if reported problems are fixed, click **Perform Check**.

23.2 Reviewing Session State

View current session state for your application by clicking the Session link on the Runtime Developer Toolbar.

Session state enables developers to store and retrieve values for a user as the user navigates between different application pages. Many applications are based on data contained within application controls. For example, buttons can display conditionally based on a value stored in session state.

See Also:

- ["Runtime Developer Toolbar"](#)
- ["Viewing Session State"](#)
- ["Managing Session State Values"](#)
- ["Managing Session State for a Workspace" and "Managing Session State for an Instance" in *Oracle Application Express Administration Guide*](#)

23.3 About Monitoring Application and Page Resource Use

Query the `V$SESSION` and `V$SQLAREA` views to monitor application and page resource use..

Oracle Application Express facilitates the monitoring of resources used by applications and pages by calling the package `DBMS_APPLICATION_INFO`. Whenever the Application Express engine renders or processes a page, the module is set to `APEX` and includes the application ID and page number. Once set, you can query the `V$SESSION` and `V$SQLAREA` views to monitor transactions.

23.4 Enabling SQL Tracing and Using TKPROF

Enable SQL tracing and then analyze the temporary file Oracle Application Express creates using the TKPROF utility.

Tracing your session can be a very effective way to debug an application. From a database perspective, each page request is a single database session. If you enable SQL tracing, then Oracle Application Express creates a temporary file you can then analyze using the TKPROF utility.

You enable SQL tracing in Oracle Application Express by using `f?p` syntax to set the argument `p_trace=YES`. For example, to trace the display of page 1 in application 100, you would use the syntax:

```
http://.../f?p=100:1&p_trace=YES
```

To use the TKPROF utility:

1. Log in to SQL*Plus as a privileged user.
2. Execute the following statement:

```
show parameter USER_DUMP_DEST
```
3. Navigate to the directory in which the trace file is created.
4. Run the TKPROF utility from the operating system prompt using the following syntax:

```
tkprof filename1 filename2 [waits=yes|no] [sort=option] [print=n]
[aggregate=yes|no] [insert=filename3] [sys=yes|no] [table=schema.table]
[explain=user/password] [record=filename4] [width=n]
```

The input and output files are the only required arguments.

5. To view online Help, invoke TKPROF without arguments.



See Also:

"Tools for End-to-End Application Tracing" in *Oracle Database SQL Tuning Guide* for information about using the TKPROF program

23.5 Utilizing Debug Mode

Use Debug mode to track down unexpected application behavior.

- [About Debug Mode](#)
- [Enabling and Disabling Debug Mode for an Application](#)
- [Running an Application in Debug Mode](#)
- [Viewing Debug Reports in Development Mode](#)
- [About Using f?p Syntax to Access Debug Mode](#)

- [Viewing Debug Reports from a Running Application](#)
- [Viewing Debug Reports](#)

**See Also:**

"APEX_DEBUG" in *Oracle Application Express API Reference*

23.5.1 About Debug Mode

The Debug mode is a built in mechanism used to track down unexpected application behavior. You enable and disable debug mode for the current page and session by clicking the **Debug** and **No Debug** links in the Runtime Developer Toolbar. To view Debug reports, click the **View Debug** link in the Runtime Developer Toolbar.



If an application runs in debug mode, Oracle Application Express writes information about how it processes each page request to a log table. You can control the logging level of detail, add debug calls in your own code, and analyze the written log information.

When debug is enabled, Oracle Application Express also uses its non-minified JavaScript files to better isolate where possible issues may be coming from with client-side-code.

**See Also:**

- ["Runtime Developer Toolbar"](#)
- ["APEX_DEBUG" in Oracle Application Express API Reference](#)

23.5.2 Enabling and Disabling Debug Mode for an Application

You can configure whether end users can run the application in debug mode by using the Debugging attribute on the Edit Application Definition page. A developer who is logged into workspace where the application resides can always run the application in debug mode.

To enable or disable debug mode:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click the **Edit Application Properties** button to the right of the application name.
The Edit Application page appears.
4. Scroll down to Properties.
5. For Debugging:

- **Yes.** Enables the application debug mode using the browser at runtime.
- **No.** Disables the application debug mode using the browser at runtime.

**See Also:**

["Managing Application Attributes"](#)

23.5.3 Running an Application in Debug Mode

You run and disable debug mode at runtime by clicking **Debug** and **No Debug** on the Runtime Developer Toolbar. By default, Debugging mode is disabled, unless you are logged into the application's workspace as a developer.

To enable or disable Debug mode at runtime:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the desired application.
3. Run the application.
4. On the Runtime Developer Toolbar, click **Debug**.

The debugging mode is enabled. Debug data is captured in the background. As long as the browser tab or window stays open, when you run a page from App Builder, it will use the current debug mode and level.

5. You can also specify a Debug Level:
 - a. On the Runtime Developer Toolbar, click **Developer Toolbar Options** and then **Default Debug Level**.
 - b. From the submenu, select one of the following:
 - **Info (default)** - The debug log contains the default or normal amount of information. This corresponds with a log level of 4 and a Debug URL argument of `YES`.
 - **App Trace** - The debug log contains messages up to level 6. This corresponds with a Debug URL argument of `LEVEL6`.
 - **Full Trace** - The log will contain the maximum amount of information. This corresponds with a Debug URL argument of `LEVEL9`. **Full Trace** can slow request processing but provides the most amount of detail.
6. To disable debug mode, on the Runtime Developer Toolbar, click **No Debug**.

**See Also:**

["Enabling and Disabling Debug Mode for an Application"](#)

23.5.4 Viewing Debug Reports in Development Mode

To view debug reports in development mode:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the desired application.
3. Click **Utilities**.
4. On the Utilities page, click **Debug Messages**.
The Debug page appears.
5. Click the **View Identifier** to the left of the session you want to view.
The Debug Message Data page appears.
6. To view steps that took the longest, hover over that step on the graph above the report.
The step details display.
7. To go to that step in the report, click the bar.

 **Note:**

Debug sessions listed in the report live for at least 2 weeks and age out along with the activity log. This is usually more than adequate for debugging purposes.

 **See Also:**

["Enabling and Disabling Debug Mode for an Application"](#)

23.5.5 About Using f?p Syntax to Access Debug Mode

You can also use f?p syntax to run an application in Debugging mode. Simply call the page and set the Debug argument to YES or LEVEL n , where n is between 1 (least detailed) and 9 (most detailed). For example:

```
f?p=100:1:&APP_SESSION.::YES
```

 **See Also:**

["About Using f?p Syntax to Link Pages"](#)

23.5.6 Viewing Debug Reports from a Running Application

To view debug report from a running application:

1. Locate and run the application in Debug mode.
2. Click **View Debug** on the Runtime Developer Toolbar.
A list of Debug reports displays.

- Click the **View Identifier** to the left of the session you want to view.
The Debug Message Data page appears.
- To view steps that took the longest, hover over that step on the graph above the report.
The step details display.
- To go to that step in the report, click the bar.

 **Note:**

Debug sessions listed in the report live for at least 2 weeks and age out along with the activity log. This is usually more than adequate for debugging purposes.

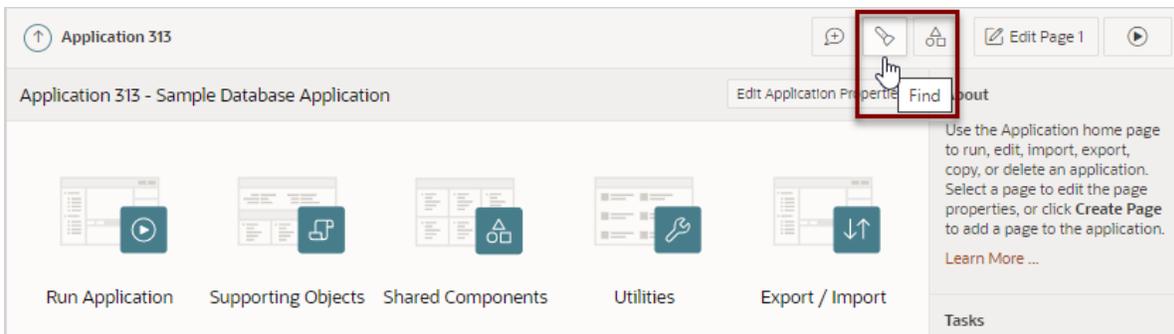
 **See Also:**

- "Running an Application in Debug Mode"
- "Enabling and Disabling Debug Mode for an Application"

23.5.7 Viewing Debug Reports

To view debug reports:

- Click the **Find** icon.



The Items Finder appears.

- Click the **Debug** tab.
- Click the View Identifier to the left of the session you want to view.
The Debug report appears.
- To view steps that took the longest, hover over that step on the graph above the report.
The step details display.

- To go to that step in the report, click the bar.

 **Note:**

Debug sessions listed in the report live for at least 2 weeks and age out along with the activity log. This is usually more than adequate for debugging purposes.

 **See Also:**

["Enabling and Disabling Debug Mode for an Application"](#)

23.6 About Removing Controls and Components to Isolate a Problem

If you have problems running a page, try removing controls and components one at a time.

Using this approach, you can quickly determine which control or component may be the source of your problem. You can disable a control or component creating a build options. Build options enable you to conditionally display specific functionality within an application.

Build options enable you to conditionally display specific functionality within an application. Build options have two possible values: INCLUDE and EXCLUDE. If you specify an attribute as being included, then the Application Express engine considers it part of the application definition at runtime. Conversely, if you specify an attribute as being excluded, then the Application Express engine treats it as if it did not exist.

Disadvantages of Using Conditions to Remove Controls or Components

Prior releases of Oracle Application Express recommended that developers disable controls or components by setting the Condition attribute to **Never**. Although this approach is still valid, a major disadvantage is it overwrites the existing condition.

 **See Also:**

["Using Build Options to Control Configuration"](#)

Deploying an Application

Learn about best practices for deploying an application. Deployment is the process of moving an application from the testing phase to the production phase.

- [About Suggested Environments](#)
Oracle recommends developers follow standard system development life cycle practices when developing applications by having different environments for development, testing, and production.
- [System Development Life Cycle Methodologies to Consider](#)
The system development life cycle (SDLC) is the overall process of developing software using a series of defined steps. There are several system SDLC models that work well for developing applications in Oracle Application Express.
- [Understanding the Deployment Process](#)
Oracle recommends developing Oracle Application Express applications in separate environments: development, testing, and finally production. Learn about different approaches and best practices during when deploying applications.
- [How to Create a Custom Application](#)
Simplify the steps needed to deploy an application by creating a custom application using the Supporting Objects utility.
- [Using Build Options to Control Configuration](#)
Use build options to conditionally include or exclude application components and functionality.
- [About Publishing the Database Application URL](#)
Once you deploy your application, load the data, and create users, you can publish your production URL.
- [Exporting an Application and Application Components](#)
Move a workspace, application, or related files by exporting it to another Application Express instance.
- [Importing Export Files](#)
After you create Export files, you then import them into the target Oracle Application Express instance.
- [Installing Export Files](#)
After you create an Export File, you can install it directly after importing, install it from the Export Repository, or install it from SQL*Plus.
- [Understanding One-click Remote Application Deployment](#)
Deploy an application to remote Oracle Application Express instances using REST Enabled SQL references.



See Also:

[Life Cycle Management with Oracle Application Express](#)

24.1 About Suggested Environments

Oracle recommends developers follow standard system development life cycle practices when developing applications by having different environments for development, testing, and production.

As a best practice, developers should only make changes to applications and related database objects in the development environment. To further enforce this policy Oracle recommends that you install runtime-only Oracle Application Express environments in your test and production environments. This will prohibit developers from accessing the App Builder and SQL Workshop in these environments. As a general rule, your administrator (DBA) should be the only ones with permission to update the test and production environments. DBAs should use the appropriate provided APIs and import applications from an SQL interface, such as SQL Developer or SQL*Plus.



See Also:

["About the Differences Between Runtime and Full Development Environments"](#)

24.2 System Development Life Cycle Methodologies to Consider

The system development life cycle (SDLC) is the overall process of developing software using a series of defined steps. There are several system SDLC models that work well for developing applications in Oracle Application Express.

- [Differences Between Iterative and Planned Development](#)
- [About the Advantages of Creating Prototypes](#)
- [Waterfall](#)
- [Spiral](#)
- [Rapid Application Development](#)

24.2.1 Differences Between Iterative and Planned Development

When developing applications using App Builder, you must find a balance between two dramatically different development methodologies:

- Iterative, rapid application development
- Planned, linear style development

Iterative, rapid application development offers so much flexibility that you run the risk of never completing your project. In contrast, Planned, linear style development can yield applications that do not meet the needs of end users even if they meet the stated requirements on paper.

24.2.2 About the Advantages of Creating Prototypes

The Oracle Application Express development environment enables developers to take a more iterative approach to development. Unlike many other development environments, creating prototypes is easy. With Oracle Application Express, developers can:

- Use built-in wizards to quickly design an application user interface.
- Make prototypes available to users and gather feedback.
- Implement changes in real time, creating new prototypes instantly.

Methodologies that work well with Oracle Application Express include Spiral and Rapid Application Development (RAD).

See Also:

- ["Spiral"](#)
- ["Rapid Application Development"](#)

24.2.3 Waterfall

The Waterfall is probably the best known SDLC model. In this methodology, the development process is broken down into the following stages:

1. Project Planning
2. Requirements Definition
3. Design
4. Development
5. Integration and Testing
6. Installation and Acceptance
7. Maintenance

This methodology is referred to as a waterfall because the output from one stage is the input for the next stage.

A primary problem with this approach is that it is assumed that all requirements can be established in advance. Unfortunately, requirements often change and evolve during the development process.

24.2.4 Spiral

A **Spiral** methodology is actually a series of short waterfall cycles. Each waterfall cycle yields new requirements and enables the development team to create a robust series of prototypes. One advantage of this approach is that it accommodates changing requirements. Disadvantages include complex project management and the risk development goes on indefinitely.

24.2.5 Rapid Application Development

A **Rapid Application Development (RAD)** methodology has a heavy emphasis on creating a prototype that closely resembles the final product. The prototype is an essential part of the requirements phase. Advantages of this model include the ability to accommodate changing requirements, rapid development cycles, and progress can be easily measured. The major disadvantage of this model is that the emphasis on prototyping can result in scope creep. As a result, developers can lose sight of their initial goals in the attempt to create the perfect application.

24.3 Understanding the Deployment Process

Oracle recommends developing Oracle Application Express applications in separate environments: development, testing, and finally production. Learn about different approaches and best practices during when deploying applications.

- [About Moving an Application to Another Instance](#)
- [Deployment Options to Consider](#)
- [How to Move an Application to Another Instance](#)

24.3.1 About Moving an Application to Another Instance

To move an application from one Oracle Application Express instance to another, you must move both the metadata and supporting objects used by the application as follows:

1. Move the application definition and all associated files.
2. Move the supporting objects.

See Also:

- ["How to Move an Application to Another Instance"](#)
- ["How to Create a Custom Application"](#)

24.3.2 Deployment Options to Consider

When you develop an application, you create the application within a specific workspace. Each workspace has a unique ID and name. A common scenario is to create the application in a development instance and then deploy it to a production instance.

Deployment options to consider include:

1. **Use the same workspace and same schema.** Export and then import the application and install it using a different application ID. This approach works well when there are few changes to the underlying objects, but frequent changes to the application functionality.

2. **Use a different workspace and same schema.** Export and then import the application into a different workspace. This is an effective way to prevent a production application from being modified by developers.
3. **Use a different workspace and different schema.** Export and then import the application into a different workspace and install it so that it uses a different schema. This new schema needs to have the database objects required by your application.
4. **Use a different database with all its variations.** Export and then import the application into a different Oracle Application Express instance and install it using a different workspace, schema, and database.

Whether to Copy the Workspace

Deciding whether to copy an existing workspace is a matter of preference. Keep in mind that the production version must have access to all the appropriate objects. For example, you might want to copy a workspace in the following situations:

- When you want to keep the same application identifiers between development and other environments.
- When the application relies on Oracle Application Express authentication. Copying the workspace automatically migrates all the required user data.

Whether to Copy the Database

When deciding whether to copy the database, remember that the schema against which the application runs must have access to the same objects as the development instance. The actual name of the schema is unimportant. You can change it during the import process.

About the Application ID

It is not necessary to have matching application IDs for a development version and production version of an application. In fact, as a best practice never hard code the application ID into your application. Instead, use the application alias (defined on the Edit Application page), or use a built-in substitution string (such as `APP_ID` and `APP_ALIAS`). Using a substitution string is the better approach because it enables you to change the application ID without affecting any application functionality.

See Also:

- ["Name"](#) for information about defining an application alias
- ["Using Built-in Substitution Strings"](#) for information about using `APP_ID` and `APP_ALIAS`

24.3.3 How to Move an Application to Another Instance

Whether you are moving an application to another workspace or just making a copy of it, deployment involves the following steps:

1. Move the supporting database objects (if appropriate).
2. Package the application definition with its supporting objects to create a custom application.

- See "[How to Create a Custom Application.](#)"
- 3. Export the custom application.
See "[Exporting an Application and Application Components.](#)"
- 4. Import the exported files into the target Oracle Application Express instance.
See "[Importing Export Files.](#)"
- [About Managing Database Objects](#)



See Also:

- "[Exporting an Application and Application Components.](#)"
- "[Understanding One-click Remote Application Deployment](#)"

24.3.3.1 About Managing Database Objects

Before you export an application and the appropriate related files, you must determine if you also need to migrate the database objects referenced by the application.

If the target schema is different from the schema used in the development environment, you must migrate the database objects referenced by the application. In many cases, this process can be as simple as using Oracle database export and import utilities to copy the application schema from the development environment to target instance. The following are two common scenarios where this approach does *not* work:

- When the object development schema refers to tablespaces to which the target instance schema does not have access.
- When the development instance schema has sample data that you do not want to migrate to the target instance schema.

If a database administrator or an Oracle Application Express administrator is the person responsible for exporting Oracle Application Express applications, be sure to clearly communicate if he or she:

- Should include all data when exporting your application.
- Should NOT include data from specific tables you identify.



Tip:

"Using Data Workshop to Manage Data" in *Oracle Application Express SQL Workshop Guide*

**See Also:**

["How to Create a Custom Application"](#)

24.4 How to Create a Custom Application

Simplify the steps needed to deploy an application by creating a custom application using the Supporting Objects utility.

- [How Creating a Custom Application Simplifies Deployment](#)
- [Creating a Custom Application](#)
- [Installing Supporting Objects](#)
- [Deleting Supporting Objects Scripts, Messages, and Installation Options](#)
- [Upgrading a Custom Application](#)
- [Deinstalling Supporting Objects](#)
- [Viewing an Install Summary](#)

**See Also:**

- ["How to Move an Application to Another Instance"](#)
- ["Exporting an Application and Application Components"](#)

24.4.1 How Creating a Custom Application Simplifies Deployment

From a developer's perspective, importing and installing an application is a complicated process. First, you create the target database objects and seed data. Second, you import and install the application definition and all related files, including images, themes, and any other required static files.

Creating a custom application using the Supporting Objects utility greatly simplifies this process. Instead of performing numerous steps to create the database objects and then import and install the application and all supporting files, you can define the supporting objects so that the application and supporting files can be migrated in a few easy steps.

After users import and install the application definition, a wizard guides them through a few simple configuration steps. Then, the wizard asks whether to install the supporting application objects. Users have the option of installing the supporting application objects then or doing it later.

From a developer's perspective, creating a custom application has the following advantages:

- Ensures that the supporting objects are created in the correct order.
- Provides an automated process for deploying an application quickly using very few steps.
- Gives users the option to install supporting application objects when they import and install the application definition or at a later time.

- Enables users and developers with a convenient method for removing the application definition, supporting files, and all database objects.
- Provides users and developers with an easy way to upgrade a previously released custom application.

Plus, you can also take advantage of the Deinstall and Install features to quickly edit the underlying database objects that support an application. For example, you can deinstall and remove all database objects, edit the underlying database object creation scripts, and reinstall to create the redefined application objects.



See Also:

- ["Installing Supporting Objects"](#)
- ["Deinstalling Supporting Objects"](#)
- ["Upgrading a Custom Application"](#)

24.4.2 Creating a Custom Application

To create a custom application, you must create installation scripts that define your application's supporting objects (including database objects, images, and seed data) and any preinstallation validations. You define these objects and the installation and deinstallation scripts and the messages that display when the user installs or deinstalls on the Supporting Objects page.

- [Accessing the Supporting Objects Utility](#)
- [Supporting Objects Page](#)

24.4.2.1 Accessing the Supporting Objects Utility

You create a custom application on the Supporting Objects utility.

To access the Supporting Objects Page utility:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.
The Application home page appears.
3. Click the **Supporting Objects** icon.
The Supporting Objects page appears.

24.4.2.2 Supporting Objects Page

The top of the Supporting Objects page displays the application name and indicates current selections for the following: Check for Objects, Verify System Privileges, Required Free KB, Prompt for License, and Include in Export. To learn more about these options, see field-level Help.

To specify whether to include supporting objects with an application export, find **Include in Export** at the top of the page, click either **Yes** or **No**. If you select **Yes**, a new page appears. From the **Include Supporting Object Definitions in Export** list, make a new selection and click **Apply Changes**.

The rest of the page is divided into the following categories: Installation, Upgrade, and Deinstallation.

- [Installation](#)
- [Upgrade](#)
- [Deinstallation](#)

 **See Also:**
"Viewing Help"

24.4.2.2.1 Installation

Use the links under Installation to define the following types of information:

- **Prerequisites.** Defines built-in checks required before installing the application, such as required free disk space, required system privileges, and schema object restrictions.

- **Application Substitution Strings.** Lists static substitution strings defined for the application. You can define static substitution strings for phrases or labels that occur in many places within an application.
When packaging an application, you can include prompts for substitution strings which users can specify when they install the custom application.
- **Build Options.** Lists build options defined for this application. You can use build options to conditionally display specific functionality within an application.
When packaging an application, you can include prompts for specific build options which display when the application is installed.
- **Pre-installation Validations.** Lists validations defined for the custom application. Similar to normal page validations, these validations prevent a user from installing database objects if the user-defined conditions are not satisfied. To create a new validation, click **Create** and follow the on-screen instructions.
- **Installation Scripts.** Enables a you to define multiple installation scripts that install supporting objects for the application. To create a new script, click **Create** and follow the on-screen instructions. To edit an existing script, click the **Edit** icon. To prevent another developer from editing a script, click the **Lock** icon. If the script is locked, the Lock icon appears as a closed padlock. If the script is unlocked, the Lock icon appears as an open padlock.
- **Messages.** Enables you to define messages that display when the user installs or deinstalls the application. Supported HTML tags include ``, `<i>`, `<u>`, `<p>`, `
`, `<hr>`, ``, ``, ``, and `<pre>`.
When these messages display, only a limited set of HTML tags are recognized to prevent a cross site-scripting (XSS) attack.



See Also:

- ["Substitutions"](#)
- ["Using Build Options to Control Configuration"](#)
- ["Exporting Build Options or Build Option Status"](#)
- ["Understanding Cross-Site Scripting Protection"](#)

24.4.2.2.2 Upgrade

Use the links under Upgrade to define the following types of information:

- **Upgrade Scripts.** Click **Upgrade Scripts** to define scripts to upgrade database objects, images, and seed data when upgrading an existing application.
- **Upgrade Message.** Enables you to define messages that display when the user upgrades the application. Supported HTML tags include ``, `<i>`, `<u>`, `<p>`, `
`, `<hr>`, ``, ``, ``, and `<pre>`.
When these messages display, only a limited set of HTML tags are recognized to prevent a cross site-scripting (XSS) attack.

 **See Also:**

- ["Upgrading a Custom Application"](#)
- ["Understanding Cross-Site Scripting Protection"](#)

24.4.2.2.3 Deinstallation

Use the links under Deinstallation to define the following types of information:

- **Deinstallation Script.** Click **Deinstallation Script** to define a script to drop database objects and static files created by the installation scripts. To edit an existing script, click the **Edit** icon.
- **Deinstallation Message.** Allows you to define messages that display when the user deinstalls the application. Supported HTML tags include ``, `<i>`, `<u>`, `<p>`, `
`, `<hr>`, ``, ``, ``, and `<pre>`.

When these messages display, only a limited set of HTML tags are recognized to prevent a cross site-scripting (XSS) attack.

 **See Also:**

- ["Understanding Cross-Site Scripting Protection"](#)

24.4.3 Installing Supporting Objects

After you edit your supporting objects and create the appropriate scripts, you can run your installation scripts by clicking **Install Supporting Objects** on the Tasks list.

End users can also use this feature if they elect to not install the custom application (or supporting objects) after they import and install the application definition.

To install supporting objects:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.
3. Click **Supporting Objects**.
The Supporting Objects page appears.
4. Click the **Install Supporting Objects** on the Tasks list.
5. To view details about the installation script before running it, expand the Tasks region and click **Preview Installation Script**.
The Preview Scripts page appears listing summary information, prerequisites, and the actual scripts to be run.
6. To exit the Preview Scripts page and continue, click **Close**.
7. From Install Supporting Objects, set to **On** and click **Next**.

8. Follow the on-screen instructions.

24.4.4 Deleting Supporting Objects Scripts, Messages, and Installation Options

You can delete the metadata that defines supporting object scripts, messages, and installation options associated with a custom application by clicking **Remove Supporting Object Installation** on the Tasks list on the Supporting Objects page.

To delete the metadata that defines supporting object scripts, messages, and installation options:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click **Supporting Objects**.
The Supporting Objects page appears.
4. On the Tasks list on the right side of the page, click **Remove Supporting Object Installation**.
5. Follow the on-screen instructions.

24.4.5 Upgrading a Custom Application

You can define scripts to upgrade a previously published application on the Upgrade page.

- [Defining an Upgrade Script](#)
- [Upgrading a Custom Application](#)

24.4.5.1 Defining an Upgrade Script

You can use the Upgrade page to define scripts to upgrade database objects, images, and seed data when upgrading an existing application.

To create an upgrade script:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. Click **Supporting Objects**.
The Supporting Objects page appears.
4. Under Upgrade, click **Upgrade Scripts**.
5. Use the Detect Existing Supporting Objects section to determine if the appropriate objects are installed or must be upgraded.
6. In Query to Detect Existing Supporting Objects, enter a query in the field that returns at least one row if the supporting objects exist.
This query determines whether the user who installs the custom application is prompted to run the installation scripts or the upgrade scripts.
7. To create a script, click **Create**.

 **Tip:**

To enable users to upgrade from various earlier versions of this application, you can add conditions to the upgrade scripts by going to the Script Properties page.

8. To prevent another developer from editing a script, click the **Lock** icon.
If the script is locked, the Lock icon appears as a closed padlock. If the script is unlocked, the Lock icon appears as an open padlock.
9. To edit an existing script, click the **Edit** icon.
10. Follow the on-screen instructions.

24.4.5.2 Upgrading a Custom Application

After you create your upgrade script, you can test it by clicking **Upgrade Supporting Objects** on Tasks list on the Supporting Object page.

End users can also use this feature to upgrade an existing custom application.

To upgrade a custom application:

1. Import a new version of application to be upgraded (if applicable).
2. On the Workspace home page, click the **App Builder** icon.
3. Select the application.
4. Click **Supporting Objects**.
The Supporting Objects page appears.
5. From the Tasks list, click **Upgrade Supporting Objects**.
6. Follow the on-screen instructions.

 **See Also:**

["Importing an Application, Page or Component Export"](#)

24.4.6 Deinstalling Supporting Objects

Once you create or install a custom application, you can deinstall it by either:

- Clicking the **Deinstall Supporting Objects** on the Supporting Objects page.
- Clicking **Delete this Application** on the Application home page.

When you deinstall an application, you have the option of removing the current application definition and running the deinstallation script defined in the Supporting Objects.

To deinstall a custom application:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.

3. Click **Supporting Objects**.
The Supporting Objects page appears.
4. From the Tasks list, click **Deinstall Supporting Objects**.
5. Select a deinstallation option:
 - **Remove Application Definition** removes the current application definition.
 - **Deinstall Database Objects** runs the deinstallation script defined in the deployment attributes for this application.
6. Follow the on-screen instructions.



See Also:

["Creating a Custom Application"](#)

24.4.7 Viewing an Install Summary

You can view a log of recent installation and deinstallation by clicking **View Install Summary** on the Tasks list on the Supporting Objects page. Note that this log only displays results from the most recent installation or deinstallation that occurred during the current Application Express session.

To view the Install Summary:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.
3. Click **Supporting Objects**.
The Supporting Objects page appears.
4. On the Tasks list on the right side of the page, click **View Install Summary**.
A Summary page appears.

24.5 Using Build Options to Control Configuration

Use build options to conditionally include or exclude application components and functionality.

- [About Build Options](#)
Build options enable developers to enable or disable application components and functionality when the application installs or at runtime using the `APEX_UTIL.GET_BUILD_OPTION_STATUS` and `APEX_UTIL.SET_BUILD_OPTION_STATUS` APIs.
- [Creating Build Options](#)
Create build options by selecting the application and accessing Build Options on the Shared Components page.
- [Including or Excluding Build Options](#)
Specify **Include** to enable a component and include it with the application. Specify **Exclude** to disable a component and exclude it from the application.

- [Selecting a Build Option](#)
Apply build options to a page, component, page control, or shared component in Page Designer.
- [Deleting Build Options and Associated Components](#)
Delete a build option by first removing the associated components and then deleting the build option.
- [Viewing Build Option Reports](#)
Access the Utilization report where build options are utilized in the current application. View the History report to see what modifications have been made to build options in the current application.
- [Exporting Build Options or Build Option Status](#)
Export build option status to toggle build options on or off within another environment.

24.5.1 About Build Options

Build options enable developers to enable or disable application components and functionality when the application installs or at runtime using the `APEX_UTIL.GET_BUILD_OPTION_STATUS` and `APEX_UTIL.SET_BUILD_OPTION_STATUS` APIs.

You can apply build options to most application components (such as pages, regions, items, validations, and so on) and specify whether to include or exclude them in the runtime application.

Build options have two possible values:

- **Include** - Application components are enabled and included with the application.
- **Exclude** - Application components are disabled and excluded from the application.

If you specify **Include**, then the Application Express engine considers the component as part of the application definition at runtime. Conversely, if you specify **Exclude**, then the Application Express engine treats the component as if it did not exist.

See Also:

`APEX_UTIL.GET_BUILD_OPTION_STATUS` and `APEX_UTIL.SET_BUILD_OPTION_STATUS`
in *Oracle Application Express API Reference*

Use Case 1: Enable and Disable Functionality Based on Installation Type

You are developing an application that has many installation types. For each installation type, users may choose to enable or disable certain application functionality. With build options, you can develop one application and when it installs, you can configure build options to include or exclude associated functionality. You may also use an API to expose features within the application. This enables privileged end users to selectively enable or disable application functionality.

Use Case 2: Hiding Incomplete Functionality in Various Environments

You are developing functionality which is not yet complete, so you do not wish to expose it to end users. You can use build options to disable functionality when the application is built for

test and production environments. The benefit of this approach is that the application can still be deployed without including incomplete functionality.

Use Case 3: Determining the Consequences of Removing Functionality

You are removing functionality you think is not needed by the application, but are unsure if removing the functionality is a safe operation. In this case, you can use build options to essentially "comment out" specific functionality. When the application is deployed and you determine the functionality is necessary, you can re-instate it. If the functionality is deemed as unnecessary, you can then safely remove it from the application.

24.5.2 Creating Build Options

Create build options by selecting the application and accessing Build Options on the Shared Components page.

To create a build option:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.
4. Under Application Logic, click **Build Options**.
5. To create a new build option, click **Create**.
6. Under Attributes:
 - a. Application - Identifies the application to which this build option applies.
 - b. Build Option - Enter a descriptive name for this build option. Build options are predefined settings that determine whether or not components within an application are enabled.
 - c. Status - Options:
 - **Include** - Include this feature or component. Associated application components are enabled and included with the application.
 - **Exclude** - Do not include this feature or component. Associated application components are disabled and excluded from the application.
 - d. Default on Export - When this application is exported, set the build option to this value.
 - e. On Upgrade Keep Status - Select whether the build option status in the deployed application should be kept, or overwritten with the specified status when the application is upgraded. **On** keeps the deployed status and is useful if the application supports build option configuration (using the `APEX_UTIL.SET_BUILD_OPTION_STATUS` API) to enable or disable the build option in the deployed application, and where you want to respect those settings upon upgrade.
 - f. Comments - Enter any comments or notes. These comments never display when running the application.
7. Click **Create Build Option**.

24.5.3 Including or Excluding Build Options

Specify **Include** to enable a component and include it with the application. Specify **Exclude** to disable a component and exclude it from the application.

Build options have two possible values: **Include** and **Exclude**. If you specify an attribute as being included, then the Application Express engine considers it part of the application definition at runtime. Conversely, if you specify an attribute as being excluded, then the Application Express engine treats it as if it did not exist.

To include or exclude a build option:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.
4. Under Application Logic, click **Build Options**.
The Build Options page appears.
5. Select a build option Name.
The Create/Edit Build Option page appears.
6. For Status, select either:
 - **Include** - Include this feature or component. Associated application components are enabled and included with the application.
 - **Exclude** - Do not include this feature or component. Associated application components are disabled and excluded from the application.
7. Edit any additional attributes as needed.
To learn more about an attribute, see field-level Help.
8. To save your changes, click **Apply Changes**.

See Also:

`APEX_UTIL.GET_BUILD_OPTION_STATUS` and `APEX_UTIL.SET_BUILD_OPTION_STATUS`
in *Oracle Application Express API Reference*

24.5.4 Selecting a Build Option

Apply build options to a page, component, page control, or shared component in Page Designer.

Once you create a build option, you can select it for a page, a component (report, chart, or form), a specific page control (button, item, list of value), and another shared component (breadcrumb, list, or tab). You apply build options to a page, component, page control, or shared component by navigating to the appropriate page. In Page Designer, select the page, component, control, or shared component and find **Configuration, Build Option**.

24.5.5 Deleting Build Options and Associated Components

Delete a build option by first removing the associated components and then deleting the build option.

- [Removing Components Associated with a Build Options](#)
- [Deleting Build Options Permanently](#)

24.5.5.1 Removing Components Associated with a Build Options

Removing components associated with a build option permanently deletes them.

To remove components associated with a build option:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.
4. Under Application Logic, click **Build Options**.

The Build Options page appears.

5. Select the build option .

The Create/Edit Build Option page appears. Note that Associated Components display at the bottom of the page.

6. Scroll down to Associated Components and click **Remove Components**.

A verification window appears.

7. Click **Yes - remove components** and then click **Remove Components**.

The components are removed.

24.5.5.2 Deleting Build Options Permanently

Tip:

Deleting a build option does not delete the Associated Components. Before deleting a build option, review the Associated Components to determine if the components should be removed.

To delete a build option:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.
4. Under Application Logic, click **Build Options**.

The Build Options page appears.

5. Select the build option.

The Create/Edit Build Option page appears.

6. Click **Delete**.

A verification window appears.

7. Click **Delete Build Option**.

The build option is removed.

24.5.6 Viewing Build Option Reports

Access the Utilization report where build options are utilized in the current application. View the History report to see what modifications have been made to build options in the current application.

- [Viewing Build Option Utilization](#)
- [Viewing Build Option History](#)

24.5.6.1 Viewing Build Option Utilization

Once you create a build option, a Utilization tab appears on the Build Options page. This report details build option utilization in the current application.



Note:

The Utilization tab only appears on the Build Options page after you create a build option.

To view the Build Option Utilization report:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.
4. Under Application Logic, click **Build Options**.
5. On the Build Options page, click **Utilization**.

The Build Option Utilization report appears.

6. Select a build option and click **Go**.

24.5.6.2 Viewing Build Option History

To view the Build Option History report:

1. On the Workspace home page, click the **App Builder** icon.
2. Select an application.
3. On the Application home page, click **Shared Components**.
4. Under Application Logic, click **Build Options**.
5. On the Build Options page, click **History**.

The Build Option History report appears.

24.5.7 Exporting Build Options or Build Option Status

Export build option status to toggle build options on or off within another environment.

You can export build options or build option status on the Component Export page. For example, you can use this feature to deploy a production application with a hidden feature by associating the components of the hidden feature with a build option having the status of `EXCLUDE`. After deployment, you can enable the hidden feature by changing the status of the build option to `INCLUDE` and then exporting the Build Option Status.

Once you apply the Build Options Status to the production instance, the new feature appears.

1. To export build options or build option status:
 1. Navigate to the Component Export page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. From the Tasks list, click **Export Application Components**.

The Components Export page appears with the **Build Options Status** tab selected.

2. On **Build Options Status**:
 - a. **Rows** - Select the number of items to display and click **Go**.
 - b. Select the Build Options to include and click **Add to Export**.

The selected Build Options display under **Components to Export**.

3. Click **Next**.
4. For Component Export:
 - a. **Export as Zip** - Options include:
 - **On** - Choose **On** to export the application as a ZIP archive containing separate files for each component.
 - **Off** - Choose **Off** to export as a single SQL file containing all the selected components.

Tip:

To learn more about the Zip archive, see "[Splitting Export Files into Separate Scripts](#)."

- b. **As of** - Specify a time in minutes to go to back to for your export. This option enables you to go back in time in your application, perhaps to get back a deleted object.

This utility uses the `DBMS_FLASHBACK` package. Because the timestamp to System Change Number (SCN) mapping is refreshed approximately every five minutes, you may have to wait that amount of time to locate the version for

which you are looking. The time undo information is retained and influenced by the startup parameter `UNDO_RETENTION` (the default is three hours). However, this only influences the size of the undo tablespace. While two databases may have the same `UNDO_RETENTION` parameter, you are able to go back further in time on a database with fewer transactions because it is not filling the undo tablespace, forcing older data to be archived.

- c. **File Character Set** - Indicates the character set in which the export file will be encoded. When importing this file you will need to specify the same character set.
- d. Click **Export Components**.

 **Tip:**

For translated applications, the Export Translations field displays. To export the selected shared components for the primary language application and all translated applications, from Export Translations field, select **Yes**. To ensure text strings and markup are up-to-date, remember to synchronize the translated applications prior to exporting the translated components.

 **See Also:**

- ["Importing Export Files"](#)
- ["Importing Export Files"](#)
- ["How to Create a Custom Application"](#)

24.6 About Publishing the Database Application URL

Once you deploy your application, load the data, and create users, you can publish your production URL.

Finding Your Production URL

You can determine the production URL for your application by either:

- Selecting the application on the Application home page and right-clicking the **Run** button. Then, select **Copy link address** or **Copy link location** depending on your browser.
- Running the application and then copying the URL.

The Run button gets its value from the Home link attribute on the Edit Security Attributes page. This link is only referenced by this icon and by applications that do not use the Oracle Application Express Login API.

Friendly URL Syntax Example

Consider the following example:

```
http://apex.somewhere.com/ords/example/r/hr-app/update-employees?  
session=13766599855150
```

Where:

- `apex.somewhere.com` is the URL of the server.
- `ords` is the service name defined when configuring Oracle REST Data Services.
- `example` is the Path Prefix which is URI path prefix used to access RESTful Services. When you create a workspace, this value defaults to workspace name.
- `r` is the router shortcut.
- `hr-app` is the Application Alias. In a new application, the Application Alias defaults to the application Name.
- `update-employees` is the Page Alias. In a new application, the Page Alias defaults to the page Name.
- `?session=13766599855150` is the session ID. When you run an application, the Application Express engine generates a session number that serves as a key to the user's session state.

To run this example, a user would use the URL:

```
http://apex.somewhere.com/ords/example/r/hr-app/update-employees
```

f?p URL Syntax Example

Consider the following example:

```
http://apex.somewhere.com/ords/f?p=11563:1:3397731373043366363
```

Where:

- `apex.somewhere.com` is the URL of the server.
- `ords` is the service name defined when configuring Oracle REST Data Services.
- `f?p=` is a prefix used by Oracle Application Express.
- `11563` is the application being called.
- `1` is the page within the application to be displayed.
- `3397731373043366363` is the session number.

To run this example, a user would use the URL:

```
http://apex.somewhere.com/pls/apex/f?p=11563:1
```



Tip:

When users sign in, they receive unique session numbers. This number displays at the end of the URL. Do not include the session number as part of the URL. When another user tries to run a URL containing a session ID, an error displays.

**See Also:**

"Understanding URL Syntax"

24.7 Exporting an Application and Application Components

Move a workspace, application, or related files by exporting it to another Application Express instance.

- [About the Export Process](#)
Move a workspace, application, or related files by creating an export and then importing and installing it into another Application Express instance.
- [Splitting Export Files into Separate Scripts](#)
Learn about splitting application, page, and component export files into separate SQL scripts.
- [About Exporting Static Files](#)
Export static application and workspace files by creating a ZIP file in Shared Components.
- [Exporting a Workspace](#)
Move or copy a workspace by exporting it.
- [Exporting an Application](#)
Move or copy an application by exporting and then importing it into the target instance.
- [Exporting an Application Page](#)
Move or copy a single application page by exporting it.
- [Exporting Application Components](#)
Use a Component Export to back up a component before editing it, or create an export that functions as a patch to another Oracle Application Express instance.
- [Exporting Themes](#)
Move or copy a theme by exporting it.
- [Exporting Plug-ins](#)
Move or copy plug-ins by exporting them.
- [Exporting User Interface Defaults](#)
Move or copy a User Interface Defaults by exporting them.
- [Exporting Team Development Feedback](#)
Move or copy user-provided feedback from the current Application Express instance.
- [Exporting Script Files from the Script Repository](#)
Move scripts from your current Script Repository by exporting them.

24.7.1 About the Export Process

Move a workspace, application, or related files by creating an export and then importing and installing it into another Application Express instance.

The export process consists of following steps:

1. **Create the Export File.**

Exporting an application, page, and application components creates a readable script file with a `.SQL` extension.

2. Import and Install the Export File.

Import the Export File into the target Application Express instance and then install it. You can install an Export File directly after importing, install it from the Export Repository, or install it from SQL*Plus. As a best practice, Oracle recommends importing an application first and then the related files.

See Also:

- ["Installing Export Files"](#)
- ["How to Create a Custom Application"](#)
- ["How to Move an Application to Another Instance"](#)

24.7.2 Splitting Export Files into Separate Scripts

Learn about splitting application, page, and component export files into separate SQL scripts.

Splitting application, page, and component exports into separate files can be very useful if you are managing files using a version control system such as Apache Subversion (SVN) or Git. This approach enables you to check in files to the repository as you make changes. For example, suppose a developer modifies Page 1 and a list of values called Categories. If you export the application as separate files, you can commit only the two files with changes.

Another benefit of splitting exports into separate files is that it enables you to take an incremental approach to deployment. Rather than having to re-install an entire application for a minor change (for example, fixing a typo on a label), only the file containing the fix needs to be run on the destination system.

You can split application, page, and component exports into separate files in two ways:

- **Export as Zip** - The **Export as Zip** option is available on the following App Builder pages: Export Application, Export Page, and Export Component. Use the **Export as Zip** option to archive the exported files into a single Zip file. You can unzip the Zip file on your local file system and then commit updated files to your source code repository.
- **APEXExport** - Use the `APEXExport` program to export workspaces, applications, and related files from a command-line. Use the `-split` option to export files into separate SQL scripts.

See Also:

"Exporting Workspaces, Apps, and Related Files from a Command-line" in *Oracle Application Express Administration Guide*

Export Directory Structure

Exporting an application, page, or components into separate scripts creates a directory structure organized by component type. This directory structure is the same whether you are using the **Export as Zip** or the `APEXExport` utility with `-split`.



See Also:

["Directory Structure When Splitting Export Files into Separate Scripts"](#)

Export File Names

Whether you are using **Export as Zip** or the `APEXExport` utility with `-split`, export files use the following naming conventions:

- **Application Export** - Named using the application ID. For example, an application with the ID 326 would be named: `f326.sql` or `f326.zip`.
- **Page Export** - Named after the application ID and page number. For example, exporting page 4 in an application with the ID 326 would be named: `f326_page_4.sql` or `f326_page_4.zip`.
- **Component Export** - If you select multiple components, the name uses the application ID and components. For, example, multiple components in an application with the ID 326 would be named: `f326_components.sql` or `f326_components.zip`.

Component file names are based on the name specified in App Builder. In general, special characters are removed and spaces are replaced with underscores.

If you rename a component in App Builder, the next time you create a Component Export, a new file name is used. For example, if you have breadcrumb named `Menu` and you create a Component Export, the file would be named `menu.sql`. If you rename that breadcrumb `Main Menu`, the new Component Export is named `main_menu.sql`. If you are using a version control system, you are responsible for applying the proper commands to rename or move the original file to maintain the history.

Generated Installation Scripts

Both **Export as Zip** and the `APEXExport` utility with `-split` create a number of installation scripts.

Depending upon the type of export, the installation scripts are named one of the following:

- **Application Export** - `install.sql`
- **Page Export** - `install_page.sql`
- **Component Export** - `install_component.sql`

In addition to installation files, each export includes two files which are useful when developing custom patch scripts:

- `set_environment.sql`
- `end_environment.sql`

These files contain internal code that help improve performance. These scripts set internal variables and perform security checks at one time for the entire import. Without these scripts, the internal variables check will be executed for each file you run.

A sample custom installation file might resemble following:

```
@@application/set_environment.sql
@@application/pages/page_00001.sql
@@application/pages/page_00023.sql
@@application/pages/page_00095.sql
@@application/end_environment.sql
```

24.7.3 About Exporting Static Files

Export static application and workspace files by creating a ZIP file in Shared Components.

Static application and workspace files include images, CSS files, and other files which must be managed independently.



See Also:

- ["Downloading a Static Application File"](#)
- ["Downloading All Static Workspace Files in a Zip"](#)

24.7.4 Exporting a Workspace

Move or copy a workspace by exporting it.

Exporting a workspace creates a SQL script file which includes user groups, users, Team Development data, and workspace artifacts including SQL Scripts, SQL Command History, saved SQL, user preferences, developer login history, email logs, and user interface defaults. Workspace exports do not include applications.

Oracle does not recommend exporting an entire workspace unless you want to migrate workspace users or replicate Shared Component subscriptions in the target instance.

1. To export a workspace:
 1. Navigate to the Export page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. On the App Builder home page, click **Workspace Utilities**.
 - c. Click **Export**.
 2. On the Export page, click **Workspace**.
 3. Under **Export Workspace**:

- a. **Include Team Development** - Set to **On** to include Team Development data. Only select **Off** if the target instance for this workspace is a runtime only instance.
 - b. **Export Type** - In most cases, do not change the default value **Minimal**. Only select **Full** if you want to replicate this workspace and all workspace artifacts including SQL Scripts, SQL Command History, saved SQL, user preferences, developer login history, email logs, and user interface defaults.
 - c. **File Format** - Indicates the character set in which the export file will be encoded.
4. Click **Export**.
 5. Import the the Workspace Export in Administration Services.

**See Also:**

"Importing a Workspace in Administration Services" in *Oracle Application Express Administration Guide*

24.7.5 Exporting an Application

Move or copy an application by exporting and then importing it into the target instance.

Exporting an application in Oracle Application Express generates a readable script file with a `.SQL` extension. An application export includes the application definition, including templates, pages, regions, items, buttons, and so on.

As a best practice, Oracle recommends you export complete applications rather than individual components. If you wish to export an application and there are components, such as pages that are not yet ready for testing, Oracle recommends you use Build Options to include or exclude various application components.

**Tip:**

In addition to exporting the actual application, you may also need to export other related static files such as cascading style sheets, images, and script files. See "[Managing Static Application Files](#)."

1. To export an application:
 1. Navigate to the Export page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. On the App Builder home page, click **Workspace Utilities**.
 - c. Click **Export**.
 2. Click **Database Applications**.
 3. Under **Choose Application**, select the application to export.
 4. Under **Export Application**:
 - a. **Export as Zip** - Options include:

- **On** - Exports the application as a ZIP archive containing separate files for each page, and shared component and installation files specifically for the Application Export.
- **Off** - Exports as a single SQL file containing the entire application.

 **Tip:**

To learn more about the Zip archive, see "[Splitting Export Files into Separate Scripts.](#)"

- b. **Owner Override** - By default, the application is owned by the owner identified in the application attribute owner. Use this attribute if you wish to import this application as a different schema owner than you are exporting.
- c. **Build Status Override** - Select the build status of the exported application. Options include:
 - **Run Application Only** - Users can only run an application. Selecting this option is an effective way to protect an application from modifications from other developers.
 - **Run and Build Application** - Developers and users can both run and edit an application.

 **Tip:**

If you select **Run Application Only**, you cannot set the argument `p_trace` to `Yes`. The only way to change this setting after you import the application, is to log in to Oracle Application Express Administration Services. .

- d. **Debugging** - Options include:
 - **Yes** - Exports the application with debugging enabled.
 - **No** - Exports the application with debugging disabled.
- e. **As of** - Specify a time in minutes to go back to for your export. This option enables you to go back in time in your application, perhaps to get back a deleted object.

This utility uses the `DBMS_FLASHBACK` package. Because the timestamp to System Change Number (SCN) mapping is refreshed approximately every five minutes, you may have to wait that amount of time to locate the version for which you are looking. The time undo information is retained and influenced by the startup parameter `UNDO_RETENTION` (the default is three hours). However, this only influences the size of the undo tablespace. While two databases can have the same `UNDO_RETENTION` parameter, you are able to go back further in time on a database with fewer transactions because it is not filling the undo tablespace, forcing older data to be archived.

- f. **File Character Set** - Indicates the character set in which the export file will be encoded. When importing this file you will need to specify the same character set.

5. Under **Export Preferences**:

- a. **Export Supporting Object Definitions** - Supporting object definitions include all configuration options and scripts and enable an application export to include database object definitions, image definitions, and seed data SQL statements encapsulated in a single file. Options include:
 - **Yes** - Includes supporting object definitions in the application export. Does not automatically load supporting objects when invoked from a command line.
 - **No** - Does not include the supporting object definitions in the export.
 - **Yes and Install on Import Automatically** - Includes supporting object definitions and a call to install supporting objects in the application export. This option is valid only for command line installs. When application imports from the command line, it automatically installs or upgrades the supporting objects.
 - b. **Export Public Reports** - Specify whether to include public reports with your application. Public reports are the public shared report settings saved by users from an interactive report or interactive grid.
 - **On** - Include public reports in the application export.
 - **Off** - Do not include public reports in the application export.
 - c. **Export Private Reports** - Specify whether to include Private reports with your application. Private reports are the private customized settings saved by users from an interactive report or interactive grid.
 - **On** - Include public reports in the application export.
 - **Off** - Do not include public reports in the application export.
 - d. **Export Report Subscriptions** - Specify whether to include interactive report or interactive grid subscription settings with your application. This will be limited to the unexpired subscription settings of all users for all interactive reports or interactive grids in the application.
 - **On** - Include report subscriptions for the reports you are exporting in the application export.
 - **Off** - Do not include report subscriptions for the reports in the application export.
 - e. **Export Developer Comments** - Specify whether to include Developer Comments in your application export.
 - **On** - Include Developer Comments in the application export.
 - **Off** - Do not include Developer Comments in the export.
 - f. **Export Translations** - Specify whether to include translations with your application export. Translation Text Messages and Dynamic Translations are always included in the application export.
 - **On** - Include the translation mappings and all text from the translation repository.
 - **Off** - Do not include translation mappings or the translation repository.
 - g. **Export with Original IDs** - Specify whether the export file should contain the application component IDs as of now or as of the last import of this application.
 - **On** - Include the IDs as of the last import.
 - **Off** - Include only the current IDs of the components.
6. Click **Export**.
 7. Import the Application Export into the target instance.

 **See Also:**

- "Importing an Application, Page or Component Export"
- "Changing Application Build Status in Administration Services" in *Oracle Application Express Administration Guide*

24.7.6 Exporting an Application Page

Move or copy a single application page by exporting it.

 **WARNING:**

Exporting and importing a single page to a different system is an advanced deployment technique with the following restrictions:

- Both systems have to have the same application ID and workspace ID.
- Both systems have to have the same IDs for Shared Components.
- If the page references new or updated Shared Components, those have to be exported and imported first.

If these restrictions are not fulfilled, the import will fail.

1. To export a page in an application:
 1. View the page in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

2. In Page Designer, and select **Export**.
 - a. On the Page Developer toolbar, click the **Utilities** menu.



- b. Select **Export**.

The Export Page Wizard appears.

3. On **Export Page**:
 - a. **Page** - Select the page you wish to export. You can select only one page for export at a time.
 - b. **Export as Zip** - Options include:
 - **On** - Export as a ZIP archive containing a separate SQL files for the page.
 - **Off** - Export as a single SQL file.

- c. **Include Installation files** - Only displays if **Export as Zip** is set to **On**. Options include:

- **On** - Generates a ZIP archive including installation files specifically for the Page Export.
- **Off** - Generate a ZIP file without the installation files.

Oracle recommends **Off** when saving the files to a version control system so that application installation files are not overwritten.

 **Tip:**

To learn more about the Zip archive, see "[Splitting Export Files into Separate Scripts.](#)"

- d. **As of** - Specify a time in minutes to go to back to for your export. This option enables you to go back in time in your application, perhaps to get back a deleted object.

This utility uses the `DBMS_FLASHBACK` package. Because the timestamps to System Change Number (SCN) mapping is refreshed approximately every five minutes, you may have to wait that amount of time to locate the version for which you are looking. The time undo information is retained and influenced by the start up parameter `UNDO_RETENTION` (the default is three hours). However, this only influences the size of the undo table space. While two databases may have the same `UNDO_RETENTION` parameter, you are able to go back further in time on a database with fewer transactions because it is not filling the undo table space, forcing older data to be archived.

- e. **File Character Set** - Indicates the character set in which the export file will be encoded. When importing this file you will need to specify the same character set.

4. Click **Export Page**.
5. Import the Page Export into the target instance.

 **See Also:**

"[Importing an Application, Page or Component Export](#)"

24.7.7 Exporting Application Components

Use a Component Export to back up a component before editing it, or create an export that functions as a patch to another Oracle Application Express instance.

 **Tip:**

If you wish to export an application and some components, such as pages that are not yet ready for testing, Oracle recommends you use Build Options to include or exclude various application components.

1. To export shared components or page components:
1. Navigate to the Component Export page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Click **Shared Components**.
 - d. From the Tasks list, click **Export Application Components**.
2. On the Component Export page, click the appropriate tabs and select the components to export:
 - **Components** displays shared application components and entire pages. Use the navigation bar at the top of the page to search for components.
 - **Components by Page** lists components of the selected page. Navigate to a specific page by making a selection from the Page list
 - **Build Option Status** displays available build options. Use this page to turn build options on and off.
3. For each tab, select the appropriate components and click **Add to Export**.
4. Review your selections. To continue, click **Next**.
5. For Component Export:
 - a. **Export as Zip** - Options include:
 - **On** - Exports the components as a ZIP archive containing separate files for each component.
 - **Off** - Exports as a single SQL file containing all the selected components.

 **Tip:**

To learn more about the Zip archive, see "[Splitting Export Files into Separate Scripts](#)."

- b. **Include Installation files** - Only displays if **Export as Zip** is set to **On**. Options include:
 - **On** - Generates a ZIP archive including installation files specifically for the exported page (for example, `install_component.sql`, `set_environment.sql` and `end_environment.sql`).
 - **Off** - Generate a ZIP file without the installation files.

Oracle recommends **Off** when saving the files to a version control system so that application installation files are not overwritten.
- c. **As of** - Specify a time in minutes to go to back to for your export. This option enables you to go back in time in your application, perhaps to get back a deleted object.

This utility uses the `DBMS_FLASHBACK` package. Because the timestamp to System Change Number (SCN) mapping is refreshed approximately every five minutes, you may have to wait that amount of time to locate the version for which you are looking. The time undo information is retained and influenced by the startup parameter `UNDO_RETENTION` (the default is three hours). However, this only influences the size of the undo tablespace. While two databases may

have the same `UNDO_RETENTION` parameter, you are able to go back further in time on a database with fewer transactions because it is not filling the undo tablespace, forcing older data to be archived.

- d. **File Character Set** - Indicates the character set in which the export file will be encoded. When importing this file you will need to specify the same character set.
- e. Click **Export Components**.

 **Tip:**

For translated applications, the Export Translations field displays. To export the selected shared components for the primary language application and all translated applications, from Export Translations field, select **Yes**. To ensure text strings and markup are up-to-date, remember to synchronize the translated applications prior to exporting the translated components.

6. Import the Component Export into the target instance.

 **See Also:**

- ["Importing an Application, Page or Component Export"](#)
- ["Managing Shared Components"](#)
- ["Exporting Build Options or Build Option Status"](#)

24.7.8 Exporting Themes

Move or copy a theme by exporting it.

Exporting a theme to create a readable script file with a `.SQL` extension.

1. To export an application theme:
 1. Navigate to the Export page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. On the App Builder home page, click **Workspace Utilities**.
 - c. Click **Export**.
 2. On the Export page, click **Themes**.
 3. On the **Themes page**:
 - a. **Application** - Select an application.
 - b. **Export Theme** - Select the theme to export.
 - c. Click **Export**.
 4. Import the Theme Export into the target instance.

 **See Also:**

- ["Importing Themes"](#)
- ["Using Themes"](#)

24.7.9 Exporting Plug-ins

Move or copy plug-ins by exporting them.

Use a Plug-in Export to export plug-ins from one Oracle Application Express development instance to a file.

1. To export a plug-ins:
 1. Navigate to the Export page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. On the App Builder home page, click **Workspace Utilities**.
 - c. Click **Export**.
 2. On the Export page, click **Plug-ins**.
 3. On the **Export Plug-in** page:
 - a. **Choose Application** - Select an application
 - b. **Plug-in** - Select the plug-in to export.
 - c. Click **Export**.
 4. Import the Plug-in Export into the target instance.

 **See Also:**

- ["Importing Plug-ins"](#)
- [Exporting a Plug-in from the Plug-in Page](#)

24.7.10 Exporting User Interface Defaults

Move or copy a User Interface Defaults by exporting them.

- [About Exporting User Interface Defaults](#)
- [Exporting User Interface Defaults from the Export Page](#)
- [Exporting User Interface Defaults from the User Interface Defaults Page](#)

24.7.10.1 About Exporting User Interface Defaults

Exporting User Interface Defaults is useful when you plan to develop on a target system. Developers use User Interface Defaults to populate initial values for region

and item properties providing consistency across multiple pages in an application or multiple applications. User Interface Defaults are divided into two categories:

- The **Table Dictionary** consists is specific to tables and columns within a selected schema. These defaults are used over those defined in the Attribute Dictionary.
- The **Attribute Dictionary** contains a set of attributes about a column that is used in creating forms and reports. The definitions are matched by column name and a particular definition can be shared among several columns by using synonyms.

When you export User Interface Defaults, all User Interface Defaults for the selected dictionary and schema are exported to a single script. When prompted, save this file to your hard drive. The file contains an API call to create table hints by making calls to the application PL/SQL API. You can use this file to import User Interface Defaults to another database and Oracle Application Express instance.

 **See Also:**

- ["Importing User Interface Defaults"](#)
- "Managing User Interface Defaults" in *Oracle Application Express SQL Workshop Guide*

24.7.10.2 Exporting User Interface Defaults from the Export Page

1. To export User Interface Defaults from the Export page:
1. Navigate to the Export page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. On the App Builder home page, click **Workspace Utilities**.
 - c. Click **Export**.
2. On the Export page, click **User Interface Defaults**.
3. Under **Table Dictionary**:
 - a. **Schema** - Select the name of the schema to be exported.
 - b. **File Format** - Displays the character set in which the export file will be encoded.
 - c. Click **Export**.
4. Under **Attribute Dictionary**:
 - a. **Count of Columns** - Displays the number of entries in the Attribute Dictionary.
 - b. Click **Export**.
5. Import the User Interface Defaults Export into the target instance.

 **See Also:**

- ["Importing User Interface Defaults"](#)

24.7.10.3 Exporting User Interface Defaults from the User Interface Defaults Page

1. To export User Interface Defaults from the User Interface Defaults page:
1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **User Interface Defaults**.
4. Review the User Interface Defaults page.
 - The **Table Dictionary** is specific to tables and columns within a selected schema. These defaults are used over any defined within the Attribute Dictionary.
 - The **Attribute Dictionary** contains a set of attributes about a column and are used in creating forms and reports.
5. To export the **Table Dictionary**:
 - Click **Table Dictionary**.
 - a. Under **Tasks**, click **Export**.
 - b. **File Format** - Select a file format.
 - **DOS** - Select **DOS** to have the lines in the resulting file terminated by carriage returns and line feeds..
 - **UNIX** - Select **UNIX** to have the lines in the resulting file contain terminated by line feeds..
 - c. Click **Export**.
6. Click **Export**.
7. Import the User Interface Defaults Export into the target instance.



See Also:

["Importing User Interface Defaults"](#)

24.7.11 Exporting Team Development Feedback

Move or copy user-provided feedback from the current Application Express instance.

1. To export Team Development Feedback:
 1. Navigate to the Export page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. On the App Builder home page, click **Workspace Utilities**.
 - c. Click **Export**.
 2. Click **Team Development Feedback**.

3. On the **Export Feedback** page:
 - a. **Changes Since** - Select the date from which to export feedback.
 - b. Click **Export**.
4. Import the Feedback Export into the target instance.

 **See Also:**

- ["Importing Team Development Feedback"](#)
- ["Managing Feedback"](#)

24.7.12 Exporting Script Files from the Script Repository

Move scripts from your current Script Repository by exporting them.

 **See Also:**

"Exporting and Importing SQL Scripts" in *Oracle Application Express SQL Workshop Guide*

24.8 Importing Export Files

After you create Export files, you then import them into the target Oracle Application Express instance.

After you import the files, you have the option to install them. You can also install them at a later time by navigating to the Export Repository.

Note that you cannot import an application created in a specific release into an earlier version. As a general rule, always import the application first and then the related files.

 **Tip:**

You can simplify the steps needed to deploy an application by creating a custom application.

- [Importing an Application, Page or Component Export](#)
Import the Application, Page or Component Export on the Import page.
- [About Importing Applications and Application Groups](#)
Application groups are exported with an application, Application Exports include an group ID, name, and comments.
- [Importing Themes](#)
Import a Theme Export on the Import page.

- [Importing Plug-ins](#)
Import the Plug-in Export on the Import page.
- [Importing User Interface Defaults](#)
Import the User Interface Defaults Export on the Import page.
- [Importing Team Development Feedback](#)
Import a Team Development Feedback Export on the Import page.

**See Also:**

- ["Installing Export Files"](#)
- ["How to Create a Custom Application"](#)
- ["How to Move an Application to Another Instance"](#)

24.8.1 Importing an Application, Page or Component Export

Import the Application, Page or Component Export on the Import page.

1. To import an Application, Page or Component Export:
 1. Sign into the Application Express instance.
 2. Navigate to the Import page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. On the App Builder home page, click **Import**.
 3. On Import:
 - a. Drag and drop, or navigate to the file.
 - b. **File Type** - Select **Database Application, Page or Component Export**.
 - c. **File Character Set** - Verify that the File Character Set is correct.
 - d. Click **Next**.

Once you import a file, you have the option to install it. You can also install this file at a later time by navigating to the Export Repository.

4. To install the file, click **Next**.
The Install Application wizard appears.
5. In the Install wizard:
 - a. **Parsing Schema** - Select a schema. After the installation finishes successfully, this will be used to set the owner of the application.
 - b. **Build Status** - Set the build status of the application. Options include:
 - **Run Application Only** - Users can only run an application.
Selecting **Run Application Only** is an effective way to protect an application from modifications from other developers.
 - **Run and Build Application** - Users can run an application and developers can both run and edit an application.

 **Tip:**

If you select **Run Application Only**, you can only change this setting after you import the application by signing in to Administration Services.

c. Install As Application - Options include:

- **Auto Assign New Application ID** - A new application ID will be created for you.
- **Reuse Application ID From Export File** - The existing application ID will be used.
- **Change Application ID** - Specify a new application ID.

You must specify an application ID that is unique across all Application Express workspaces.

d. Click Install Application.

The application installs.

6. Select the appropriate option:

- Upgrade Application
- Edit Application
- Run Application

 **See Also:**

"Changing Application Build Status Set During Deployment" in *Oracle Application Express Administration Guide*

24.8.2 About Importing Applications and Application Groups

Application groups are exported with an application, Application Exports include an group ID, name, and comments.

When importing an application, the application import follows these rules:

- On import, an application uses an existing group if the ID matches.
- If no application group exists with the same ID on the target system, then application import looks for another group ID with the same name. If a name match is found, the application is imported with the ID corresponding to this application group name.
- If no ID or name matches existing application groups on the target system then a new application group is created. The new application group uses the application group ID if that ID is not used in that Oracle Application Express instance. If the group ID is being used, then a new ID is generated.

24.8.3 Importing Themes

Import a Theme Export on the Import page.

1. To import a Theme Export:
 1. Sign into the Application Express instance.
 2. Navigate to the Import page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. On the App Builder home page, click **Import**.
 3. On Import:
 - a. Drag and drop, or navigate to the file.
 - b. **File Type** - Select **Theme Export**.
 - c. **File Character Set** - Verify that File Character Set is correct.
 - d. Click **Next**.

Once you import a file, you have the option to install it. You can also install this file at a later time by navigating to the Export Repository.

4. To install the file, click **Next**.
The Install Application wizard appears.
5. Click **Install Theme**.



See Also:

- ["Using Themes"](#)
- ["Exporting Themes"](#)

24.8.4 Importing Plug-ins

Import the Plug-in Export on the Import page.

1. To import a Plug-in Export:
 1. Sign into the Application Express instance.
 2. Navigate to the Import page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. On the App Builder home page, click **Import**.
 3. On Import:
 - a. Drag and drop, or navigate to the file.
 - b. **File Type** - Select **Plug-in**.
 - c. **File Character Set** - Verify that File Character Set is correct.
 - d. Click **Next**.

Once you import a file, you have the option to install it. You can also install this file at a later time by navigating to the Export Repository.

4. To install an imported file, click **Next**.

5. On Install:
 - a. **Install Into Application** - Select the target application. You can install the plug-in into the same application or into a different application.

 **Tip:**

When you install a plug-in into the current application, the new plug-in will overwrite an existing plug-in having the same plug-in name. If the installation succeeds, the installation of the plug-in becomes permanent. If any errors are encountered, the actions are rolled back, resulting in no permanent changes.

- b. Click **Install Plug-in**.

 **Note:**

"Importing a Plug-in from the Plug-in Page"

24.8.5 Importing User Interface Defaults

Import the User Interface Defaults Export on the Import page.

You can install a User Interface Defaults Table Dictionary export into any schema provisioned in the workspace. When you install a Table Dictionary export, the old defaults will be overwritten. User Interface Defaults Attribute Dictionary imports replace any matching attribute definitions that are found but will not remove any existing attribute definitions that are not contained in the export. If the installation succeeds, the installation of the user interface defaults becomes permanent. If any errors are encountered, the actions are rolled back, resulting in no permanent changes.

1. To import a User Interface Defaults Export:
 1. Sign into the Application Express instance.
 2. Navigate to the Import page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. On the App Builder home page, click **Import**.
 3. On Import:
 - a. Drag and drop, or navigate to the file.
 - b. **File Type** - Select **User Interface Defaults**.
 - c. **File Character Set** - Verify that File Character Set is correct.
 - d. Click **Next**.

Once you import a file, you have the option to install it. You can also install this file at a later time by navigating to the Export Repository.

4. To install an imported file, click **Next**.
5. Click **Install User Interface Defaults**.

 **See Also:**

- "Managing User Interface Defaults" in *Oracle Application Express SQL Workshop Guide*
- ["Exporting User Interface Defaults"](#)

24.8.6 Importing Team Development Feedback

Import a Team Development Feedback Export on the Import page.

1. To import a Team Development Feedback Export:
 1. Sign into the Application Express instance.
 2. Navigate to the Import page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. On the App Builder home page, click **Import**.
 3. On Import:
 - a. Drag and drop, or navigate to the file.
 - b. **File Type** - Select **Team Development Feedback**.
 - c. **File Character Set** - Verify that File Character Set is correct.
 - d. Click **Next**.

Once you import a file, you have the option to install it. You can also install this file at a later time by navigating to the Export Repository.

4. To install an imported file, click **Next**.
5. Click **Import Feedback**.

 **See Also:**

- ["Managing Feedback"](#)
- ["Exporting Team Development Feedback"](#)

24.9 Installing Export Files

After you create an Export File, you can install it directly after importing, install it from the Export Repository, or install it from SQL*Plus.

- [About Installing Export Files](#)

When you import Export Files into a target Application Express instance, the files are stored in the Export Repository. From the Export Repository, you can import, install, or delete Export Files.

- [Installing an Application Export from the Export Repository](#)
If you did not install your Application Export after importing, you can install it in the Export Repository.
- [Installing Other Files from the Export Repository](#)
If you did not install your Export Files after importing, you can install them in the Export Repository.
- [Deleting Files from the Export Repository](#)
Delete Export Files from the Export Repository.
- [Installing Export Files from SQL*Plus](#)
Install Export Files from SQL*Plus.

24.9.1 About Installing Export Files

When you import Export Files into a target Application Express instance, the files are stored in the Export Repository. From the Export Repository, you can import, install, or delete Export Files.

After you create an Export File, you can install it in the following ways:

- **After Importing:**
After you import the Export Files, you can install them by clicking the **Next** button.
- **From the Export Repository:**
Import the Export Files and then install the files from the Export Repository.
- **From SQL*Plus:**
Install the export files from SQL*Plus.

Tip:

You can simplify the steps needed to deploy an application by creating a custom application.

See Also:

- ["How to Create a Custom Application"](#)
- ["Exporting an Application and Application Components"](#)
- [Importing Export Files](#)
- "Installing Exported Applications in a Runtime Environment" in *Oracle Application Express Administration Guide*

24.9.2 Installing an Application Export from the Export Repository

If you did not install your Application Export after importing, you can install it in the Export Repository.

1. To install an Application Export from the Export Repository:
1. Navigate to the Export Repository:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. On the Application home page, click **Utilities**.
 - d. Click **Export Repository**.
2. Find the application export and click **Install** in the Action column.
3. In the Install wizard:
 - a. **Parsing Schema** - Select a schema. After the installation finishes successfully, this will be used to set the owner of the application.
 - b. **Build Status** - Set the build status of the application. Options include:
 - **Run Application Only** - Users can only run an application.
Selecting **Run Application Only** is an effective way to protect an application from modifications from other developers.
 - **Run and Build Application** - Users can run an application and developers can both run and edit an application.

**Tip:**

If you select **Run Application Only**, you can only change this setting after you import the application by signing in to Administration Services.

- c. **Install As Application** - Options include:
 - **Auto Assign New Application ID** - A new application ID will be created for you.
 - **Reuse Application ID From Export File** - The existing application ID will be used.
 - **Change Application ID** - Specify a new application ID.

You must specify an application ID that is unique across all Application Express workspaces.

- d. Click **Install Application**.

The application installs.

24.9.3 Installing Other Files from the Export Repository

If you did not install your Export Files after importing, you can install them in the Export Repository.

1. To install other Export Files stored in the Export Repository:
1. Navigate to the Export Repository:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.

- c. On the Application home page, click **Utilities**.
 - d. Click **Export Repository**.
 2. Select the file to be installed and click **Install** in the Action column.
 3. Follow the on-screen instructions. The steps differ slightly depending upon the export type.

24.9.4 Deleting Files from the Export Repository

Delete Export Files from the Export Repository.

1. To delete Export Files stored in the Export Repository:
 1. Navigate to the Export Repository:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. On the Application home page, click **Utilities**.
 - d. Click **Export Repository**.
 2. Select the file to be deleted and click **Delete Checked**.

24.9.5 Installing Export Files from SQL*Plus

Install Export Files from SQL*Plus.

Restrictions When Installing Export files from SQL*Plus

When installing Export files from SQL*Plus, the Export File must originate from the same user database account as the one into which you are installing. The following restrictions applies to database application exports. The application is overwritten. Therefore, the target workspace must own the ID of the application being installed.

1. To install Export Files from SQL*Plus:
 1. Start SQL*Plus and connect to the database where Oracle Application Express is installed with the default schema for the workspace you are installing into:
 - On Windows:

```
SYSTEM_DRIVE:\ sqlplus /nolog
SQL> CONNECT <Default_Schema>
Enter password: Default_Schema_Password
```

- On UNIX and Linux:

```
$ sqlplus /nolog
SQL> CONNECT <Default_Schema>
Enter password: Default_Schema_Password
```

2. Run the export file.

```
SQL> @f144.sql
```

For example, if your export file is named `f144.sql` by default, you would type `@f144` at the command prompt.

24.10 Understanding One-click Remote Application Deployment

Deploy an application to remote Oracle Application Express instances using REST Enabled SQL references.

- [About One-click Remote Application Deployment](#)
One-click remote application deployment leverages the existing REST Enabled SQL references that works with a Oracle REST Data Services (ORDS) REST Enabled SQL Service.
- [Remotely Deploying an Application](#)
Access the Remote Deployment option from the Export/Import option in App Builder.



See Also:

["Managing REST Enabled SQL References"](#)

24.10.1 About One-click Remote Application Deployment

One-click remote application deployment leverages the existing REST Enabled SQL references that works with a Oracle REST Data Services (ORDS) REST Enabled SQL Service.

One-click remote application deployment is authenticated through first party authentication (Basic Authentication), Schema Authentication (database username and password), or OAuth 2 Client Credentials. When you create a REST Enabled SQL reference in Shared Components, you either specify an existing credential, or create a new credential. Optionally create the credentials as empty credentials to prompt for client ID and client secret each time the REST Enabled SQL reference is used.



Note:

Oracle recommends always using empty credentials for remote application deployment in shared development environments so only those with the knowledge of those credentials can deploy applications or run SQL or PL/SQL on the REST Enabled SQL reference.

24.10.2 Remotely Deploying an Application

Access the Remote Deployment option from the Export/Import option in App Builder.

1. To remotely deploy an application:

1. Create an application.
2. Optional: Create supporting object installation scripts to create the underlying table and insert the rows.
3. Navigate to the Remote Deployment page:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. On the Application home page, click **Export/Import**.
 - d. Click **Remote Deployment**.
4. On Deployment Server, select an existing REST Enable SQL Service or click the plus (+) icon to create a new one.
5. To create a new REST Enable SQL Service:
 - a. Click the plus (+) icon.
 - b. **Name** - Enter a descriptive name for this REST Enabled SQL Service.
 - c. **Endpoint URL** - Enter the base URL for this REST Enabled SQL Service. Include the ORDS context root and schema URL prefix, (for example, `https://host:port/ords/schema`, but do not add `/_/sql`).
 - d. Click **Next**.
 - e. **Credentials** - Select the credential to authenticate against. To edit an existing credential, navigate to Credentials in Shared Components.

To create new credentials, enter a Credential Name and select an Authentication Type.
 - f. Click **Create**.
6. On Remote Deployment:
 - a. **Deployment Server** - Select an existing REST Enable SQL Service.
 - b. **Client ID** - For Basic Authentication, enter the database user name. For OAuth2, enter the client ID.

This information will not be encrypted. User names for Basic Authentication are converted to upper case. To include a case-sensitive user name, prefix it with the exclamation mark (!).
 - c. **Client Secret** - Enter the password or OAuth2 Client Secret. This information is stored encrypted and cannot be retrieved in clear text.
 - d. Click **Next**.

The Remote Deployment Options page appears.
7. Under Deploy Application:
 - a. **Build Status** - Set the build status of the application. Options include:
 - **Run Application Only** - Users can only run an application. This option is an effective way to protect an application from modifications from other developers.
 - **Run and Build Application** - Developers and users can both run and develop the application.
This setting can be changed when importing using the Application Express Web interface but not the command line interface.

- b. **As of** - Specify a time in minutes to go to back to for your export. This option enables you to go back in time in your application, perhaps to get back a deleted object.

This utility uses the `DBMS_FLASHBACK` package. Because the timestamp to System Change Number (SCN) mapping is refreshed approximately every five minutes, you may have to wait that amount of time to locate the version for which you are looking. The time undo information is retained and influenced by the startup parameter `UNDO_RETENTION` (the default is three hours). However, this only influences the size of the undo tablespace. While two databases can have the same `UNDO_RETENTION` parameter, you are able to go back further in time on a database with fewer transactions because it is not filling the undo tablespace, forcing older data to be archived.

8. Under Export Preferences:

- a. **Export Supporting Object Definitions** - Supporting object definitions include all configuration options and scripts and enable an application export to include database object definitions, image definitions, and seed data SQL statements encapsulated in a single file. Options include:
 - **Yes** - Includes supporting object definitions in the application export. Does not automatically load supporting objects when invoked from a command line.
 - **No** - Does not include the supporting object definitions in the export.
 - **Yes and Install on Import Automatically** - Includes supporting object definitions and a call to install supporting objects in the application export.
- b. **Export Public Reports** - Specify whether to include public reports with your application. Public reports are the public shared report settings saved by users from an interactive report or interactive grid.
 - **On** - Include public reports in the application export.
 - **Off** - Do not include public reports in the application export.
- c. **Export Private Reports** - Specify whether to include private reports with your application. Private reports are the private customized settings saved by users from an interactive report or interactive grid.
 - **On** - Include private reports in the application export.
 - **Off** - Do not private public reports in the application export.
- d. **Export Report Subscriptions** - Specify whether to include interactive report or interactive grid subscription settings with your application. This will be limited to the unexpired subscription settings of all users for all interactive reports or interactive grids in the application.
 - **On** - Include report subscriptions for the reports you are exporting in the application export.
 - **Off** - Do not include report subscriptions for the reports in the application export.
- e. **Export Developer Comments** - Specify whether to include Developer Comments in your application export.
 - **On** - Include Developer Comments in the application export.
 - **Off** - Do not include Developer Comments in the export.

Managing Application Legacy Components

Although Oracle still supports legacy application components, Oracle does not recommend using them.

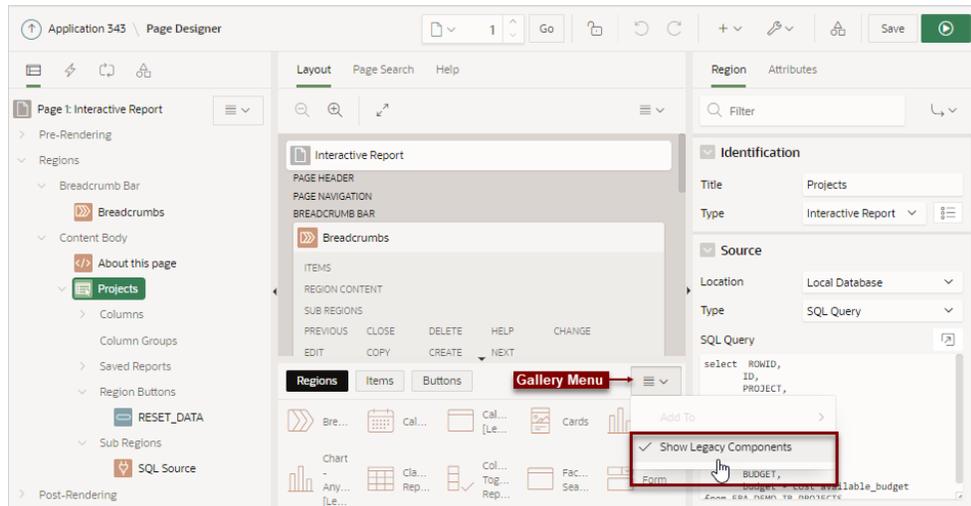
- [Viewing Legacy Components in the Gallery](#)
View legacy and unsupported components in the Page Designer Gallery by selecting the **Gallery Menu** and then **Show Legacy Components**.
- [Managing Legacy Calendars](#)
Legacy calendars are template-based. In previous releases Legacy Calendar was referred to as Calendar (Template, Classic calendar, Easy calendar, and SQL calendar).
- [Managing Applications with Legacy Data Loading Capability](#)
Applications with legacy data loading capability enable end users to dynamically import data into a table within any schema to which they have access.
- [Creating a Legacy Master Detail Form](#)
Create a legacy master detail form by running the Create Page Wizard and selecting Legacy Page and then Legacy Master Detail.
- [Managing Legacy Tabular Forms](#)
A legacy tabular form enables users to update multiple rows in a table at once from a single page.
- [Managing Legacy Web Services](#)
Legacy Web services enable applications to interact with one another over the web in a platform-neutral, language independent environment.

25.1 Viewing Legacy Components in the Gallery

View legacy and unsupported components in the Page Designer Gallery by selecting the **Gallery Menu** and then **Show Legacy Components**.

To view legacy components in the gallery:

1. Navigate to the Workspace home page.
2. Click the **App Builder** icon.
3. Select an application.
4. Select a page.
The page appears in Page Designer.
5. Click **Gallery Menu** and select **Show Legacy Components**.



25.2 Managing Legacy Calendars

Legacy calendars are template-based. In previous releases Legacy Calendar was referred to as Calendar (Template, Classic calendar, Easy calendar, and SQL calendar).

Tip:

Legacy calendars are legacy application components. Although Oracle still supports legacy components, the creation of new calendars is based on the FullCalendar jQuery library.

- [Editing Legacy Calendar Attributes](#)
- [About Supported Calendar Substitution Strings in Legacy Calendars](#)

25.2.1 Editing Legacy Calendar Attributes

To edit calendar Attributes:

1. View the page containing the calendar in Page Designer:
 - a. On the Workspace home page, click the **App Builder** icon.
 - b. Select an application.
 - c. Select a page.

Page Designer appears.

In the Property Editor, attributes are organized into groups. To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

2. To edit the Region attributes.
 - a. In the Rendering tab, locate and select the calendar.
 - b. In the Property Editor, review and edit the attributes on the Region tab.
3. To edit the calendar Attributes.
 - a. In the Rendering tab, locate and select the calendar.
 - b. In the Property Editor, review and edit the attributes on the Attributes tab.
4. To save your changes click **Save**. To save and run the page, click **Save and Run Page**.

25.2.2 About Supported Calendar Substitution Strings in Legacy Calendars

App Builder supports many date format substitution strings. You can view a complete list of supported substitution strings on the [Calendar Templates](#) page.

To view a list of supported substitution strings for calendars:

1. Navigate to the appropriate calendar template.
2. View the Substitution Stings list on the right side of the page.

 **See Also:**

["Using Themes and Theme Styles"](#)

25.3 Managing Applications with Legacy Data Loading Capability

Applications with legacy data loading capability enable end users to dynamically import data into a table within any schema to which they have access.

- [Comparing Legacy Data Loading and New Data Loading](#)
Learn about the differences between legacy data loading and new data loading
- [About Creating a Legacy Data Load Wizard](#)
Create a Data Load Wizard by running the Create Page Wizard and creating a Data Load page.
- [Creating a Legacy Data Load Page](#)
To create a legacy Data Load Wizard, a developer creates a Data Load page with the Create Page Wizard.
- [Re-creating Legacy Data Load Pages](#)
To make changes to existing legacy Data Load pages, Oracle recommends re-creating new pages without deleting the data loading definitions.

- [Editing a Legacy Data Load Definition](#)
Edit the Data Load Definition in Shared Components.

25.3.1 Comparing Legacy Data Loading and New Data Loading

Learn about the differences between legacy data loading and new data loading

Oracle Application Express includes two types of data loading: new data loading and legacy data loading. The new data loading has many benefits over legacy data loading.

Benefits of new data loading include:

- New application data loading supports CSV, XLSX, XML, and JSON formats.
- Column mapping occurs at design time, removing the burden for end users.
- Flexible column mappings based on simple names or regular expressions.
- Data conversion with transformation rules or lookup queries.
- Easy work flow for end users: upload the file, verify the preview, and load data.
- CSV, XLSX, XML, and JSON data formats can be loaded to tables or collections.
- Configure data loading to Append, Merge or Replace data, with or without Error Handling.
- Simple new Process Type Data Loading: Customize Data Loading pages as you wish.
- APEX_DATA_LOADING PL/SQL API available for custom processing.
- Maximum number of columns to load is 300. Note that Legacy data load supports up to 45.



See Also:

["Creating Applications with Data Loading Capability"](#)

25.3.2 About Creating a Legacy Data Load Wizard

Create a Data Load Wizard by running the Create Page Wizard and creating a Data Load page.

During the process of creating the Data Load page, developers can specify the upload table and its unique columns, table lookups, and data transformation rules.

 **Note:**

A Data Load Wizard is not designed or intended to load hundreds of thousands of rows of data. While it is possible to use a Data Load Wizard to load this high volume of data, you may encounter performance issues with both transmitting and loading large data files. Tools like Oracle SQL Developer and Oracle SQL*Loader are better suited to loading large volumes of data.

The Data Load Wizard includes support for the following:

- **Table Definitions** - This definition specifies the data upload table name with its unique key columns.
- **Data Transformation Rules** - For formatting transformations such as changing import data to uppercase, lowercase, and so on, you must define data transformation rules. For example, if the import file includes column data with both upper and lowercase and the upload table requires all uppercase, you can define a data transformation rule to insert only uppercase into the target column.
- **Table Lookups** - If data existing in the import file must be mapped to data in another table, specify a table lookup to perform the mapping. For example, if the import file contains a department name for the `DEPTNO` column but the upload table requires a number for that column, use a table lookup rule to find the corresponding department number for that department name in another table.
- **Column Name Aliases** - There are many situations when a developer does not wish to expose the table column names to the end user, or to expose all columns to the end user. In those situations, you can create a column aliases for the columns that need to be exposed.
- **Manage Concurrency** - If multiple users are uploading data at the same time, developers can use extra column to track the version of data in the underlying table. The Data Load Wizard can use this column to check and signal the end user if anyone else is working with the same data at the same time. This is particularly important if uploading into a table that is regularly updated.
- **Multiple Spreadsheet Columns** - There are many situations when a spreadsheet to be uploaded has multiple columns that the developer wants to concatenate and upload in to one table column (for example `FirstName` and `LastName` on spreadsheet can be uploaded into `ENAME` of the `EMP` table).
- **Skip Validation** - You can improve data loading performance when uploading a large number of records by skipping the validation step. If uploading thousands of records, the end user might not be interested in validating each record. If you are certain that each record will be inserted as new record, the data loading process does not need to check for duplicates.

The newly generated Data Load Wizard consists of four pages that provide users with the ability to upload data from a file or by copy and paste, define data and table mappings, validate the data, and finally to upload the data to the table. The developer can later edit the Data Load Wizard's definitions such as table lookups and data transformation rules, by accessing Shared Components, Data References, Data Load Definitions.

Supported Data Types

Data Load Wizards support the following data types:

- VARCHAR2
- DATE
- TIMESTAMP
- NUMBER

Unsupported Data Types

Data Load Wizards do not support the following data types:

- Large objects (BLOB and CLOB)
- Complex types (XMLTYPE and SDO_GEOMETRY)
- CHAR

See Also:

- ["Creating a Legacy Data Load Page"](#)
- ["Editing a Data Load Definition"](#)

25.3.3 Creating a Legacy Data Load Page

To create a legacy Data Load Wizard, a developer creates a Data Load page with the Create Page Wizard.

To create a legacy Data Load Wizard:

1. On the Workspace home page, click the **App Builder** icon.
2. Select the application.
3. Click **Create Page**.
4. For Create a Page:
 - a. User Interface - Select a user interface for the page (optional).
This attribute only displays for applications using older themes and for which Desktop and Mobile User Interfaces have been defined.
 - b. Page Type - Select **Component**.

Tip:

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

- Scroll down and select **Legacy Page**.
- Select **Legacy Data Loading**.

5. For Data Load Table:
 - a. Legacy Data Load - Choose whether to create a new or to re-use an existing Legacy Data Load definition.
 - b. Definition Name - Enter the name of this data load definition.
 - c. Owner - Select the owner of the table on which the form will be based..
 - d. Table Name - Select the table to use for data loading (also known as the upload table).
 - e. Unique Column 1 - Identify the column name(s) to be used as the primary unique key column during the data load process. You can define up to 3 unique key columns.
 - f. Case Sensitive - Identify whether the selected unique key column is case sensitive. By default, this is set to **No**.
 - g. Define additional Unique Columns. You can define up to 3 unique key columns.
 - h. Click **Next**.
6. For Add Transformation Rules (optional) - Transformation Rules enable you to change the data being uploaded before it is inserted into the base table. Select the column to transform and then the desired rule to apply to it.
 - a. Select Column(s) to create a transformation rule - Select the column on which the transformation rule definition is to be based and move them to the right.
 - b. Rule Name - Enter a name for this transformation rule.
 - c. Sequence - Specify the sequence for the transformation rule. The sequence determines the order of execution.
 - d. Type - Select the type of transformation rule you want to perform.
 - e. Provide additional details based on the transformation type you have chosen.
 - f. Click **Add Transformation**.
 - g. Click **Next**.
7. For Table Lookups - Match an uploaded value against another table and use the associated key value, instead of the uploaded value.
 - a. Add new table lookup for Column (optional) - Identify the column on which the table lookup definition is to be based.
 - b. Lookup Table Owner - Select the owner of the lookup table.
 - c. Lookup Table Name - Identify the table to be used for this table lookup definition.
 - d. Return Column - Select the name of the column returned by the table lookup. This value will be inserted into the load column specified and is generally the key value of the parent in a foreign key relationship (for example: `DEPTNO`).
 - e. Upload Column - Select the name of the column end users will upload instead of the return column. This is the column that contains the display value from the lookup table (for example: `DNAME`).
 - f. Upload Column 2 - Select the name of the second column to be uploaded to uniquely identify the return column if necessary. For example, to uniquely identify a State Code it may be necessary to upload the State Name and Country.
 - g. Upload Column 3 - Select the name of the third column to be uploaded to uniquely identify the return column.

 **See Also:**

- "Re-creating Legacy Data Load Pages"
- "Editing Pages in Page Designer"

25.3.4 Re-creating Legacy Data Load Pages

To make changes to existing legacy Data Load pages, Oracle recommends re-creating new pages without deleting the data loading definitions.

1. To re-create legacy Data Load Wizard pages without deleting the data loading definitions:
 1. Navigate to the Data Load Definitions page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 - d. Under Data Load Definitions, click **Data Load Definitions**.
 - e. Expand the **Legacy Data Load** region and click the legacy data load.
 2. Click the Legacy Data Load you want to re-create.
The Data Load Table Details page appears.
 3. From Tasks, click **Create Pages using this Legacy Data load**.
The Page Attributes page of the Create Data Load Wizard appears.
 4. For each page, edit the appropriate attributes and click **Next**.
To learn more about any attributes, see field-level Help.
 5. Click **Create**.

25.3.5 Editing a Legacy Data Load Definition

Edit the Data Load Definition in Shared Components.

A Data Load Definition is comprised of a data load table, table rules, and lookup tables used by the Data Load Wizard in your application. A data load table is an existing table in your schema that has been selected for use in the data loading process, to upload data.

1. To edit a Data Load Definition:
 1. Navigate to the Data Load Definitions page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
 - d. Under Data References, click **Data Load Definitions**.

- e. Expand the **Legacy Data Load** region and click **Legacy Data Load**.

The Data Load Table Details page appears. To learn more about any attributes, see field-level Help.

2. For Data Load Definition:

- Name - Name for the data load definition.
- Table Name - Displays the name of underlying table to be used for data load definition.
- Unique column 1 - The column name used as the primary unique key column during the data load process.
- Case Sensitive - Identify whether the selected unique key column 1 is case sensitive. By default, this is set to No.
- Unique column 2 - If the unique key definition of the selected table is a compound key, consisting of 2 or more columns, this column name is used as the second unique key column during the data load process.
- Case Sensitive - Identify whether the selected unique key column 2 is case sensitive. By default, this is set to No.
- Unique column 3 - If the unique key definition of the selected table is a compound key, consisting of 2 or more columns, this column name is used as the third unique key column during the data load process.
- Case Sensitive - Identify whether the selected unique key column 3 is case sensitive. By default, this is set to No.
- Skip Validation - One step in data loading is to validate actions to be taken on records to be uploaded. Select Yes to skip validation.

3. Transformation Rules lists previously defined transformation rules.

- To create a new rule:
 - a. Click **Create Transformation Rule**.
 - b. Edit the attributes.
To learn more about an attribute, see field-level Help.
 - c. Click **Create**.
- To edit an existing rule:
 - a. Click the rule name.
 - b. Edit the attributes.
 - c. Click **Apply Changes**.

4. Table Lookups map data in the import file to data found in another table.

- To create a new Table Lookups:
 - a. Click **Create Table Lookup**.
 - b. Edit the attributes.
 - c. Click **Create**.
- To edit an existing Table Lookup:
 - a. Click column name.
 - b. Edit the attributes.

- b. Page Type - Select **Legacy Page** and then **Legacy Master Detail**.

 **Tip:**

Component pages provides page-level functionality and can be added multiple times within a given application such as reports, forms, charts, or calendars. **Feature** pages provide application-level functionality and can only be added once per application.

5. On Master Table and Columns:
- Table/ View Owner- Choose the schema that owns the master table.
 - Table/ View Name - Select the table or view which contains the columns to be included in the master page.
 - Select Columns- Select the columns to display in your master page. You may add additional columns later.
 - Use User Interface Defaults -Select whether to use User Interface Default values to create the form. If you select **No**, the wizard does not use User Interface Default values.
 - Click **Next**.
6. On Detail Table and Columns:
- Show Only Related Tables - Specify whether to restrict the list of detail tables to only those tables related to the master table. Select **Yes** or **No**.
 - Table / View Owner - Select the table or view owner. The default selected owner for the table or view is the same owner as for your application. If the owner of your application has select privileges on tables or views in other schemas, you may select another schema.
 - Table/View Name - Select the table or view which contains the columns to be included in the detail page.
 - Select Columns - Select the columns to display in your detail page. You may add columns later.
 - Click **Next**.
- Next, define a primary key. Forms perform insert, update and delete operations on table rows in the database. You identify the rows by using either a primary key defined on the table, or the ROWID pseudo column, which uniquely identifies a row in a table.
7. On Define Primary Key:
- Select one for each table.
- Managed by Database (ROWID)** - Use the ROWID pseudo column to identify rows to update and delete.
 - Select Primary Key Column(s)** - Use the source table's primary key column. If selected, specify Primary Key Column 1 and optionally Primary Key Column 2. See field-level Help for more information.
 - Click **Next**.
8. On Master Detail Link:

Define the relationship between the Master and Detail tables. You may type in the column names (fully qualified with table names), or choose them from the list.

- a. Link Master Column - Select the master column.
- b. Link Detail Column - Select the detail column.
- c. Click **Next**.

9. On Master Options:

If a navigation order column is not defined, the master update form will navigate by the primary key column. By default, this wizard creates a master report page. You can choose to not create master report page if you already have a report page.

- a. Include master row navigation? - Select **Yes** or **No**. If you select **Yes**, define the navigation order columns. If a navigation order column is not defined, the master update form will navigate by the primary key column.

If a navigation order column is not defined, the master update form will navigate by the primary key column. By default, this wizard creates a master report page. You can choose to not create master report page if you already have a report page.

- b. Master Row Navigation Order- Select the master row navigation order.
- c. Secondary Navigation Order - Select the secondary navigation order.
- d. Include master report? - Click **No** to if you already have a report page.
- e. Click **Next**.

10. On Layout:

- a. Edit detail as tabular form on same page - Select to create a two page master detail.
- b. Edit detail on separate page - Select to create three page master detail.
- c. Click **Next**.

11. On Page Attributes:

 **Note:**

This page specifies master and detail page information. If the pages you specify do not exist, the pages will be created for you.

Master Page

- a. Page Number - Enter the page numbers that will display master and detail. A new page will be created if one does not already exist.
- b. Page Title - Enter page titles for the new pages. If the pages already exist, the existing page names display.
- c. Region Title - Enter names for the regions containing the master and detail.
- d. Page Mode - Identify the page mode, See field-level Help for more information.

Detail Page

- a. Page Number - Enter the page number.
- b. Page Title - Enter the page title.
- c. Click **Next**.

12. On Navigation Menu, select how you want this page integrated into the Navigation Menu and click **Next**. See field-level Help for more information.
13. On Confirm:
Verify the attributes and confirm your selections.
14. Click **Create**.



See Also:

["Creating Master Detail Forms"](#)

25.5 Managing Legacy Tabular Forms

A legacy tabular form enables users to update multiple rows in a table at once from a single page.



Note:

A tabular form is a legacy application component. Although existing legacy tabular forms are supported, the creation of new legacy tabular forms has been desupported. Oracle recommends developers create interactive grids instead.

A legacy tabular form enables users to update multiple rows in a table at once from a single page. A legacy tabular form enables you to perform update, insert, and delete operations on multiple rows in a database table. Tabular forms include a built-in multiple row update process that performs optimistic locking behind the scenes to maintain the data integrity.

- [Best Practices When Managing Tabular Forms](#)
- [How Legacy Tabular Forms Work](#)
- [About Running a Legacy Tabular Form](#)



See Also:

- ["Managing Interactive Grids"](#)
- ["Developing Forms"](#)

25.5.1 Best Practices When Managing Tabular Forms

Oracle recommends the following best practices when managing tabular forms:

- Do not modify of the select list of a SQL statement of a existing legacy tabular form. If you must modify the query, make sure the values of the updatable columns are not altered after being queried from the database by the Application Express engine.
- Do not add custom JavaScript to display types that use display type specific JavaScript logic (for example, radio groups, simple check boxes, and popup key LOVs).

25.5.2 How Legacy Tabular Forms Work

Tabular forms are based on a SQL query in which the query columns are tied to the underlying table columns. Unlike a single record form, tabular forms do not store data in session state. When a tabular form page is submitted, the tabular form data is processed using built-in data manipulation language (DML), or a custom PL/SQL page processes.

A tabular form with automatic DML has two processes for multi-row operations:

- A Multi Row Update (MRU) process performs create and update operations.
- Multi Row Delete (MRD) process deletes requests on one or more rows.

MRU and MRD processes reference the underlying table name and the primary key columns. The primary key columns must be part of the tabular form SQL query, and the report columns must be either hidden or display-only (save state) in order for the DML processes to be able to identify the correct records. For new records, the primary key values must be `NULL` to be identified as new records. Delete operations are performed by referencing row number of the row to be deleted. Users can check one or more rows on the current page and when they click the Delete button, the row numbers identify the corresponding primary key value(s) and the matching rows are deleted.

Wizard generated tabular forms built-in DML includes a checksum column to prevent lost updates. Using a method called optimistic locking, a checksum is computed for each row when rendering a tabular form. This checksum is stored in an extra hidden tabular form column. Upon submission of the form for update, an additional set of checksums is computed on the then current data stored in the database. The new checksums are compared to those built when the tabular form was first rendered, and if there are any mismatches, the update is rejected, because the data in the database was either modified by another user or another process in the time between the tabular form was rendered and the time the data was submitted.

25.5.3 About Running a Legacy Tabular Form

When running a tabular form, data is rendered as a report having updatable columns shown using various form elements (including text fields, text areas, date pickers, select lists, radio groups, and so on).

Tabular Form

<input type="checkbox"/>	Project	Task Name	Start Date	End Date	Status
<input type="checkbox"/>	APEX Environment Cc	Identify server require	14-JAN-15	15-JAN-15	Closed
<input type="checkbox"/>	Maintain Support Sys	HR software upgrade	14-JAN-15	11-MAR-15	On-Hold
<input type="checkbox"/>	Maintain Support Sys	Apply Billing System	14-JAN-15	15-MAR-15	On-Hold
<input type="checkbox"/>	APEX Environment Cc	Determine Web lister	15-JAN-15	15-JAN-15	Closed
<input type="checkbox"/>	APEX Environment Cc	Specify security auth	16-JAN-15	18-JAN-15	Closed
<input type="checkbox"/>	APEX Environment Cc	Select servers for Dev	16-JAN-15	21-JAN-15	Closed
<input type="checkbox"/>	Email Integration	Complete plan	21-JAN-15	26-FEB-15	Closed
<input type="checkbox"/>	APEX Environment Cc	Configure Workspace	23-JAN-15	23-JAN-15	Closed
<input type="checkbox"/>	APEX Environment Cc	Create pilot workspac	23-JAN-15	23-JAN-15	Closed
<input type="checkbox"/>	Maintain Support Sys	Arrange for vacation	04-MAR-15	27-MAR-15	Open

row(s) 1 - 10 of 73 [Next](#)

[Add Row](#)

[Cancel](#) [Delete](#) [Apply Changes](#)

For numeric and date fields, you can also pre-define date and number format masks, or apply those format masks after generating the initial form.

Each report also includes a check box column (called a row selector). Users use this row selector to select one or more columns and update or delete data. To add a row, users click **Add Row**.



Tip:

You can control the appearance of a specific column by editing column attributes.



See Also:

"Managing User Interface Defaults" in *Oracle Application Express SQL Workshop Guide*

25.6 Managing Legacy Web Services

Legacy Web services enable applications to interact with one another over the web in a platform-neutral, language independent environment.



Note:

The SOAP 1.1 specification is a W3C note. SOAP Version 1.2 specification is a W3C recommendation.

For information about Simple Object Access Protocol (SOAP) see:

<http://www.w3.org/TR/SOAP/>

- [About Web Services](#)
- [Creating Web Service References](#)
- [About Working with SSL Enabled Web Services](#)
- [Creating Web Service References Based on a WSDL](#)
- [Creating Web Service References Manually](#)
- [Creating RESTful Web Service References](#)
- [Using the Web Service Reference Repository](#)
- [Creating an Input Form and Report on a Web Service](#)
- [Creating a Form on a Web Service](#)
- [Creating a Report on a Web Service](#)
- [How to Invoke a Web Service as a Process](#)
- [Viewing a Web Service Reference History](#)

25.6.1 About Web Services

In a typical Web services scenario, a business application sends a request to a service at a given URL by using the protocol over HTTP. The service receives the request, processes it, and returns a response. You can incorporate calls with external Web services in applications developed in App Builder.

Web services are typically based on Simple Object Access Protocol (SOAP) or Representational State Transfer (REST) architectures. SOAP is a World Wide Web Consortium (W3C) standard protocol for sending and receiving requests and responses across the Internet. SOAP messages can be sent back and forth between a service provider and a service user in SOAP envelopes. RESTful Web services are resource oriented. The scope of the Web service is found in the URI and the method of the service is described by the HTTP method that is used such as GET, POST, PUT, HEAD, and DELETE.

SOAP offers two primary advantages:

- SOAP is based on XML, and therefore easy to use.

- SOAP messages are not blocked by firewalls because this protocol uses simple transport protocols, such as HTTP.

 **Tip:**

If you run Oracle Application Express with Oracle Database 11g Release 1 (11.1), you must enable network services to use Web services.

REST offers similar advantages:

- REST messages are also not blocked by firewalls because this protocol uses the HTTP protocol.
- REST requests do not require the overhead of XML and SOAP envelopes and inputs are typically provided in the URI.

 **See Also:**

["Enabling Network Services in Oracle Database 11g or Later"](#)

25.6.2 Creating Web Service References

To use Web services in Oracle Application Express, you create a Web service reference using a wizard. Web service references can be based on a Web Services Description Language (WSDL) document, RESTful style, or created manually by supplying information about the service.

- [Accessing the Web Service References Page](#)
- [Specifying an Application Proxy Server Address](#)

 **See Also:**

- ["Creating Web Service References Based on a WSDL"](#)
- ["Creating Web Service References Manually"](#)
- ["Creating RESTful Web Service References"](#)

25.6.2.1 Accessing the Web Service References Page

You manage Web service references on the Web Service References page.

To access the Web Service References page:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.

- c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Data Sources, click **Legacy Web Service References**.
The Web Service References page appears.

25.6.2.2 Specifying an Application Proxy Server Address

If your environment requires a proxy server to access the Internet, you must either specify a proxy server address on the Application Attributes page, or your instance administrator must define an instance proxy, before you can create a Web service reference.

To specify a proxy address for an application:

1. On the Workspace home page, click the **App Builder** icon.
The App Builder home page appears.
2. Select an application.
Application home page appears.
3. Click **Edit Application Properties**.
4. Under Properties, enter the proxy server in the Proxy Server field.
5. Click **Apply Changes**.

25.6.3 About Working with SSL Enabled Web Services

Secure Sockets Layer (SSL) is an industry standard protocol that uses RSA public key cryptography with symmetric key cryptography to provide authentication, encryption, and data integrity.

If the Web service that you need to interact with is SSL-enabled (that is, `https` displays in the URL to the Web service), you must create a wallet and configure Oracle Application Express to use the wallet. A wallet is a password-protected container that stores authentication and signing credentials (including private keys, certificates, and trusted certificates) needed by SSL.



See Also:

"Configuring Wallet Information" in *Oracle Application Express Administration Guide*

25.6.4 Creating Web Service References Based on a WSDL

You can create Web service reference based on a Web Services Description Language (WSDL) document.

- [About Creating Web Service References Based on a WSDL](#)
- [Creating a Web Service Reference by Specifying a WSDL Document](#)
- [Testing a Web Service Reference Created from a WSDL](#)

25.6.4.1 About Creating Web Service References Based on a WSDL

Before you create a Web service reference based on a WSDL, you must decide how to locate the WSDL. You locate a WSDL by entering the URL to the WSDL document.

You then run a wizard which analyzes the WSDL and collects all the necessary information to create a valid SOAP message, including:

- The URL used to post the SOAP request over HTTP(S)
- A Universal Resource Identifier (URI) identifying the SOAP HTTP request
- Operations of the Web Service
- Input parameters for each operation
- Output parameters for each operation

25.6.4.2 Creating a Web Service Reference by Specifying a WSDL Document

To create a Web service by specifying a URL to a specific WSDL document:

1. Navigate to the Web Service References page.
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an existing application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **Legacy Web Service References**.
2. Click **Create**.
3. For Web Reference Type, select **Based on WSDL** and click **Next**.
4. If prompted to search a UDDI registry to find a WSDL, click **No** then **Next**.
5. In WSDL Location, enter the URL to the WSDL document.
6. For Username, enter the username required to access the WSDL.
7. For Password, enter the password required to access the WSDL.
8. Click **Next**.

The Web Service Details page appears.
9. For Basic Authentication, select:
 - **No** - Select this option if authentication credentials are not sent as part of the HTTP request.
 - **Yes** - Select this option if authentication credentials are sent as part of the HTTP request. Web services that employ basic authentication usually also use the HTTPS (SSL) protocol since the username and password are sent in clear text.
10. Click **Create Reference**.

The Web service reference is added to the Web Service References Repository.
11. On the Create page, the following selections are available:

- View Web Service References - Select to go to the Web Service Reference page.
- Create Form on Web Service - Select to create a Form for this Web Service Reference.
- Create Form & Report on Web Service - Select to create a Form and Report for this Web Service Reference.

25.6.4.3 Testing a Web Service Reference Created from a WSDL

After you have created a Web service reference, you can test it on the Test Web Service Reference page.

To test a Web service reference:

1. Navigate to the Web Service References page.
 - a. On the Workspace home page, click **App Builder**.
 - b. Select a existing application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **Legacy Web Service References**.
2. Select the **View Report** icon.
3. Click the **Test** icon for the Web Service reference you want to test.

The Test Web Service Reference page appears. The Web service name and URL endpoint display at the top of the page.

4. From Operation, select an operation (that is, the method to be executed).
5. Under Input Parameters, enter the appropriate values.
6. Click **Test**.

The message request and response appear at the bottom of the page under Messages.



See Also:

["Accessing the Web Service References Page"](#)

25.6.5 Creating Web Service References Manually

You can create a Web service reference manually.

- [About Creating Web Service References Manually](#)
- [Creating a Web Service Reference Manually](#)
- [Testing a Web Service Reference Created Manually](#)

25.6.5.1 About Creating Web Service References Manually

When you create a Web service reference manually, you supply the necessary information to create a valid SOAP request, including:

- The URL used to post the SOAP request over HTTP(S)

- A Universal Resource Identifier (URI) identifying the SOAP HTTP request
- The SOAP envelope for the request, including any item substitutions
- Optionally the name of a collection to store the response from the Web service

25.6.5.2 Creating a Web Service Reference Manually

Creating a Web service reference manually, adds it to Web Service References Repository.

To create a Web service reference manually:

1. Navigate to the Web Service References page.
 - a. On the Workspace home page, click **App Builder**.
 - b. Select a existing application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **Legacy Web Service References**.
2. Click **Create**.
3. Select **Manual** and click **Next**.
4. On Create Web Service Reference:
 - a. Name - Enter a name to identify the reference.
 - b. URL - Enter the URL used to post the SOAP request over HTTP. This corresponds to the soap:address location of a service port in the WSDL.
 - c. Action - Enter the intent of the SOAP HTTP request (optional). The value is a URI identifying the intent. SOAP places no restrictions on the format or specificity of the URI or requires that it is resolvable.
 - d. Proxy - Enter a proxy to override the application proxy for this service.
 - e. SOAP Version - Select **1.1** or **1.2**.
 - f. Basic Authentication - Choose whether the Web service requires authentication. Select **Yes** or **No**.
 - g. SOAP Envelope - Specify the SOAP envelope to be used for the SOAP request to the Web service..

 **Note:**

You can reference items from session state in the SOAP envelope by using #ITEM_NAME# syntax.

- h. Store Response in Collection - Enter the name of a collection to store the Web service response. The response will be stored in the CLOB001 column of the collection entered here.
- i. Click **Create**.



See Also:

["Accessing the Web Service References Page"](#)

25.6.5.3 Testing a Web Service Reference Created Manually

After you have created a Web service reference, you can test it on the Test Web Service Reference page.

To test a Web service reference:

1. Navigate to the Web Service References page.
 - a. On the Workspace home page, click **App Builder**.
 - b. Select a existing application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **Legacy Web Service References**.
2. Select the **View Report** icon.
3. Click the **Test** icon for the Web Service reference you want to test.

The Test Web Service Reference page appears. The Web service name and URL endpoint display at the top of the page.

4. If required, enter the username and password under Basic Authentication.
5. In SOAP Envelope text area, optionally edit the SOAP request envelope.
6. Click **Test**.

The message request and response appear at the bottom of the page under Messages.



See Also:

["Accessing the Web Service References Page"](#)

25.6.6 Creating RESTful Web Service References

You can create a Representational State Transfer (REST) or RESTful web service.

- [About Creating RESTful Web Service References](#)
- [Creating a RESTful Web Service Reference](#)
- [Testing a REST Web Service Reference](#)

25.6.6.1 About Creating RESTful Web Service References

RESTful Web services are resource oriented. The scope of the Web service is found in the URI and the method of the service is described by the HTTP method that is used such as GET, POST, PUT, HEAD, and DELETE. When you create a RESTful Web service reference,

you supply the necessary information about the structure of the request and response including:

- A Universal Resource Identifier (URI) identifying the RESTful request
- The HTTP method identifying the method of the Web service
- HTTP Headers, if required, that are part of the request
- The type of input expected by the Web service
- The format of the response and how to identify the response parameters

25.6.6.2 Creating a RESTful Web Service Reference

To create a RESTful Web service reference:

1. Navigate to the Web Service References page.
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an existing application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **Legacy Web Service References**.
2. Click **Create**.
3. Select **REST** and click **Next**.
4. For REST Details, specify the following:
 - a. Name - Enter a name to identify the reference.
 - b. URL - Enter the URL endpoint of the Web service.
 - c. Proxy - Enter a proxy to override the application proxy for this service (optional). This setting is overridden by the proxy setting for this instance.
 - d. HTTP Method - Choose the http method used for the request to the Web service. Select **GET**, **HEAD**, **POST**, **PUT** or **DELETE**.
 - e. Basic Authentication - Select **Yes** to require HTTP Basic Authentication. Otherwise, select **No**.
 - f. REST HTTP Headers - Enter the names of the HTTP headers to send with the request.
 - g. Click **Next**.
5. For REST Input parameters, specify the following:
 - a. Name - Enter the name of the input parameter expected by the method.
 - b. Type - Select the input type.
 - c. Click **Add Parameter**.
 - d. Repeat steps a through c for each expected input.
 - e. Click **Next**.
6. For REST Output parameters, specify the following:
 - a. Output Format - Select **XML**, **Text** or **JSON** for the response format expected from the Web service.

- b. XPath to Output Parameters (XML only) - Enter an XPath expression to the relevant part of the response.

For example:

```
/ListBucketResult/Contents
```

- c. Response Namespace (XML only) - Enter the namespace corresponding to the Response XPath.

For example:

```
http://s3.amazonaws.com/doc/2006-03-01/
```

- d. Parameter Delimiter (**Text** only) - Enter the character or sequence that separates parameters returned from the Web service. Use `\n` to indicate a new line and `\t` to indicate a tab character.
- e. New Record Delimiter (**Text** only) - Enter the character or sequence that determines a new record in a text response from the Web service. Use `\n` to indicate a new line and `\t` to indicate a tab character.
- f. Name - Enter the name of the output parameter returned by the method.
- g. Path - Enter the path. If the response is XML, the path is an XPath expression to the node. If the response is Text, the path is a number. If the response is JSON, the entire response is stored in the `CLOB001` column of a collection you specify.
- h. Type - Select the output type.
- i. Click **Add Parameter**.
- j. Repeat steps f through h for each returned output parameter.

 **Note:**

Click **Test** to send a request to a RESTful Web service and see the response. This test process helps you specify the appropriate Output parameters.

7. Click **Create**.

The Create Web Service Reference Success page appears. The Web service reference is added to the Web Service References Repository.

 **See Also:**

- ["Accessing the Web Service References Page"](#)
- "Creating a Proxy Server for an Instance" in *Oracle Application Express Administration Guide*

25.6.6.3 Testing a REST Web Service Reference

After you have created a Web service reference, you can test it on the Test Web Service Reference page.

To test a Web service reference:

1. Navigate to the Web Service References page.
 - a. On the Workspace home page, click **App Builder**.
 - b. Select a existing application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **Legacy Web Service References**.
2. Select the **View Report** icon.
3. Click the **Test** icon for the Web Service reference you want to test.

The Test Web Service Reference page appears. The Web service name and URL endpoint display at the top of the page.

4. In the URL and Proxy Override fields, optionally edit the values for the test.
5. If required, enter the username and password under Basic Authentication.
6. Under HTTP Headers, enter appropriate values.
7. Under Input Parameters, enter appropriate values.
8. Click **Test**.

The message response appears at the bottom of the page under Messages.



See Also:

["Accessing the Web Service References Page"](#)

25.6.7 Using the Web Service Reference Repository

Web service references are stored in the Web Service Reference Repository.

To access the Web Service References Repository:

1. Navigate to the Web Service References page.
 - a. On the Workspace home page, click **App Builder**.
 - b. Select a existing application.
 - c. On the Application home page, click **Shared Components** in the center of the page.
 - d. Under Data Sources, select **Legacy Web Service References**.

The Web Service Reference page appears.

A Search bar displays at the top of the page. Available controls include:

- **Search columns icon** - Resembles a magnifying glass. Click this icon to narrow your search. To search all columns, select **All Columns**.
- **Text area** - Enter case insensitive search criteria (wildcard characters are implied) and click **Go**.

- **Go button** - Executes a search or applies a filter.
 - **View Icons** - Displays each Web service reference as a large icon. To edit a Web service reference, click the appropriate icon.
 - **View Report** - Displays each Web service reference as a line in a report.
 - **Actions menu** - Displays the Actions menu. Use this menu to customize the report view.
2. Click the **View Report** icon.
 3. In report view you can:
 - Edit a reference by clicking the reference name.
 - Test a reference by clicking the **Test** icon.
 - View details about a reference by clicking the **View** icon. Note that this option is not available for manually created or REST Web service references.

 **See Also:**

- ["Accessing the Web Service References Page"](#)
- ["About the Actions Menu"](#)

25.6.8 Creating an Input Form and Report on a Web Service

This section describes how to create an input form and report on a Web service.

- [About the Create Form and Report on Web Service Wizard](#)
- [Creating a Form and Report by Adding a New Page](#)

25.6.8.1 About the Create Form and Report on Web Service Wizard

The Create Form and Report on Web Service Wizard creates an input form, a submit button, and a report for displaying results. You can execute this wizard directly after creating the Web service reference from a WSDL or a RESTful style Web service, or by adding a page.

Use this wizard when you expect a nonscalar result from the Web service. The Amazon Product API Web service is a good example. This Web service returns many results based on the search criteria entered in an input form.

25.6.8.2 Creating a Form and Report by Adding a New Page

If you have an existing Web service reference, you can create an input form and report by adding a new page.

To create a form and report by adding a new page:

1. Create the Web service reference.
2. Run the Create Page Wizard. On Create a Page:
 - a. For Page Type, select **Component** and then **Legacy Page**.

- [About the Create Form on Web Service Wizard](#)
- [Creating a Form by Adding a New Page](#)

25.6.9.1 About the Create Form on Web Service Wizard

The Create Form on Web Service Wizard creates a form and a submit button. You can execute this wizard after creating the Web service reference from a WSDL or on a RESTful style Web service, or by running the Create Page Wizard.

Use this wizard when you expect a scalar result from the Web service. A Web service that looks up a stock price is a good example because the input is a stock symbol and the output is the scalar value price.

25.6.9.2 Creating a Form by Adding a New Page

If you have an existing Web service reference, you can create a form based on a Web service reference by adding a new page.

To create a form by adding a new page:

1. Create the Web service reference.
2. Run the Create Page Wizard. On Create a Page:
 - a. For Page Type, select **Component** and then **Legacy Page**.
 - b. On Create page, select **Form on Web Service**.
3. For Page Attributes:
 - a. Page Number - Select a page to contain the new form, or enter a new page number.
 - b. Page Name - Specify a name for the page.
 - c. Page Mode - Identify the page mode.
To learn more, see field-level Help.
 - d. Page Group - Identify the name of the page group you would like to associate with this page. Page groups help developers manage the pages within an application. To create a page group, enter the name. To use an existing page group, select the name from the list of values.
 - e. Region Title - Select whether you want to use a breadcrumb navigation control on your page, and which breadcrumb navigation control you want to use.
 - f. Breadcrumb - Enter a title for the region in which the form will appear.
 - g. Click **Next**.
4. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
5. For Choose Service:
 - a. Web Service Reference - Select the Web service reference.
 - b. Operation - Select the method to be executed. For RESTful style Web references, doREST is selected automatically. The Operation option does not appear for Manual style Web references.

- c. Click **Next**.
6. For Input Items, make these selections and click **Next**:
 - a. Identify which items to add to the form. To include an item, select **Yes** in the Create column. Otherwise, select **No**.
 - b. If necessary, edit the Item Name.
 - c. If necessary, edit the Item Label.
7. If applicable, specify the Item Names and Item Labels for basic authentication and click **Next**.

 **Note:**

This step only appears if basic authentication was specified for this Web service reference when it was created.

8. If applicable, specify the Item Names and Item Labels for basic authentication.
Note that this step only appears if basic authentication was specified for this Web service reference when it was created.
9. For Output Items, make these selections and click **Next**:
 - a. Identify which items to add to the form. To include an item, select **Yes** in the Create column. Otherwise, select **No**.
 - b. If necessary, edit the Item Name.
 - c. If necessary, edit the Item Label.
10. Click **Create**.

 **See Also:**

- ["Creating Web Service References Based on a WSDL"](#)
- ["Creating Web Service References Manually"](#)
- ["Managing Pages in a Database Application"](#)
- ["Editing User Interface Attributes"](#)

25.6.10 Creating a Report on a Web Service

To create a report in which to display Web Service request results:

1. Create the Web service reference.
2. Run the Create Page Wizard. On Create a Page:
 - a. For User Interface, if applicable select a user interface for the page.
This attribute only displays for applications using older themes for which Desktop and Mobile User Interfaces have been defined.
 - b. For Page Type, select **Component** and then **Report**.

- c. On Create page, select **Report on Web Service**.
3. For Page Attributes:
 - a. Page Number - Select a page to contain the new form, or enter a new page number.
 - b. Page Name - Specify a name for the page.
 - c. Page Mode - Identify the page mode.
To learn more, see field-level Help.
 - d. Breadcrumb - Enter a title for the region in which the form will appear.
 - e. Click **Next**.
4. For Navigation Preference:
 - a. Select how you want this page integrated into the Navigation Menu. To learn more, see field-level Help.
 - b. Click **Next**.
5. If Web Reference Type is **REST**:
 - a. Web Reference Type - Choose **REST**.
 - b. Web Service Reference - Select the name of the Web service reference and click **Next**.
 - c. Result Stored in Collection - Enter the name of the temporary result set name where the Web service result is stored. The temporary result set is stored in an Application Express collection.
 - d. Report Template - Choose the report template to be used by this report region.
 - e. Rows Per Page- Select the number of rows to display per page.
 - f. Select the parameters to be included in the report.
 - g. Click **Next**.
6. For Web Reference Type, choose **REST**, **Generated from WSDL**, or **Manually Created**.
What appears next depends upon your selection.
7. If Web Reference Type is **Generated from WSDL**:
 - a. Web Reference Type - Choose **Generated from WSDL**.
 - b. Web Service Reference - Select the name of the Web service reference.
 - c. Operation - Select the operation. The operation is the method that will be executed..
 - d. Result Tree to Report On - Select the portion of the resulting XML document that contains the information you want to include in the report.
 - e. Report Parameters and Options:
 - Temporary Result Set Name - Enter a name for the collection that stores the Web service result.
 - Select and deselect the appropriate parameters.
 - f. Click **Next**.
8. If Web Reference Type is **Manually Created**:
 - a. Web Reference Type - Choose **Manually Created**.

- b. Web Service Reference - Select the name of the Web service reference.
 - c. SOAP Style - Choose the style of the SOAP response. The style can be determined from the style attribute of the soap:binding element from the WSDL for this operation.
 - d. Message Format - Choose the message format. The encoding can be determined from the use attribute of the soap:body element of the output message in the WSDL for this operation.
 - e. Result Node Path (XPath)(Value Required)- Enter the XPath expression to the node of the response message that you are creating the report on. The node is a child of the soap:Body element.

For example:

```
/result/myNode
```
 - f. Message Namespace - Enter the namespace for the response message. This can typically be determined by looking for the targetNamespace attribute of the WSDL and click **Next**.
 - g. Enter the name of the collection where the response message is stored.
 - h. Enter the names of the parameters that you want to be included in the report.
 - i. Click **Next**.
9. Click **Create**.

25.6.11 How to Invoke a Web Service as a Process

You can invoke a Web service as a process on the page. The process is created for you if you run one of the Create Form wizards for Web services. Running the process submits the request to the service provider. You can then display the request results in the report.

- [Invoking a Web Service as a Process](#)
- [Editing a Web Service Process](#)

25.6.11.1 Invoking a Web Service as a Process

To invoke a Web service as a process:

1. Create a Web Service Reference.
2. Run the Create Page Wizard. On Create a Page:
 - a. For User Interface, if applicable select a user interface for the page.

This attribute only displays for applications using older themes for which Desktop and Mobile User Interfaces have been defined.
 - b. For Page Type, select **Component** and then **Blank Page**.
3. For Page Attributes:
 - a. Page Number - Select a page to contain the new form, or enter a new page number.
 - b. Page Name - Specify a name for the page.
 - c. Page Mode - Identify the page mode.

To learn more, see field-level Help.

- d. Page Group - Identify the name of the page group you would like to associate with this page. Page groups help developers manage the pages within an application. To create a page group, enter the name. To use an existing page group, select the name from the list of values.
 - e. Breadcrumb - Enter a title for the region in which the form will appear.
 - f. Click **Next**.
4. For Navigation Preference:
 - a. Select **Do not associate this page with a navigation menu entry**.
 - b. Click **Next**.

5. Click **Finish**.

Page Designer appears.

6. Under Page Rendering or Page Processing, locate the Processes section, right-click and select **Create Process**.

The New process appears.

7. Edit the process attributes in the Property Editor.

Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

8. Edit **Identification** attributes:
 - a. Find the **Identification** group.
 - b. Name - Enter the name of the page process for easy identification by developers.
 - c. Type - Select **Web Service**.
9. Edit **Settings**:
 - a. Find the **Settings** group.
 - b. Web Service Operation - Select a Web Service Operation.
 - c. Store Result In - Select **Item(s)** or **Collection**.
10. Edit **Execution Options** Options:
 - a. Find the **Execution Options** group.
 - b. Sequence - Specify the sequence for this component. The sequence determines the order of execution.
 - c. Point - Select the processing point.
11. Edit **Success Message**:
 - a. Find the **Success Message** group.

- b. **Success Message** - Enter the success message for this process. If the process runs and does not generate an error, then this process success message displays in the notification section of the resulting page displayed.

To learn more, click the **Help** tab.

12. Edit Error Message:

- a. Find the **Error Message** group.
- b. **Error Message** - Enter the error message for this process. This message displays if an unhandled exception is raised. After any error processing stops, a rollback is issued and an error message displays..

To learn more, click the **Help** tab.

13. Edit Server-side Condition:

- a. Find the **Server-side Condition** group.
- b. **When Button Pressed** - If you want this page processing component to execute only when the specified button is clicked, select a button from the list. You can incorporate this button condition with other conditions to further refine when this page processing component executes.
- c. **Condition Type** - Select a condition type that must be met in order for this component to be processed. Depending upon your selection, additional attributes may appear.

14. Click Save.



See Also:

- ["Creating Web Service References Based on a WSDL"](#)
- ["Creating Web Service References Manually"](#)
- ["Creating a RESTful Web Service Reference"](#)
- ["Managing Pages in a Database Application"](#)

25.6.11.2 Editing a Web Service Process

After you create a process of type Web service on a Web service reference created from a WSDL or a RESTful style Web reference, you can change the attributes of the input and output parameters to the service.

To edit a Web service process:

1. Create a Web service process.
2. Navigate to the page containing the Web service process.
Page Designer appears.
3. In the left pane, find the process name and expand the tree.
In Parameters and **Out Parameters** display under the process.
4. Expand **In Parameters** and **Out Parameters**. Defined parameters appear.

5. Select a parameter and edit the attributes in the Property Editor.

Attributes are organized in groups. To find a group or attribute, enter keywords in the Filter Properties field. The Property Editor displays the group or attributes. Or, you can click **Go to Group** and select the group.

 **Tip:**

To view help for an attribute, select the attribute in the Property Editor and click the **Help** tab in the central pane.

6. Click **Save**.

 **See Also:**

["How to Invoke a Web Service as a Process"](#)

25.6.12 Viewing a Web Service Reference History

The Web Services History displays changes to Web service references for the current application by application ID, Web service references name, developer, and date.

To view a history of Web service reference changes:

1. Navigate to the Shared Components page:
 - a. On the Workspace home page, click **App Builder**.
 - b. Select an application.
 - c. On the Application home page, click **Shared Components**.
The Shared Components page appears.
2. Under Data Sources, click **Legacy Web Service References**.
The Web Service References page appears.
3. Click **History**.

 **Note:**

The History button only appears on the Web Service Reference page if at least one reference exists.

A

About Item Types

Learn about key attributes that control item functionality.

An item can be part of an HTML form or used in an interactive grid column. An item can be a text field, text area, password, select list, check box, and so on. Developers can control how a page item works by editing the page item attributes. To learn more about specific item attributes, select the attribute in Page Designer and select the Help tab.

- [Available Item Types](#)



See Also:

- ["Viewing Help in Page Designer"](#)
- ["Understanding Page-Level Items"](#)
- ["Editing Page-Level Items"](#)

A.1 Available Item Types

The following table describes available item types in App Builder and notes important attributes that control item behavior.



Tip:

Your application may also include plug-in items. Plug-ins display as *<My Plug-in>* [*Plug-in*]. See ["Implementing Plug-ins."](#)

Table A-1 Available Item Types

Item Type	Description
Check Box	<p>Displays a single check box, enabling the user to check or uncheck it. The check box item always has one of two values the checked value or unchecked value.</p> <p>Page Designer item attributes:</p> <ul style="list-style-type: none"> • Settings, Use Defaults - If set to On, the Check Box uses the application-level component settings defined in Shared Components, Component Settings, Check Box. <p>See Also: Configuring Check Box</p> <p>If Use Defaults is set to Off, the following custom settings appear:</p> <ul style="list-style-type: none"> – Checked Value - Enter the value stored in the page item if the end user checks the checkbox. The value can be up to 255 characters long. <p>On a Faceted Search page, if the facet filters a query column <i>based on a List Of Values</i>, this value must match <i>both</i> LOV display and return value. If display and return values differ, then you cannot use this facet type for this column - use the Checkbox Group facet instead.</p> <ul style="list-style-type: none"> – Unchecked Value - Enter the value stored in the page item if the user unchecks the checkbox. This attribute can also be left blank if you want to store NULL when checked. The value can be up to 255 characters long. <p>Note: This value is used if the page item is populated with a value which does not match either the Checked Value or Unchecked Value.</p>
Check Box Group	<p>Displays multiple values as check boxes, enabling the end user to select multiple values. A list of values is required for items displayed as check boxes. The values corresponding to the checked boxes are stored in a single colon-delimited string.</p> <p>Note: For Yes/No check boxes (that is, a check box with only one value), Oracle recommends using a Check box or a Switch item type.</p> <p>The following example displays employee names (ename), but returns employee numbers (empno):</p> <pre>SELECT ename, empno FROM emp;</pre> <p>See Also: APEX_UTIL in <i>Oracle Application Express API Reference</i> for information about breaking up returned values</p> <p>Page Designer item attributes:</p> <ul style="list-style-type: none"> • Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details. • Settings, Number Columns - Enter the number of layout columns used to display the check boxes. For example, a value of 2 would display two columns of check boxes. By default, all values display in one column. <p>See Also: Creating a Cascading List of Values</p>

Table A-1 (Cont.) Available Item Types

Item Type	Description
Color Picker	<p data-bbox="444 338 1378 401">Displays a control for choosing or entering a color depending on the Display As setting. End users can enter a color value or select one from an inline or popup color spectrum.</p> <p data-bbox="444 407 764 432">Page Designer item attributes:</p> <ul data-bbox="444 443 1378 1365" style="list-style-type: none"> <li data-bbox="444 443 1378 527">• Settings, Use Defaults - If set to On, the Color Picker uses the application-level component settings defined in Shared Components, Component Settings, Color Picker. <ul data-bbox="493 537 1378 1365" style="list-style-type: none"> <li data-bbox="493 537 951 562">See Also: Configuring Color Picker Display <li data-bbox="493 573 1110 598">If Use Defaults is set to Off, the following settings appear: <ul data-bbox="493 609 1378 1365" style="list-style-type: none"> <li data-bbox="493 609 1378 856">– Display As - Select how the color picker displays. Options include: <ul data-bbox="542 646 1378 856" style="list-style-type: none"> <li data-bbox="542 646 1378 709">* Popup - Displays as a text field with icon to open the color spectrum picker. <li data-bbox="542 709 1057 735">* Inline - Displays as an inline color spectrum. <li data-bbox="542 735 1378 798">* Color-only Popup - Displays as a button which opens the color spectrum popup. <li data-bbox="542 798 1378 856">* Native Color Picker - Displays as a native browser color input (the UI is dependent on the browser). <li data-bbox="493 867 1378 930">– Mode - Select the amount of information shown in the color picker. Options include Simple or Full. <li data-bbox="493 930 1378 1014">– Color Preset - Determines if the color picker should display a set of predefined colors and whether they are from the theme or custom. Options include None, Theme Style Colors, or Custom Colors. <li data-bbox="493 1014 1378 1161">– Contrast With - Compare the color of this item with a color from another item or a static value and display the contrast ratio between them in the color picker UI. Enabling this option can help the user choose colors with enough contrast to be accessible to everyone. Options include: None, Page Item, or Static Color. <li data-bbox="493 1161 1378 1287">– Return Value As - Specify the format of the color value returned by this item. Even if the color is entered in a different valid format it will be presented, returned, and sent to the server in this format. Options include: Hex, rgb, rgb/rgba, hsl, hsl/hsla, or Any CSS Value. See Help for more details. <li data-bbox="444 1287 1378 1365">• Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details.

Table A-1 (Cont.) Available Item Types

Item Type	Description
Date Picker	<p data-bbox="444 338 1338 422">Displays a text field with a calendar icon. End users can either enter the date directly into the text item, or click on the calendar icon to select a date, and optionally a time, from the calendar popup.</p> <p data-bbox="444 432 1344 485">Time is only displayed in the calendar popup if the Format Mask for this item includes time components.</p> <p data-bbox="444 495 764 527">Page Designer item attributes:</p> <ul data-bbox="444 537 1377 1087" style="list-style-type: none"> <li data-bbox="444 537 1138 569">• Settings, Show Time - Set to On to include time information. <li data-bbox="444 569 1377 621">• Settings, Display As - Select the display mode for the date picker. Options include Popup, Inline, and Native HTML. See Help for more details. <li data-bbox="444 621 1377 814">• Settings, Minimum Date - Specify if this item has a minimum date. Options include: <ul data-bbox="493 695 1377 814" style="list-style-type: none"> <li data-bbox="493 695 899 726">– None - No minimum date defined. <li data-bbox="493 726 1279 758">– Item - Minimum date is derived dynamically from another item's value. <li data-bbox="493 758 1377 814">– Static - Minimum date is a static value, defined as either an absolute value, or relative value to today's date. <p data-bbox="493 825 1230 846">Additional attributes display conditionally based on the selected value.</p> <ul data-bbox="444 856 1377 1087" style="list-style-type: none"> <li data-bbox="444 856 1377 909">• Settings, Maximum Date - Enter the maximum date that can be input or selected. Additional attributes display conditionally based on the selected value. <li data-bbox="444 909 1377 1003">• Settings, Multiple Months - Determines if the calendar displays multiple months. If set to On, the Number of Months attribute appears. Enter the number of months to show at once. <li data-bbox="444 1003 1377 1087">• Settings, Use Defaults - If set to On, the Date Picker uses the application-level component settings defined in Shared Components, Component Settings, Date Picker. <p data-bbox="493 1098 951 1129">See Also: Configuring Color Picker Display</p> <p data-bbox="493 1140 1195 1161">If Use Defaults is set to Off, the following custom settings appear:</p> <ul data-bbox="444 1171 1377 1591" style="list-style-type: none"> <li data-bbox="493 1171 1377 1266">– Appearance - Control the appearance of the calendar used to select dates. This option is only used when Display As is set either Popup or Inline. Options include Show Week, Month Picker, and Year Picker. <li data-bbox="493 1266 1377 1350">– Days Outside Month - Dictates the behavior of days outside the current viewing month. This option is only used when Display As is set either Popup or Inline. Options include Hidden, Selectable, and Visible. <li data-bbox="493 1350 1377 1476">– Time Increment - Time increment in minutes used by the time selection control. This attribute is used for selecting the time of these increments can still be manually entered and saved. This option is only used when Display As is set either Popup or Inline. <li data-bbox="444 1476 1377 1507">• Appearance, Format Mask - Enter a date format mask to apply to this component. <li data-bbox="444 1507 1377 1591">• Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details.

Table A-1 (Cont.) Available Item Types

Item Type	Description
Display Image	<p>Displays an image stored in a database BLOB columns, or based on an image URL.</p> <p>Note: Not supported for interactive grid columns.</p> <p>Page Designer item attributes:</p> <ul style="list-style-type: none">• Settings, Based On - Determines where the item is retrieved from. To learn more about an attribute, see field-level Help.• Settings, Alternative Text Column - Enter the uppercase page or application item name which holds the alternative text for this image. This text is read by screen readers when an end user navigates to this item.• Settings, Filename Column - Enter the uppercase page or application item name that holds the filename column value associated with the BLOB column.• Settings, BLOB Last Updated Column - If specified, the column is used for browser caching. It identifies if the image changed since the last browser request. If not entered, no caching is done. Note: This attribute is case sensitive and the column must be of type DATE.
Display Only	<p>Displays a non-enterable text item.</p> <p>Page Designer item attributes:</p> <ul style="list-style-type: none">• Settings, Send On Page Submit - Specify whether the current item value should be sent when the page is submitted.• Settings, Based On - Specifies what gets displayed in the field. Options include:<ul style="list-style-type: none">– Page Item Value - The current value of the page item displays.– Display Value of List of Values - The current value of the page item maps to a different display value using a list of values.– Output of PL/SQL Code - The specified PL/SQL code takes care of emitting the necessary output for the page item. <p>Settings, Show Line Breaks - Select On to convert line breaks in the display value to an HTML line break and display them in HTML output.</p>

Table A-1 (Cont.) Available Item Types

Item Type	Description
File Browse	<p>Displays a text field with a Browse button. The Browse button enables the user to locate and upload a file from a local file system.</p> <p>Note: Not supported for interactive grid columns.</p> <p>See Also: About Securing File Uploads</p> <p>Page Designer attributes:</p> <ul style="list-style-type: none"> • Settings, Storage Type - Identify where the uploaded file is stored. Options include: <ul style="list-style-type: none"> – BLOB column specified in Item Source attribute - Stores the uploaded file in the table used by the Automatic Row Processing (DML) process and the column specified in the item source attribute. The column has to be of data type BLOB. If the file gets downloaded, the table name of the Automatic Row Fetch process is used. – Table APEX_APPLICATION_TEMP_FILES - Stores the uploaded file(s) in a temporary location that you can access with the view APEX_APPLICATION_TEMP_FILES. Application Express will automatically delete the file(s) at the end of the session or at the end of the upload request, depending on what you choose for Purge File At. <p>If Storage Type equals Table APEX_APPLICATION_TEMP_FILES:</p> <ul style="list-style-type: none"> – Purge File at - Define when Application Express should remove the temporary file. – Allow Multiple Files - Specify whether multiple files can be uploaded at once. Multiple file names will be stored as a colon delimited list in the page item.. – File Types - Specify a comma delimited list of file types which might be used by the browser to restrict which files can be uploaded. <p>If Storage Type equals BLOB column specified in Item Source:</p> <ul style="list-style-type: none"> – MIME Type Column - Enter the uppercase page or application item name used to store the mime type of the uploaded file. The mime type is used by the browser to identify which application is used to display the content of the BLOB when the file is downloaded. – Filename Column - Enter the page or application item used to store the filename of the uploaded file. . – Character Set Column - Enter the uppercase page or application item name used to store the character set of the uploaded file. The character set of the BLOB is not automatically set on upload. End users should set the character set for the document they are uploading. – BLOB Last Updated Column - Enter the uppercase page or application item name used to store the current timestamp when a file is uploaded. This date value is used for browser caching.. – Display Download Link - Specify whether the download link displays when there is a non-empty BLOB associated with this item. – Download Link Text - Enter the text that displays as part of the download link. If not specified, the text stored in the Text Message for APEX.FILE_BROWSE.DOWNLOAD_LINK_TEXTwithin Shared Components, displays. – Content Disposition - Select how the browser handles the content when downloading. <ul style="list-style-type: none"> • Settings, File Types - Specify a comma delimited list of file types which might be used by the browser to restrict which files can be uploaded.

Table A-1 (Cont.) Available Item Types

Item Type	Description
Hidden	<p>Items that are included within the page source but are not rendered. Hidden item values are saved in session state. They are generally used to store values required by page processing or other page items, but should not be displayed to the end user.</p> <p>Page Designer attribute:</p> <ul style="list-style-type: none"> • Settings, Value is Protected - Select On to prevent hidden values from being manipulated when a page is posted.
Markdown Editor	<p>Displays a simple text editor that enables you to use Markdown shorthand syntax to add formatting to text.</p> <p>Note: Markdown Editor is not supported for interactive grid columns.</p> <p>See Also: Markdown Guide</p> <p>Page Designer item attributes:</p> <ul style="list-style-type: none"> • Settings, Toolbar - Select the number of text formatting icons available within the toolbar: Simple, Full, or None. Simple includes Bold, Italic, Strikethrough, Unordered List, Numbered List, Blockquote, Link. Full adds image upload capability to the Simple (default) layout. None removes all icons except the Preview button. • Validation, Value Required- If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details.
List Manager	<p>Displays a text item with a popup list of values icon, Add and Remove buttons, and a list of selected values.</p> <p>Note: Not supported for interactive grid columns.</p> <p>You can type in the value or pick from the list of available items. You can then utilize the buttons to manage the values selected. The selected values are stored in a single colon-delimited string.</p> <p>Page Designer attributes:</p> <ul style="list-style-type: none"> • Settings, Fetch - Select how data is displayed when the Popup LOV is opened. • Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details. <p>See Also: Creating a Cascading List of Values</p>

Table A-1 (Cont.) Available Item Types

Item Type	Description
Number Field	<p>Displays as a number field and supports automatic formatting. Numbers are formatted on the client after data entry according to the format mask. This item type automatically checks if the entered value is a number. No extra validations are required. Validation is done on both client and server.</p> <p>Page Designer attributes:</p> <ul style="list-style-type: none"> • Appearance, Format Mask - Specifies how the number is to be formatted for display. The locale determines the decimal separator used for data entry. • Settings, Minimum Value - Enter the minimum value permitted. The value can be a static value or a dynamic value using substitution syntax. • Settings, Maximum Value - Enter the maximum value permitted. The value can be a static value or a dynamic value using substitution syntax. • Settings, Number Alignment - Select how to align the number that displays. This setting does not apply when the item is rendered as Read Only or where HTML Form Element Attributes are specified. • Validation, Value Required - If set to On and the page item is visible, Application Express automatically performs a NOT NULL validation when the page is submitted. <p>You can replace the predefined error text with an application specific error message, by defining a message called <code>APEX.PAGE_ITEM_IS_REQUIRED</code> in Shared Components, Text Messages. Specify the message display location by updating the application-level setting, Default Error Display Location.</p>
Password	<p>Displays an HTML password form element. As the end user enters text a black dot is displayed for that character, instead of the actual character entered.</p> <p>Page Designer attributes:</p> <ul style="list-style-type: none"> • Settings, Submit when Enter Pressed - Specify whether pressing the Enter key while in this field automatically submits the page. • Settings, Does not save state - Specify whether the password is saved in session state. <p>Oracle strongly recommends that you do not write the password into session state, for security reasons. The value can potentially be read from browser cache and Application Express session tables. If you do set this attribute to No, consider setting Store value encrypted in session state to Yes.</p> <ul style="list-style-type: none"> • Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details. <p>See Also: About Session State and Security</p>
Percent Graph	<p>Displays the value as a percentage graph. The value retrieved must be between 0 and 100.</p>

Table A-1 (Cont.) Available Item Types

Item Type	Description
Popup LOV	<p>Displays a text item with a popup list of values icon. When the end user clicks the icon, a popup window appears with a search field, and a list of supported values.</p> <p>Popup LOV is best suited for large lists since end users can enter search criteria to reduce the available values displayed. For relatively small lists Select List is often better suited.</p> <pre data-bbox="444 531 821 583">SELECT ename name, empno id FROM emp</pre> <p>If one of the columns is an expression, remember to use an alias. For example:</p> <pre data-bbox="444 709 1170 735">SELECT ename ' ' job display_value, empno FROM emp</pre> <p>Page Designer item attributes:</p> <ul data-bbox="444 821 1377 1119" style="list-style-type: none"> • Settings, Display As - Selects how the results are displayed either an inline popup or modal dialog. • Settings, Initial Fetch - Select how data is initially fetched for the list of values. This applies only the first time the popup is opened after the page loads or the item is refreshed such as due to a cascade. See also attribute Minimum Characters. • Settings, Multiple Values - Specifies if multiple values can be selected or entered. • Settings, Manual Entry - Select whether or not manual entry is allowed. • Validation, Value Required - If set to On and the page item is visible, Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details. <p>See Also: Creating a Cascading List of Values</p>
Radio Group	<p>Displays multiple values as radio group options, enabling the end user to select a single value.</p> <p>The following example displays employee names (ename), but returns employee numbers (empno):</p> <pre data-bbox="444 1339 846 1365">SELECT ename, empno FROM emp;</pre> <p>Page Designer item attributes:</p> <ul data-bbox="444 1451 1377 1894" style="list-style-type: none"> • Settings, Number of Columns - Enter the number of radio group columns to display. For example, a value of 2 would display two columns. If there were five values then it would display over three rows. • Settings, Page Action on Selection - Select what action is taken when a radio group value is selected. See Help for more details. • Settings, Execute Validations - This attribute only appears if Page Action when Value Changed is set to Submit Page. Controls the execution of validations when a page is submitted. Set this attribute to Off to prevent the execution of validations and associated error messages. Set this attribute to On to execute all page and built-in validations and associated error messages when the page is submitted. <p>See Also: About Determining When Validations Execute and Creating a Cascading List of Values</p> <ul data-bbox="444 1818 1377 1894" style="list-style-type: none"> • Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details.

Table A-1 (Cont.) Available Item Types

Item Type	Description
Rich Text Editor	<p>Displays a text area with comprehensive text formatting options. End users can enhance the content displayed in a similar fashion to using a word processor, such as Microsoft Word. End users can also cut and paste documents that are in rich text format (RTF) file format into this item.</p> <p>Note: Not supported for interactive grid columns.</p> <p>Page Designer item attributes:</p> <ul style="list-style-type: none"> • Settings, Toolbar - Select the number of text formatting options available within the editor. • Settings, Toolbar Expanded - Specify whether the editor is initially expanded within the text area. • Settings, Skin - Select the editor skin used to style the editor. • Settings, Toolbar Position - Specify where in the text area the editor displays. • Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details.
Select List	<p>Displays an item with a built-in list of values selector. When the end user clicks the item, the list of supported values displays directly inline with the current item.</p> <p>Select List is best suited for relatively small, discrete lists. End users can very quickly select a value from the list without needing to change focus to a popup dialog. For large lists, consider using a Popup LOV.</p> <pre>select [displayValue], [returnValue] from ... where ... order by ...</pre> <p>Page Designer item attributes:</p> <ul style="list-style-type: none"> • Settings, Page Action on Selection - Select what action is taken when a list value is selected. See help for options. • Settings, Allow Multi Selection - Specify whether multiple values or only a single value can be selected from the list of values. Multiple values are returned as a comma-separated list. • Settings, Execute Validations - Displays if Page Action on Selection is set to Submit Page. Controls the execution of validations when a page is submitted. Set this attribute to Off to prevent the execution of validations and associated error messages. Set this attribute to On to execute all page and built-in validations and associated error messages when the page is submitted. Use this attribute in conjunction with the validation attribute, Always Execute. See Also: About Determining When Validations Execute • Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details.

Table A-1 (Cont.) Available Item Types

Item Type	Description
Shuttle	<p>Displays as a multiple select list that includes two boxes containing lists. The left list displays the source list of values that have not been selected and the right list shows the currently selected values. End users can select one or more values in a list then use the shuttle controls to move the selected values or all values.</p> <p>The current values are stored in a single colon-delimited string.</p> <p>Page Designer item attributes:</p> <ul style="list-style-type: none"> • Settings, Show Controls - Select what data movement controls displays in the middle of the shuttle. Options include: None, Moving Only, Ordering Only, or All. • Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details. <p>Note: To create this item type, you must define a list of values. See Creating Lists of Values at the Application-Level, Working with Multiple Select List Item, and Creating a Cascading List of Values.</p>
Star Rating	<p>Displays a star rating (maximum of 10) that end users can click to set a numeric value.</p> <p>Page Designer item attributes:</p> <ul style="list-style-type: none"> • Settings, Number of Stars - Set the total number of stars (one to ten) for end users to choose (default five). • Settings, Use Defaults - If set to On, the Star Rating uses the application-level component settings defined in Shared Components, Component Settings, Star Rating. <p>See Also: Configuring Star Rating</p> <p>If Use Defaults is set to Off, the following custom settings appear:</p> <ul style="list-style-type: none"> – Icon - The icon class to use (such as <code>fa-thumb-up</code>). Click the drop-down list to pick an icon. – Active Color - Default color for active stars. – Inactive Color - Default color for inactive stars. – Tooltip - The template for the tooltip when end users hover the mouse over the item. This rating value replaces the <code>#VALUE#</code> substitution (for example, the movie rating is <code>#VALUE#</code>). – Show Clear Button - Choose whether to display the Clear button (x) next to the stars. – Show Value - Choose whether to display a value next to the stars. – Read Only Display - Choose what to display if the item is read only. Options include Stars, Value, Stars and Value, and Single Star and Value.

Table A-1 (Cont.) Available Item Types

Item Type	Description
Switch	<p>Displays as a flip toggle switch.</p> <p>Page Designer item attributes:</p> <ul style="list-style-type: none"> • Settings, Use Defaults - If set to On, the Color Picker uses the application-level component settings defined in Shared Components, Component Settings, Color Picker. <p>Note: Switch items can display as a flip toggle switch (the default), Pill Button, or Select List. See Configuring Switch Defaults.</p> <p>If Use Defaults is set to Off, the following custom settings appear:</p> <ul style="list-style-type: none"> – On Value - Enter the value stored in the page item if the user picks the On option. The value can be up to 255 characters long. – On Label - Enter the text displayed for the On option. – Off Value Enter the value stored in the page item if the user picks the Off option. This attribute can also be left blank if you want to store NULL when the Off option is selected. The value can be up to 255 characters long. <p>Note: This value is used if the page item is populated with a value which does not match either the On Value or Off Value.</p> <ul style="list-style-type: none"> – Off Label - Enter the text displayed for the Off option. • Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details.
Text Field	<p>Displays the item as a text field.</p> <p>Page Designer item attributes:</p> <ul style="list-style-type: none"> • Settings, Subtype - Select the HTML5 text subtype. This enables devices with on-screen keyboards to show an optimized keyboard layout specific to the subtype, for easier data input. The subtype selection is also used to render an appropriate link with the value of the page item, if it is rendered read only. This attribute does not change the text item, or data entry, when using a physical keyboard. <p>Note: This HTML5 feature only works in modern browsers. Older, non HTML5-compliant, browsers ignore this attribute and render the page item as a normal text field.</p> <ul style="list-style-type: none"> • Settings, Trim Spaces - Select how the item value is trimmed. This setting trims spaces, tabs, and new lines from the text entered. Options include: Leading, Trailing, Leading and Trailing, or None. • Settings, Text Case - Select how the item value text case is transformed. Options include: No Change, Lower, and Upper. • Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details.

Table A-1 (Cont.) Available Item Types

Item Type	Description
Text Field with autocomplete	<p>Displays a text field that displays a list of possible values, based on the text already entered by the end user, inline with the text item. The list is further refined as the end user types in more text.</p> <pre>select [column] from ... where ... order by ...</pre> <p>Page Designer item attributes:</p> <ul style="list-style-type: none"> • Settings, Search - Select how the search against the entered value is performed. When using Lazy Loading this setting can have an impact on query performance. Selecting Contains & Case Sensitive or Contains & Ignore Case prevents the use of column indexes. • Settings, Lazy Loading - Specify whether matching values are retrieved from the database using Lazy Loading techniques. Lazy loading retrieves matching records from the database each time the user types a character. Otherwise, all of the list values are loaded on page load. Oracle recommends using Lazy Loading when you have a large select list, as loading a large number of records may impact the time to initially load the page. • Settings, Maximum Values in List - Enter the maximum number of items to display in the select box. This value can help avoid performance problems by returning too many rows, and also prevent a very large return set when only a few letters have been entered. • Settings, Automatic Fill - Specify whether the text field is filled automatically with the first autocomplete value. See Help for more details. • Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details.
Text Area	<p>Displays a multiple-row text area.</p> <p>Page Designer item attributes:</p> <ul style="list-style-type: none"> • Settings, Resizable - Specify whether the text area resizing using the mouse is enabled. • Settings, Auto-Height - Specify whether the height of the text area varies based on the amount of text displayed. Use this option to scale the text area to the amount of data. • Settings, Character Counter - If set to On include a counter that displays the number of characters entered in the field. • Settings, Trim Spaces - Select how the item value is trimmed. This setting trims spaces, tabs, and new lines from the text entered. Options include: Leading, Trailing, Leading and Trailing, or None. • Validation, Value Required - If set to On and the page item is visible, Oracle Application Express automatically performs a NOT NULL validation when the page is submitted. See Help for more details.

B

Oracle Application Express Limits

Learn about limits associated with Oracle Application Express components.

The Oracle Application Express development environment has no limits as to the number of workspaces or number of users that can exist in a given workspace.

- [Component Limits](#)

B.1 Component Limits

The following table describes limits associated with Oracle Application Express components, such as interactive reports, classic reports, forms, and tabular forms.

Table B-1 Component Limits

Component	Limits	To Learn More...
Data loading	When loading data, the maximum number of columns is 45.	"Managing Applications with Legacy Data Loading Capability"
Export of interactive report and classic report using external print server	If using an external print server, there is a 32k limitation on the generated report template header sub-template. Also, depending on the column alias lengths, approximately 26 columns (or less) are supported.	"Exporting an Application and Application Components"
Forms	32767 bytes for a text area or rich text editor item. Two columns for primary key (when using built in DML processes). For users with more than two primary key columns defined, you can also specify a ROWID.	"Developing Forms"
Interactive reports	999 rows per column heading filter (if no custom LOV is specified in the column attributes). A chart within an interactive report can render up to 10000 data points.	"Developing Reports"
Item names	Item names should not exceed 30 characters. Items longer than 30 characters cannot be referenced using bind variable syntax.	"Referencing Session State Using Bind Variable Syntax" "About Item Naming Conventions"
Tabular Forms	One wizard-generated tabular form per page (using built-in DML). 50 editable tabular form columns (apex_application.g_f01-apex_application.g_f50), generated with apex_item or the built-in tabular form display types.	"Managing Legacy Tabular Forms"

Table B-1 (Cont.) Component Limits

Component	Limits	To Learn More...
Validations	Text entered for validations may not exceed 3,950 characters.	"Understanding Validations"

C

Directory Structure When Splitting Export Files into Separate Scripts

Exporting an application, page, or component as separate files creates a directory structure organized by component type.

This directory structure may extend multiple levels. This directory structure is the same whether you are using **Export as Zip** option in App Builder or the `APEXExport` utility with the `-split` option.

- [Export Directory Structure](#)



See Also:

["Splitting Export Files into Separate Scripts"](#)

C.1 Export Directory Structure

The following table describes the directory structure of applications, pages, or components exported as separate files.

Component	Directory Structure
Page	application/pages
Page Group	application/pages/page_groups
Plug-in Settings	application/plugin_settings
Credential	application/shared_components/credentials
Data Loading	application/shared_components/data_loading/tables
Data Profile	application/shared_components/data_profiles
Email Template	application/shared_components/email/templates
Application Static File	application/shared_components/files
Text Message	application/shared_components/globalization/messages
Application Computation	application/shared_components/logic/ application_computations
Application Item	application/shared_components/logic/application_items
Application Process	application/shared_components/logic/application_processes
Application Setting	application/shared_components/logic/application_settings
Build Option	application/shared_components/logic/build_options
Build Option Status	application/shared_components/logic/build_options/status

Component	Directory Structure
Web Service	application/shared_components/logic/webservices
Breadcrumb Entry	application/shared_components/navigation/breadcrumbentry
Breadcrumb	application/shared_components/navigation/breadcrumbs
List	application/shared_components/navigation/lists
Navigation Bar Entry	application/shared_components/navigation/navigation_bar
Parent Tab	application/shared_components/navigation/tabs/parent
Tab	application/shared_components/navigation/tabs/standard
Tree	application/shared_components/navigation/trees
Plug-in	application/shared_components/plugins
Remote Server	application/shared_components/remote_servers
Report Layout	application/shared_components/reports/report_layouts
Report Query	application/shared_components/reports/report_queries
Application Access Control Role	application/shared_components/security/app_access_control
Authentication Scheme	application/shared_components/security/authentications
Authorization Scheme	application/shared_components/security/authorizations
List of Values	application/shared_components/user_interface/lovs
Shortcut	application/shared_components/user_interface/shortcuts
Breadcrumb Template	application/shared_components/user_interface/templates/ breadcrumb
Button Template	application/shared_components/user_interface/templates/ button
Calendar Template	application/shared_components/user_interface/templates/ calendar
Label Template	application/shared_components/user_interface/templates/ label
List Template	application/shared_components/user_interface/templates/ list
Page Template	application/shared_components/user_interface/templates/ page
Popup List of Values Template	application/shared_components/user_interface/templates/ populov
Region Template	application/shared_components/user_interface/templates/ region
Report Template	application/shared_components/user_interface/templates/ report
REST Data Source (Web Source)	application/shared_components/web_sources

D

Available Conditions

Learn about conditions available in App Builder.

- [What Are Conditions?](#)
- [Conditions Available in App Builder](#)

D.1 What Are Conditions?

A condition is a small unit of logic that helps developers control the display of regions, items, buttons, and tabs as well execute processes, computations and validations. When you apply a condition to a control or component, the condition is evaluated. Whether a condition passes or fails determines whether a control or component displays, or page processing executes.

You can specify conditions by selecting a condition type when you create the control (region, button, or item) or component (tab, list, or navigation bar), or by making a selection under the condition attribute.



See Also:

["Understanding Conditional Rendering and Processing"](#) and ["Conditions Available in App Builder"](#)

D.2 Conditions Available in App Builder

The following table describes many App Builder conditions. To view a complete listing of all available conditions for a given control or component, expand the condition type list.

Table D-1 Available Conditions

Condition	Description
Rows returned	The SQL query returns one or more rows.
No Rows returned	The SQL Query returns no rows
SQL Expression	The SQL expression evaluates to TRUE.
PLSQL Expression	The SQL expression evaluates to TRUE.
PL/SQL Function Body	The PL/SQL function body returns TRUE.
Request = Value	The page request is equal to the text you enter into the Value attribute.
Request != Value	The page request is not equal to the text you enter into the Value attribute.
Request is contained in Value	The page request is contained in the text you enter into the Value attribute.

Table D-1 (Cont.) Available Conditions

Condition	Description
Request is NOT contained in Value	The page request is not contained in the text you enter into the Value attribute.
Item = Value	The value of the selected item is equal to the text you enter into the Value attribute.
Item != Value	The value of the selected item is not equal to the text you enter into the Value attribute.
Item is NULL	The value of the selected item is empty.
Item is NOT NULL	The value of the selected item is not empty.
Item is zero	The value of the selected item is the number zero.
Item is NOT zero	The value of the selected item is not the number zero.
Item is NULL or zero	The value of the selected item is empty or the number zero.
Item is NOT NULL and NOT zero	The value of the selected item is not empty and not the number zero.
Item contains no spaces	The value of the selected item has no spaces.
Item is numeric	The value of the selected Item is numeric.
Item is NOT numeric	The value of the selected item is not numeric.
Item is alphanumeric	The value of the selected item is alphanumeric, containing only letters or numbers and no special characters.
Item is in colon delimited list	The value of the selected item is completely contained in the text you enter into the Value attribute.
Item is NOT in colon delimited list	The value of the selected Item is not completely contained in the text you entered into the Value attribute.
User Preference = Value	The value of the Preference entered is equal to the text you enter into the Value attribute.
User Preference != Value	The value of the Preference entered is not equal to the text you enter into the Value attribute.
Current Page = Page	The current page is equal to the value you enter into Page.
Current Page != Page	The current page is not equal to the value you enter into Page.
Current Page is in comma delimited list	The current page is in the comma separated list you enter into Pages.
Current Page is NOT in comma delimited list	The current page is not in the comma separated list you enter into Pages.
Current page is in Printer Friendly mode	The current page has been toggled to 'Printer Friendly Mode' by the end user.
Current page is NOT in Printer Friendly mode	The current page has not been toggled to 'Printer Friendly Mode' by the end user.
Page/Region is Read Only	Either the page or parent region, if appropriate, 'Read Only' condition evaluates to TRUE.
Page/Region is NOT Read Only	The page and parent region, if appropriate, are displayed normally.
User is authenticated (not public)	The end user is logged into the application. See Also: "Establishing User Identity Through Authentication" for information about authentication
User is the public user (user has not authenticated)	The end user is not logged into the application.

Table D-1 (Cont.) Available Conditions

Condition	Description
Inline Validation Errors Displayed	An inline validation error is displayed on the page, following a page submission.
Inline Validation Errors NOT displayed	An inline validation error is not displayed on the page.
Current Language = Value	The end user is currently running the application in the language you enter into the Value attribute.
Current Language != Value	The end user is not currently running the application in the language you enter into the Value attribute.
Current Language is contained in Value	The end user is currently running the application in one of the languages you enter into the Value attribute.
Current Language is NOT contained in Value	The end user is not currently running the application in one of the languages you enter into the Value attribute.
Never	The component is never rendered. Note: Changing a condition to Never will remove any existing condition. For temporarily disabling a component, Oracle recommends using the Build Option attribute.

E

About Granted Privileges

Learn about grant privileges in Oracle Application Express.

- [About Granting Privileges to Database Users](#)
- [Understanding Privileges Granted to PUBLIC](#)

E.1 About Granting Privileges to Database Users

In Oracle Application Express, no privileges are granted to database users when creating a workspace on an existing schema. Unless direct grants exist, database users in Oracle Application Express will not be able to create tables or other database objects. To allow the creation of typical database objects, Oracle recommends the following list of directly granted privileges:

```
grant CREATE SESSION to [database username]
grant CREATE CLUSTER to [database username]
grant CREATE DIMENSION to [database username]
grant CREATE INDEXTYPE to [database username]
grant CREATE JOB to [database username]
grant CREATE MATERIALIZED VIEW to [database username]
grant CREATE OPERATOR to [database username]
grant CREATE PROCEDURE to [database username]
grant CREATE SEQUENCE to [database username]
grant CREATE SNAPSHOT to [database username]
grant CREATE SYNONYM to [database username]
grant CREATE TABLE to [database username]
grant CREATE TRIGGER to [database username]
grant CREATE TYPE to [database username]
grant CREATE VIEW to [database username]
```

E.2 Understanding Privileges Granted to PUBLIC

This section describes public synonyms that exist and for which the execute privilege is granted to PUBLIC for the packages, procedures, functions, tables, and views owned by the Oracle Application Express product schema, (for example, APEX_210100). To avoid conflicts with operation of the Application Express engine, Oracle recommends not to use the

following names for database objects in schemas associated with Oracle Application Express workspaces.

 **Tip:**

To avoid conflicts with operation of the Application Express engine, Oracle recommends not to use the following names for database objects in schemas associated with Oracle Application Express workspaces.

- Packages
- Procedures
- Functions
- Tables
- Views
- Sequences
- Types

E.2.1 Packages

Public synonyms exist and execute privilege is granted to PUBLIC for the following packages owned by the Oracle Application Express product schema, (for example, APEX_210100):

```
APEXWS
APEX_MIG_PROJECTS_UPDATE
APEX_UI_DEFAULT_UPDATE
HTMLDB_CUSTOM_AUTH
HTMLDB_ITEM
HTMLDB_LANG
HTMLDB_SITE_ADMIN_PRIVS
WWV_FLOW_APPLICATION_INSTALL
HTMLDB_UTIL
WWV_FLOW
WWV_FLOW_API
WWV_FLOW_AUDIT
WWV_FLOW_CSS_API
WWV_FLOW_APPLICATION_INSTALL
WWV_FLOW_AUDIT
WWV_FLOW_COLLECTION
```

WWV_FLOW_CSS
WWV_FLOW_CSS_API
WWV_FLOW_CUSTOMIZE
WWV_FLOW_CUSTOM_AUTH
WWV_FLOW_CUSTOM_AUTH_LDAP
WWV_FLOW_CUSTOM_AUTH_STD
WWV_FLOW_DEBUG_MESSAGE
WWV_FLOW_EPG_INCLUDE_MODULES
WWV_FLOW_FILE_MGR
WWV_FLOW_FND_USER_API
WWV_FLOW_GLOBAL
WWV_FLOW_HINT
WWV_FLOW_HTML_API
WWV_FLOW_ID
WWV_FLOW_IMAGE_API
WWV_FLOW_ITEM
WWV_FLOW_ITEM_HELP
WWV_FLOW_JAVASCRIPT
WWV_FLOW_LANG
WWV_FLOW_LDAP
WWV_FLOW_LOOKUP_TABLES
WWV_FLOW_MAIL
WWV_FLOW_PLSQL_JOB
WWV_FLOW_PLUGIN
WWV_FLOW_PLUGIN_UTIL
WWV_FLOW_PREFERENCES
WWV_FLOW_RANDOM
WWV_FLOW_RENDER_SHORTCUT
WWV_FLOW_REST
WWV_FLOW_SVG
WWV_FLOW_USER_API
WWV_FLOW_UTILITIES
WWV_FLOW_WEBSERVICES_API

WWV_FLOW_WS_IMPORT_API

WWV_MIG_ACC_LOAD

WWV_RENDER_CALENDAR2

WWV_RENDER_CHART2

Execute privilege is granted to PUBLIC for the following packages owned by the Oracle Application Express product schema, (for example, APEX_210100):

WWV_CALCULATOR

WWV_FLOW_FLASH_CHART

WWV_FLOW_GENERATE_DDL

WWV_FLOW_IMAGE_GENERATOR

WWV_FLOW_TREE_GLOBAL_VARS

E.2.2 Procedures

Public synonyms exist and execute privilege is granted to PUBLIC for the following procedures owned by the Oracle Application Express product schema, (for example, APEX_210100):

APEX

APEX_ADMIN

DEVELOPMENT_SERVICE_HOME

DEVELOPMENT_SERVICE_HOME_LOGIN

DEVELOPMENT_SERVICE_SIGNUP

F

HTMLDB

HTMLDB_ADMIN

HTMLDB_LOGIN

P

WS

WWV_FLOW_INIT_HTTP_BUFFER

Z

E.2.3 Functions

Public synonyms exist and execute privilege is granted to PUBLIC for the following functions owned by the Oracle Application Express product schema, (for example, APEX_210100):

NV

V

Execute privilege is granted to PUBLIC for the following function owned by the Oracle Application Express product schema, (for example, APEX_210100):

WWV_POPUP_FILTER

E.2.4 Tables

Public synonyms exist and select privilege is granted to PUBLIC for the following tables owned by the Oracle Application Express product schema, (for example, APEX_210100):

WWV_FLOW_DUAL100

WWV_FLOW_TEMP_TABLE

WWV_FLOW_LOV_TEMP

E.2.5 Views

Public synonyms exist and select privilege is granted to PUBLIC for the following views owned by the Oracle Application Express product schema (for example, APEX_210100):

APEX_APPLICATIONS

APEX_APPLICATION_ALL_AUTH

APEX_APPLICATION_AUTH

APEX_APPLICATION_AUTHORIZATION

APEX_APPLICATION_BC_ENTRIES

APEX_APPLICATION_BREADCRUMBS

APEX_APPLICATION_BUILD_OPTIONS

APEX_APPLICATION_CACHING

APEX_APPLICATION_COMPUTATIONS

APEX_APPLICATION_GROUPS

APEX_APPLICATION_ITEMS

APEX_APPLICATION_LISTS

APEX_APPLICATION_LIST_ENTRIES

APEX_APPLICATION_LOVS

APEX_APPLICATION_LOV_ENTRIES

APEX_APPLICATION_NAV_BAR

APEX_APPLICATION_PAGES

APEX_APPLICATION_PAGE_BRANCHES

APEX_APPLICATION_PAGE_BUTTONS

APEX_APPLICATION_PAGE_CHARTS
APEX_APPLICATION_PAGE_CHART_S
APEX_APPLICATION_PAGE_CHART_A
APEX_APPLICATION_PAGE_COMP
APEX_APPLICATION_PAGE_DA
APEX_APPLICATION_PAGE_DA_ACTS
APEX_APPLICATION_PAGE_DB_ITEMS
APEX_APPLICATION_PAGE_FLASH5
APEX_APPLICATION_PAGE_FLASH5_S
APEX_APPLICATION_PAGE_GROUPS
APEX_APPLICATION_PAGE_IR
APEX_APPLICATION_PAGE_IR_CAT
APEX_APPLICATION_PAGE_IR_CGRPS
APEX_APPLICATION_PAGE_IR_COL
APEX_APPLICATION_PAGE_IR_COMP
APEX_APPLICATION_PAGE_IR_COND
APEX_APPLICATION_PAGE_IR_GRPBY
APEX_APPLICATION_PAGE_IR_PIVOT
APEX_APPLICATION_PAGE_IR_PVAGG
APEX_APPLICATION_PAGE_IR_PVSRT
APEX_APPLICATION_PAGE_IR_RPT
APEX_APPLICATION_PAGE_IR_SUB
APEX_APPLICATION_PAGE_ITEMS
APEX_APPLICATION_PAGE_MAP
APEX_APPLICATION_PAGE_PROC
APEX_APPLICATION_PAGE_REGIONS
APEX_APPLICATION_PAGE_RPT
APEX_APPLICATION_PAGE_RPT_COLS
APEX_APPLICATION_PAGE_TREES
APEX_APPLICATION_PAGE_VAL
APEX_APPLICATION_PARENT_TABS
APEX_APPLICATION_PROCESSES
APEX_APPLICATION_RPT_LAYOUTS

APEX_APPLICATION_RPT_QRY_STMTS
APEX_APPLICATION_RPT_QUERIES
APEX_APPLICATION_SETTINGS
APEX_APPLICATION_SHORTCUTS
APEX_APPLICATION_SUBSTITUTIONS
APEX_APPLICATION_SUPP_OBJECTS
APEX_APPLICATION_SUPP_OBJ_BOPT
APEX_APPLICATION_SUPP_OBJ_CHCK
APEX_APPLICATION_SUPP_OBJ_SCR
APEX_APPLICATION_TABS
APEX_APPLICATION_TEMPLATES
APEX_APPLICATION_TEMP_BC
APEX_APPLICATION_TEMP_BUTTON
APEX_APPLICATION_TEMP_CALENDAR
APEX_APPLICATION_TEMP_LABEL
APEX_APPLICATION_TEMP_LIST
APEX_APPLICATION_TEMP_PAGE
APEX_APPLICATION_TEMP_POPUPLOV
APEX_APPLICATION_TEMP_REGION
APEX_APPLICATION_TEMP_REPORT
APEX_APPLICATION_THEMES
APEX_APPLICATION_TRANSLATIONS
APEX_APPLICATION_TRANS_MAP
APEX_APPLICATION_TREES
APEX_APPLICATION_WEB_SERVICES
APEX_APPL_ACL_ROLES
APEX_APPL_ACL_USER_ROLES
APEX_APPL_ACL_USERS
APEX_APPL_PAGE_IG_COLUMNS
APEX_APPL_PAGE_IG_COL_GROUPS
APEX_APPL_PAGE_IGS
APEX_APPL_PAGE_IG_RPTS
APEX_APPL_PAGE_IG_RPT_VIEWS

APEX_APPL_PAGE_IG_RPT_COMPUTES
APEX_APPL_PAGE_IG_RPT_FILTERS
APEX_APPL_PAGE_IG_RPT_COLUMNS
APEX_APPL_PAGE_IG_RPT_HIGHLTS
APEX_APPL_PAGE_IG_RPT_AGGS
APEX_APPL_PAGE_IG_RPT_CHT_COLS
APEX_APPL_PLUGINS
APEX_APPL_PLUGIN_ATTRIBUTES
APEX_APPL_PLUGIN_ATTR_VALUES
APEX_APPL_PLUGIN_EVENTS
APEX_APPL_PLUGIN_FILES
APEX_DEBUG_MESSAGES
APEX_DEVELOPER_ACTIVITY_LOG
APEX_DICTIONARY
APEX_PATCHES
APEX_PKG_APP_ACTIVITY
APEX_PKG_APP_AUTHENTICATIONS
APEX_PKG_APPS
APEX_RELEASE
APEX_STANDARD_CONDITIONS
APEX_TEAM_BUGS
APEX_TEAM_FEEDBACK
APEX_TEAM_MILESTONES
APEX_TEAM_TODOS
APEX_THEMES
APEX_UI_DEFAULTS_ATTR_DICT
APEX_UI_DEFAULTS_COLUMNS
APEX_UI_DEFAULTS_GROUPS
APEX_UI_DEFAULTS_LOV_DATA
APEX_UI_DEFAULTS_TABLES
APEX_WORKSPACES
APEX_WORKSPACE_ACCESS_LOG
APEX_WORKSPACE_ACTIVITY_LOG

APEX_WORKSPACE_APEX_USERS
APEX_WORKSPACE_CLICKS
APEX_WORKSPACE_DEVELOPERS
APEX_WORKSPACE_FILES
APEX_WORKSPACE_LOG_SUMMARY
APEX_WORKSPACE_LOG_SUMMARY_USR
APEX_WORKSPACE_SCHEMAS
APEX_WORKSPACE_SESSIONS
APEX_WORKSPACE_SQL_SCRIPTS
APEX_WS_APPLICATIONS
APEX_WS_APP_PAGES
APEX_WS_DATA_GRID
APEX_WS_DATA_GRID_COL
WWV_FLOW_CLICKTHRU_LOG
WWV_FLOW_COLLECTIONS
WWV_FLOW_FEEDBACK_TYPES
WWV_FLOW_GROUP_USERS
WWV_FLOW_LISTS_OF_VALUES\$_V
WWV_FLOW_LIST_OF_VALUES_DATA_V
WWV_FLOW_MONTHS_MON
WWV_FLOW_MONTHS_MONTH
WWV_FLOW_PLSQL_JOBS
WWV_FLOW_USERS
WWV_FLOW_USER_ACCESS_LOG
WWV_FLOW_USER_ACTIVITY_LOG
WWV_FLOW_USER_MAIL_LOG
WWV_FLOW_YEARS

Additionally, insert is granted on the following:

WWV_FLOW_FILES

Additionally, the following views have select privilege granted to PUBLIC, but no synonym:

WWV_FLOW_HOURS_12
WWV_FLOW_HOURS_24
WWV_FLOW_MINUTES

WWV_FLOW_MINUTES_5

E.2.6 Sequences

The following sequences have public synonyms and select privilege granted to public:

WWV_FLOW_SESSION_SEQ

WWV_SEQ

E.2.7 Types

The following types have execute granted to public but no synonyms:

WWV_FLOW_TREE_ENTRY

WWV_FLOW_TREE_SUBS

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