Oracle® APEX AI Application Generator

SQL Workshop Guide

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Oracle APEX AI Application Generator SQL Workshop Guide, Release 26.1

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Preface

Oracle APEX SQL Workshop Guide describes how to use SQL Workshop and Oracle APEX utilities to load and unload data from an Oracle database, generate DDL, view object reports, and restore dropped database objects.

- Audience
- Related Documents
- Conventions

Audience

Oracle APEX SQL Workshop Guide is intended for application developers who are building database-centric Web applications using Oracle APEX. The guide describes how to use Oracle APEX SQL Workshop and utilities to load and unload data from an Oracle database, generate DDL, view object reports, and restore dropped database objects.

To use this guide, you must have a general understanding of relational database concepts and the operating system environment under which Oracle APEX is running.

> **See Also**
>
> Quick Start in *Oracle APEX App Builder User's Guide*

Related Documents

For more information, see these Oracle resources:

- Oracle APEX Documentation Library
- *Oracle AI Database Concepts*
- Working with SQLcl in *Oracle SQLcl User's Guide*

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.

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Convention	Meaning
italic	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.

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1

Changes in Release 26.1

All content in *Oracle APEX SQL Workshop Guide* has been updated to reflect release 26.1 functionality and user interface changes.

See *Oracle APEX Release Notes* for details on New Features and Changed Behavior.

Deprecated and Desupported Features

See Deprecated Features and Desupported Features in *Oracle APEX Release Notes*.

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2

Getting Started with SQL Workshop

SQL Workshop provides tools that enable you to view and manage database objects.

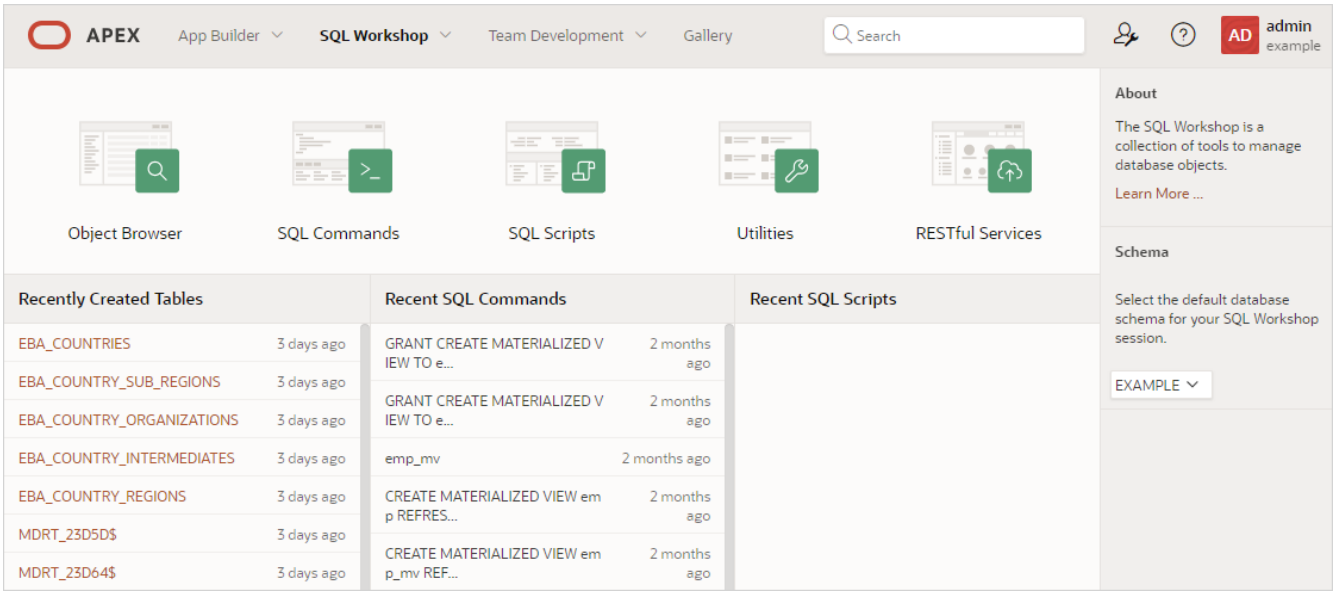
Object Browser enables you to use a tree control to view object properties and create new objects. The SQL Commands tool enables you to enter ad-hoc SQL. Query Builder enables you to create join queries using drag and drop. SQL Scripts enables you to store and run scripts. The Data Workshop enables you to load and unload text, DDL, and spreadsheet data.

- SQL Workshop Home Page
  Learn about the SQL Workshop home page.
- Selecting a Schema
  Select the default database schema for your SQL Workshop session.

2.1 SQL Workshop Home Page

Learn about the SQL Workshop home page.

You access SQL Workshop by clicking the **SQL Workshop** icon on the Workspace home page. The SQL Workshop home page appears.



SQL Workshop home page features the following icons:

- Object Browser.
- SQL Commands.
- SQL Scripts.
- Utilities.

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- RESTful Services.

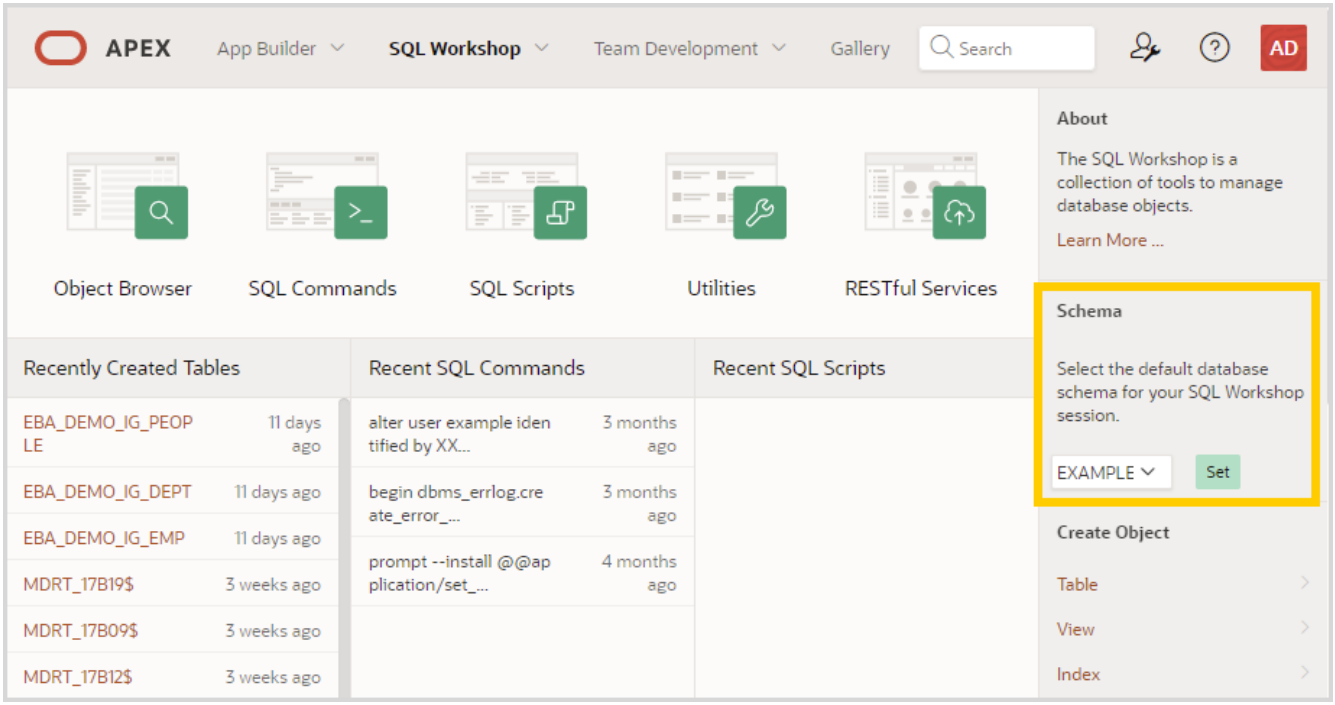
See Also

- Managing Database Objects with Object Browser
- Using SQL Commands
- Using SQL Scripts
- Using SQL Workshop Utilities
- Enabling Data Exchange with RESTful Services

2.2 Selecting a Schema

Select the default database schema for your SQL Workshop session.

A schema is a logical container for database objects. Use the Schema list on the right side of the SQL Workshop home page to select the default database schema for your SQL Workshop session. Only schemas assigned to your workspace display in the Schema list.



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3

Managing Database Objects with Object Browser

Object Browser enables developers to browse, create, and edit objects in the Oracle Database.

Oracle APEX has many views defined to help you work with the underlying table structures. The views combine multiple base tables and use meaningful column names to minimize complexity and to be more intuitive to use.

- Accessing Object Browser
  Learn about how to access Object Browser.
- Understanding Object Browser
  Use Object Browser to create, browse, and edit database objects in your workspace.
- Managing Tables
  A table is a unit of data storage in an Oracle database, containing rows and columns. Use Object Browser to create, view, edit, or drop tables.
- Managing Views
  A view is a logical representation of another table or combination of tables. Use Object Browser to create, view, edit, download, compile, and drop views.
- Managing Indexes
  An index is an optional structure associated with tables and clusters. Use Object Browser to create, view, or drop an index.
- Managing Sequences
  A sequence generates a serial list of unique numbers for numeric columns of a database table. Use Object Browser to create, view, or drop a sequence.
- Managing Types
  A type is a user-specified object or collection definition. Use Object Browser to create, view, or drop a type.
- Managing Packages
  A package is a database object that groups logically related PL/SQL types, items, functions and procedures. Use Object Browser to view, create, edit, download, and drop packages.
- Managing Procedures
  A procedure is a subprogram that performs a specific action. Use Object Browser to view, create, edit, download, and drop procedures.
- Managing Functions
  A function is a subprogram that can take parameters and return a single value. You can use Object Browser to create, view, edit, compile, download, and drop functions.
- Managing Triggers
  A database trigger is a stored subprogram associated with a database table, view, or event. You can use Object Browser to create, view, edit, compile, download, drop, and disable or enable a trigger.

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- Managing Database Links
  A database link is a schema object in one database that enables you to access objects in another database. Use Object Browser to create, browse, or drop a database link.
- Managing Materialized Views
  A materialized view is a query result that is stored or *materialized* in advance as a schema object. Use Object Browser to view, or drop materialized views.
- Managing Synonyms
  A synonym is an alias for a schema object. Use Object Browser to create, view and drop a synonym.
- Managing SODA Collections
  Use Object Browser to load data to a SODA collection as JSON, TXT, or ZIP files.

> **See Also**
>
> *Oracle AI Database SQL Language Reference*

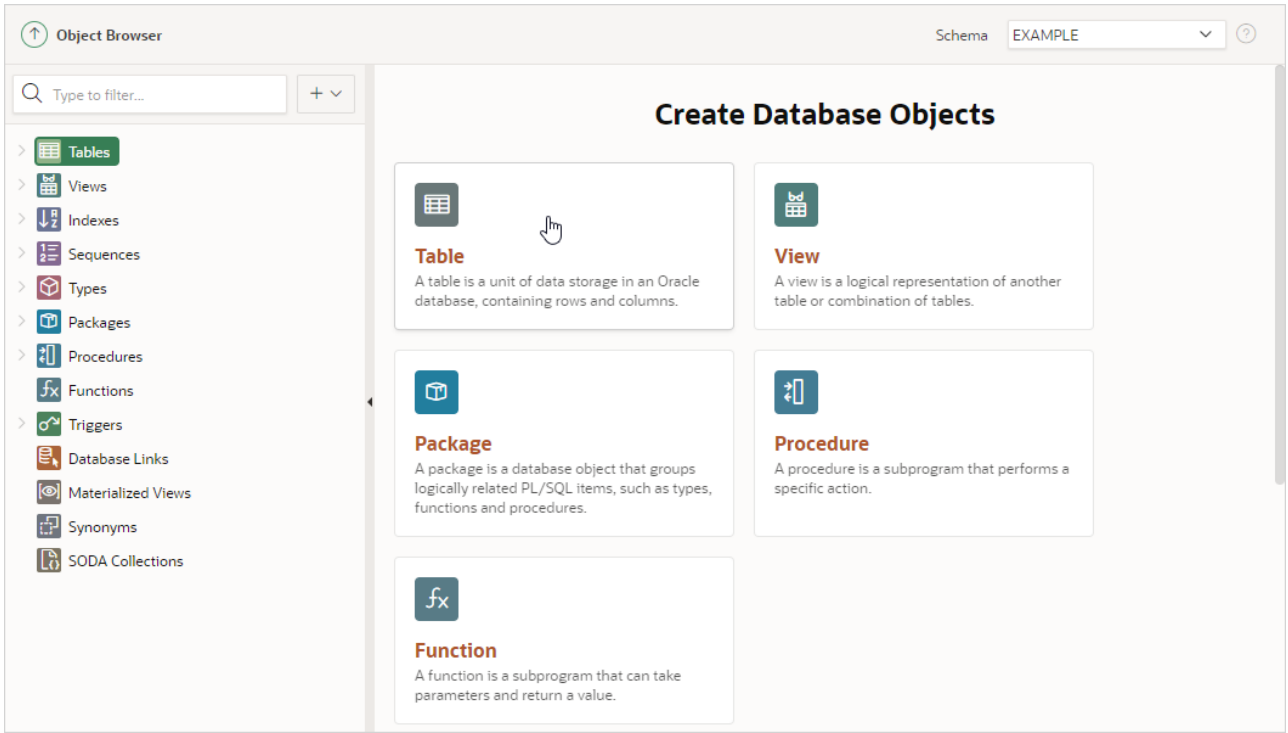
3.1 Accessing Object Browser

Learn about how to access Object Browser.

To access Object Browser:

1. On the Workspace home page, click **SQL Workshop**.
2. Click **Object Browser**.

   Object Browser appears.



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The **Object Tree** displays in the left pane and displays database objects of a selected type. To view specific objects, expand the object type. When you initially access Object Browser, the right pane displays a cards region with tiles for each object type. Clicking a tile displays the create object wizard for the selected object. Once you start using Object Browser, the cards region disappears. To display the cards region again, click an object type in Object Tree.

> **See Also**
>
> Configuring SQL Workshop in *Oracle APEX Administration Guide*

3.2 Understanding Object Browser

Use Object Browser to create, browse, and edit database objects in your workspace.

- About Object Tree and Object Detail View
  Learn about the Object Tree and Object Detail View.
- Selecting Objects and Viewing Object Details
  You can view the details of an object by selecting it from the Object Tree and then clicking the different object detail tabs.
- Filtering Objects in the Object Tree
  Filter objects by entering a search term in the filter above the Object Tree.
- Hiding or Resizing the Object Tree
  Hide or restore the Object Tree clicking the Collapse and Restore controls.
- Code Editor in Object Browser
  Learn about the Code Editor available Object Browser.
- Creating Database Objects
  Use the Create dialog to create database objects in Object Browser.

3.2.1 About Object Tree and Object Detail View

Learn about the Object Tree and Object Detail View.

Object Browser is divided into two panes:

- **Object Tree** - The Object Tree displays database objects of a selected type within the current schema. To view specific objects, expand the object type and select the object in the tree.

  To change the current schema, select a new schema from the **Schema** list.
- **Object Detail View** - Selecting an object type in the Object Tree populates the Object Detail View. The Object Detail View displays tabs specific to the object type. Each tab displays actions appropriate for the object.

  In the following example, **Views** is expanded and displays six views.

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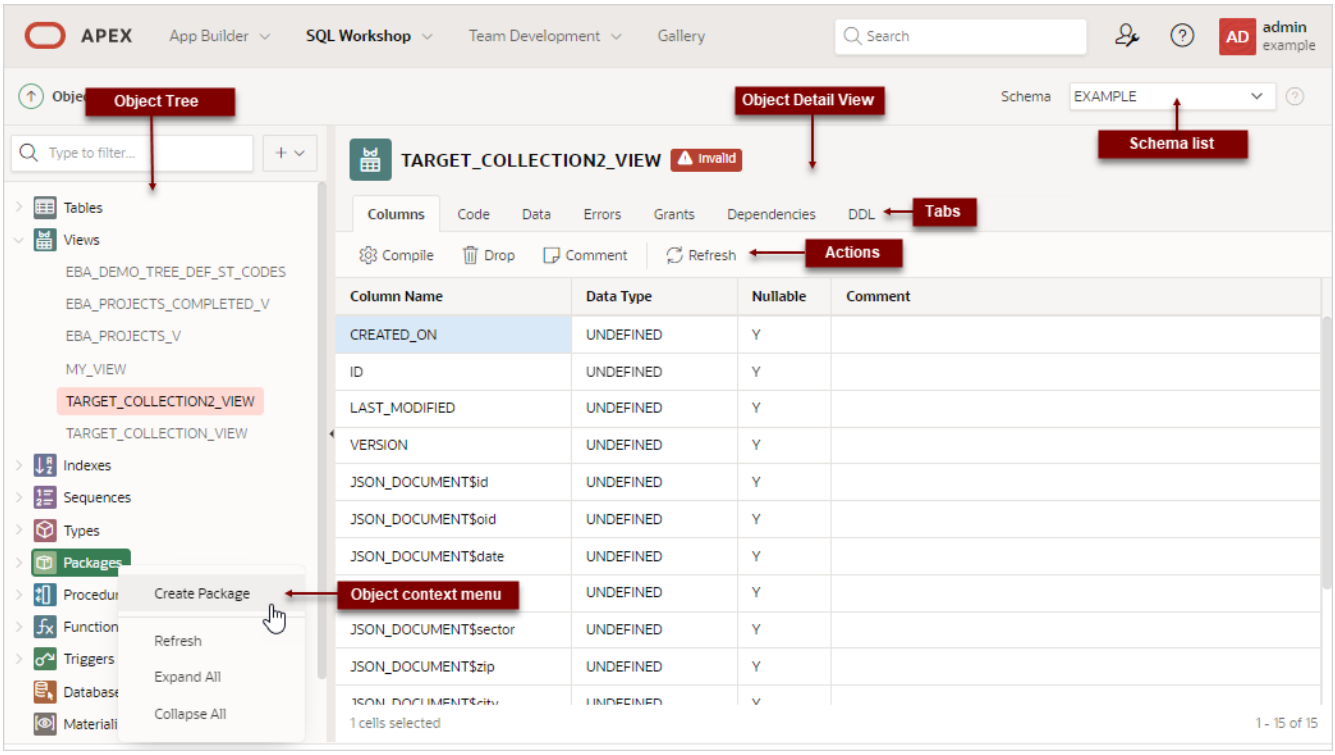

About the Object Tree Context Menus

Right-clicking an object type, displays a context menu with the following controls:

- **Create** *object* - Launches the appropriate Create *Object* dialog.
- **Refresh** - Refreshes the current view.
- **Expand All** - Expands all nodes in the Object Tree.
- **Collapse All** - Collapses all nodes in the Object Tree.

Common Object Browser Behaviors

Other common Object Browser behaviors include:

- Invalid objects display in red in the Object Tree and an Invalid flag appears in the Object Detail View.
- Object Browser remembers the last viewed object. If you exit Object Browser and return later, the last viewed object and the line position displays.
- When modifying objects, such as adding a column to a table, the Create dialog displays the SQL it creates in the dialog. Developers can use this as a learning tool or copy and paste it for later use.

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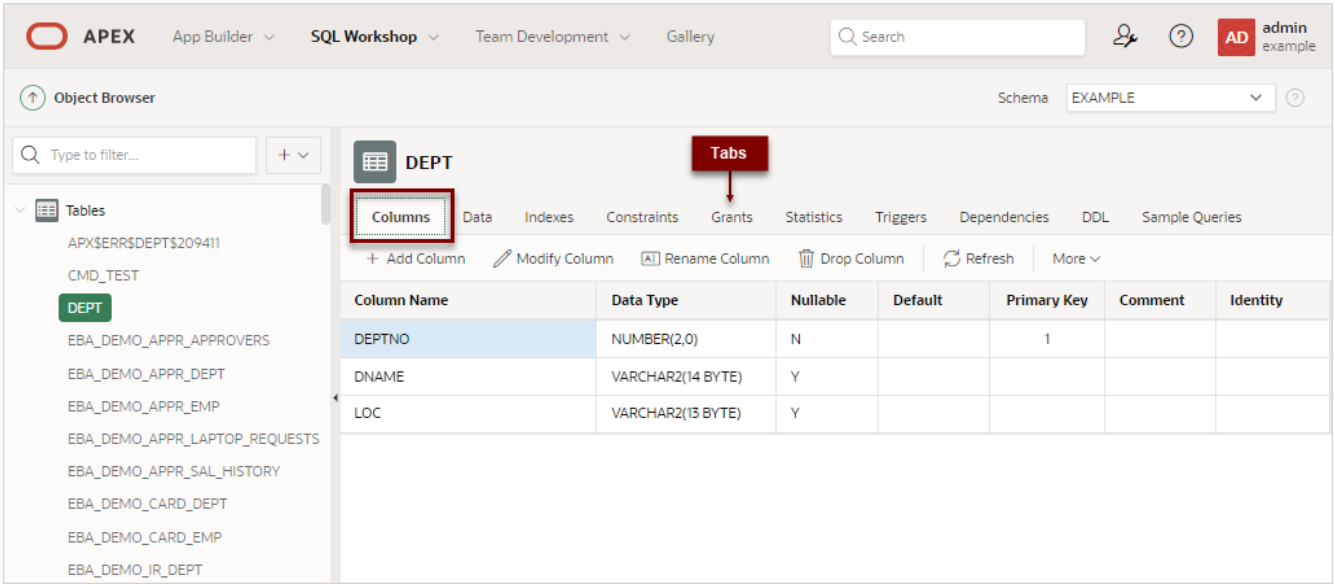
3.2.2 Selecting Objects and Viewing Object Details

You can view the details of an object by selecting it from the Object Tree and then clicking the different object detail tabs.

Object Detail View

In Object Browser, expand an object type in the Object Tree and select an object. The object details (also called the **Object Detail View**) appears.



Note the various tabs available for the object. The specific tabs available varies depending upon the object type. In the previous example, the `DEPT` table is selected and includes the following tabs: **Columns**, **Data**, **Indexes**, **Constraints**, **Grants**, **Statistics**, **Triggers**, **Dependencies**, **DDL**, and **Sample Queries**. In this example, the **Columns** tab is selected.

Object Tabs and Actions

The next example shows Object Browser with the `DEPT` table and **Data** tab selected. You can view and edit the table data using the **Data** tab. The **Data** tab includes the following Actions: **Insert Row**, **Columns**, **Filter**, **Count Rows**, **Load Data**, **Download**, and **Refresh**.

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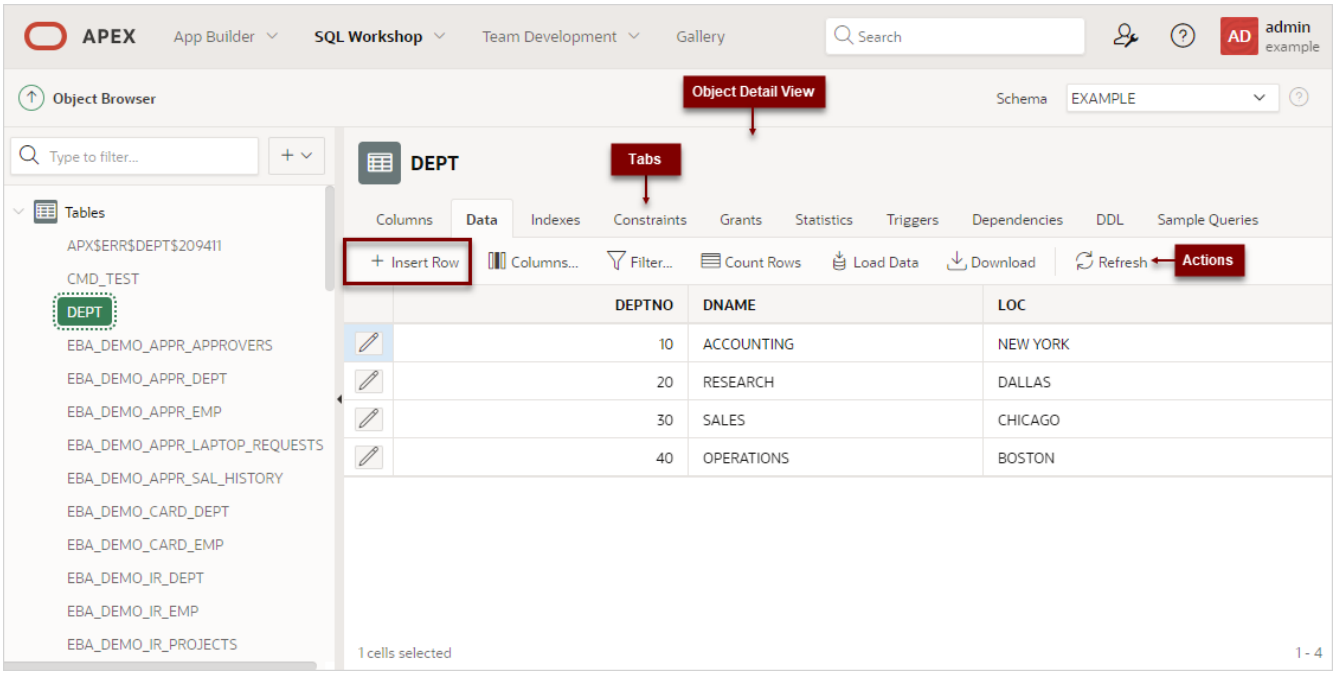

You can view and edit the table data from the Data tab. For example, to add a table row:

1. Click the **Data** tab.
2. Click the **Insert Row** action.

   Clicking an action displays a dialog box.
3. Edit the row details and click **Create**.

> **Note**
>
> To learn more about editing table data see Editing Table Data.

3.2.3 Filtering Objects in the Object Tree

Filter objects by entering a search term in the filter above the Object Tree.

In the example that follows, the search term `PROJECTS` displays in the filter. Within the Object Tree only objects that include that search term appear. Filters created in Object Browser are persistent and are preserved within the APEX session.

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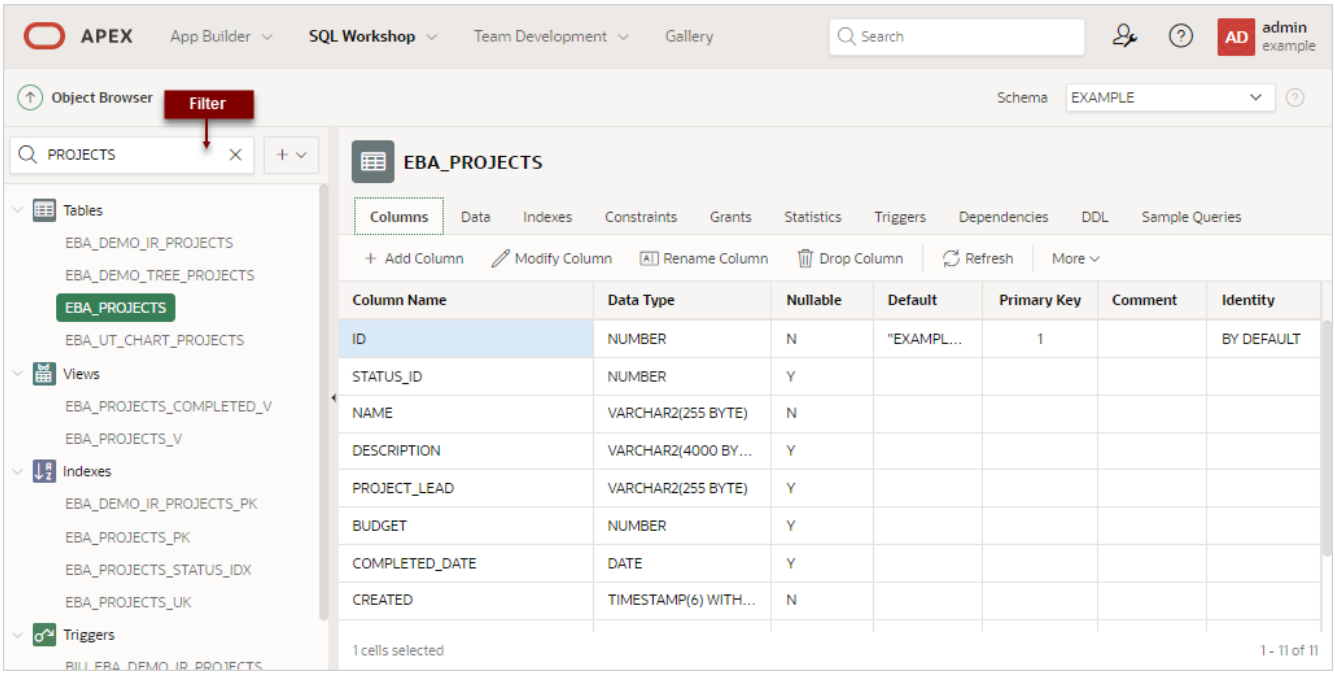
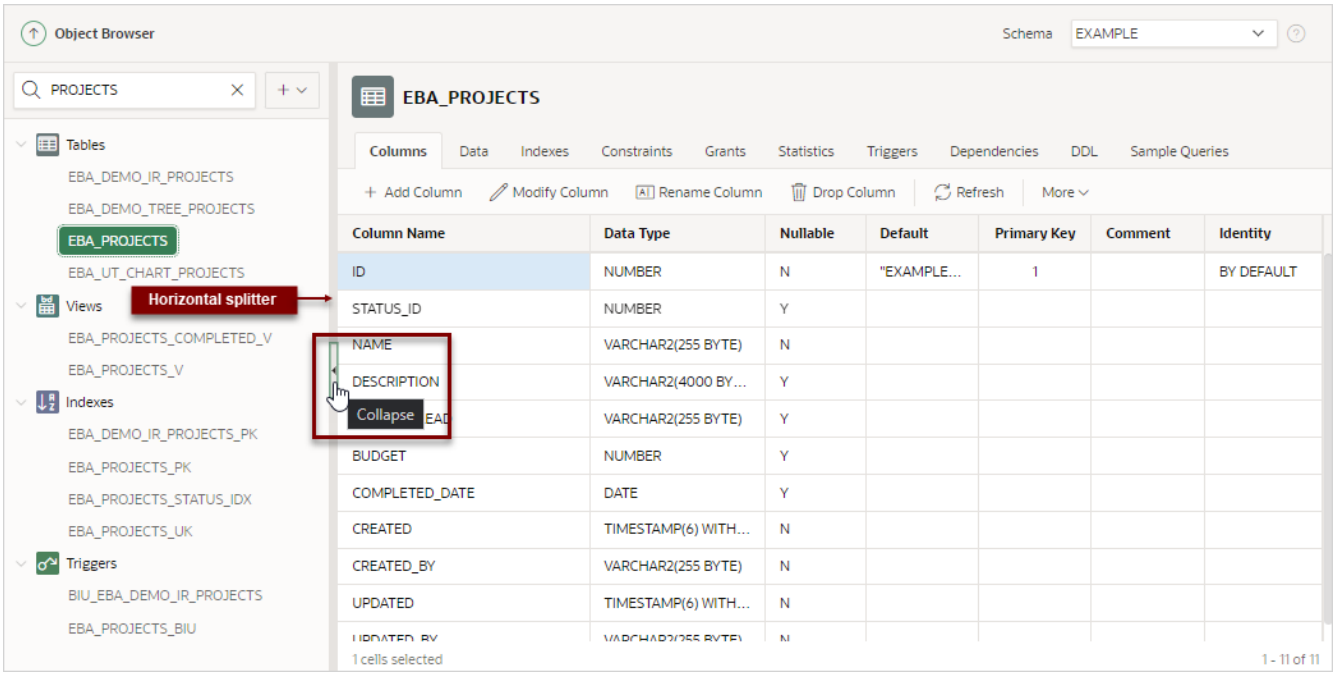


3.2.4 Hiding or Resizing the Object Tree

Hide or restore the Object Tree clicking the Collapse and Restore controls.

If the Object Tree displays, clicking the **Collapse** control hides it. Similarly, if the Object Tree is hidden, selecting **Restore** causes the Object Tree to reappear. You can also adjust the size of the panes manually by selecting and dragging the horizontal splitter.



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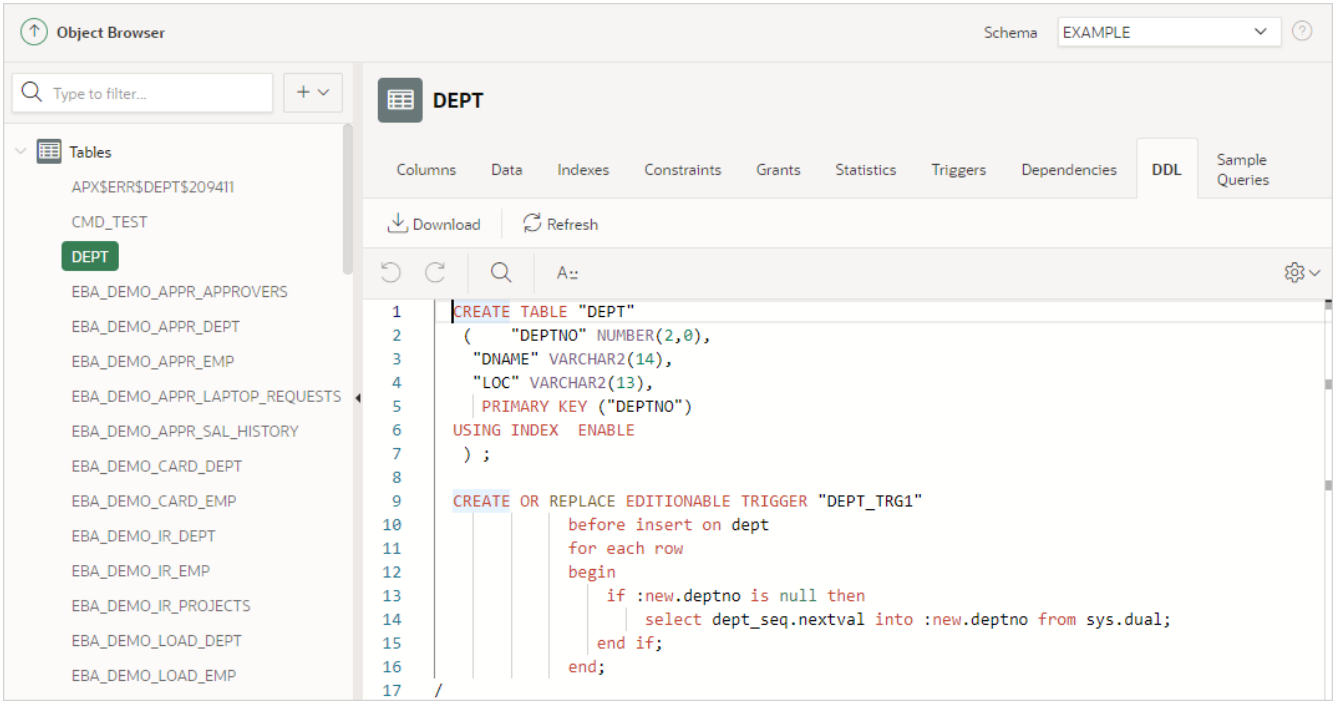
3.2.5 Code Editor in Object Browser

Learn about the Code Editor available Object Browser.

Many tabs in Object Detail View feature a fully functional Code Editor. The following example shows the **DDL** tab for the DEPT table.



Tip

If you have configured Generative AI for your workspace, Oracle APEX includes integrated AI Chat capability (called APEX Assistant) in all all Code Editors. To learn more, see Managing Generative AI in APEX in *Oracle APEX App Builder User's Guide*.

Code Editor controls include:

-
  Undo - Ctrl+Z
-
  Redo - Ctrl+Shift+Z
-
  Find - Ctrl+F

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-
  Auto Complete - Ctrl+Space
- 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
  - Paste
  - 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+,)

> **See Also**
>
> Code Editor Keyboard Shortcuts in *Oracle APEX Accessibility Guide*

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
- Minimap - Options include: On, Off, Only when >100 lines.
- Accessibility Mode
- Show Line Numbers
- Show Ruler
- Show Suggestions
- Show Whitespace
- Bracket Pair Colorization

> **See Also**
>
> Managing Generative AI in APEX in *Oracle APEX App Builder User's Guide*

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3.2.6 Creating Database Objects

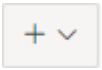
Use the Create dialog to create database objects in Object Browser.

The following options enable you to quickly create objects in Object Browser:

- Create Database Objects menu (+)
- Context menu of a tree node (right-click)
- Object Browser cards landing page containing shortcuts to the Create dialog for each object type

Each method opens a Create dialog for the specified object type.

To create an object in Object Browser with the Create Database Objects menu:

1. Click the **Create Database Objects** menu () and select an object type.

   Tip

   To create new objects from the Object Tree, right-click the object and select the **Create** option.

   The appropriate Create *Object* dialog appears.
2. Follow the on-screen instructions.

   APEX automatically converts the names of objects to uppercase and replaces spaces with underscores. To name objects in mixed case, use SQL Commands to create the objects manually.

   See Using the Command Editor.

3.3 Managing Tables

A table is a unit of data storage in an Oracle database, containing rows and columns. Use Object Browser to create, view, edit, or drop tables.

- Creating a Table
  Create a table using Object Browser.
- Viewing a Table
  Select a table from the Object Tree and access tabs in the Object Detail View.
- Editing Table Columns
  Select a table from the Object Tree and click the Columns tab.
- Editing Table Data
  Select a table from the Object Tree and click the Data tab.
- Dropping a Table
  Select a table from the Object Tree, click the Columns tab, and select Drop Table from the More menu.
- Creating an Application from a Table
  Select a table from the Object Tree, click the Columns tab, and select Create App from the More menu.

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- Analyzing Statistics of a Table
  Select a table from the Object Tree and click the Statistics tab to examine various metrics of a table.
- Viewing Sample Queries for a Table
  Select a table from the Object Tree and click the Sample Queries tab to view sample queries.

> **See Also**
>
> - Tables and Table Clusters in *Oracle AI Database Concepts* for an introduction to schema objects and discusses tables
> - Managing Tables in *Oracle APEX Administration Guide*

3.3.1 Creating a Table

Create a table using Object Browser.

To create a table:

1. In Object Browser, click the **Create Database Objects** menu and select **Table**.

   > **Tip**
   >
   > To create new objects from the Object Tree, right-click the object and select the **Create** option.

   The Create Table Wizard appears.
2. In Create Table:
   a. Table Name - Enter the name of the table. The name must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore.
   b. Semantics - Select the semantics option for the text columns. Options include:
      - **Default** - Defaults to the database setting. If you are unsure about this setting, then choose **Default**.
      - **BYTE** - Storage for the text columns is determined by the number of bytes.
      - **CHAR** - Storage is determined by the number of characters.
   c. **Comments** - Enter comments for the table. These comments are added to the table object.
3. Columns - Use the Columns to add, edit, and delete a column. Available controls include:
   - **Edit** - Toggles Editing mode. When enabled, you can single-click a cell to edit. When disabled, you must double-click to edit.
   - **Move Down** - Moves a column down in the table.
   - **Move Up** - Moves a column up in the table.
   - **Add Column** - Adds a new row (or column) to the table.
   - **Row Actions** menu - Displays in the first cell on a row in the Columns region. Available Actions include:

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- **Add Column**
- **Delete Column**
- **Move Up** (Alt + Up)
- **Move Down** (Alt + Down)

4. To add a column, click **Add Column**.

   A new row appears. Edit the column attributes by selecting a cell and typing. Column attributes include:

   a. Column Name - Enter the column name.

   b. Data Type - Select the column type.

   c. Precision - Enter the number of digits before the decimal point.

      Not all column types have this setting. Precision must be a positive integer. Only `NUMBER`, `FLOAT`, `INTERVAL YEAR TO MONTH`, and `INTERVAL DAY TO SECOND` have this setting. For example, if a column of type `NUMBER` has precision of 4, the column value can be 0 through 9999.

   d. Scale - Specifies scale or length depending on the selected data type:

      - For `NUMBER` types, scale is the number of digits after the decimal point.
      - For `VARCHAR2` and `CHAR` types, scale is the number of stored characters.
      - For `TIMESTAMP` types, scale is the fractional seconds precision and must be a number between 0 and 9. Scale must be a positive number. For example, if a column type `TIMESTAMP` has a scale of 3, seconds are between .000 seconds and .999 seconds.

   e. Not Null - Enable to specify a column must always have a value, select the Not Null check box.

   f. Primary Key - Enable if the column is part of the primary key. A **primary key** uniquely identifies a row in a table.

      If only one column is selected as primary key column and if the column data type is `NUMBER` or `FLOAT`, then the primary key column is automatically created as identity column.

   g. Default Expression - If applicable, enter a default expression (must be a valid SQL expression). Custom functions are not allowed.

   h. Comment - Enter comments for the column. These comments are added to the table column.

5. (Optional) Click **Preview SQL** to review the SQL script used to generate the table.

6. Click **Create Table**.

See Also

- Using the Table Finder in *Oracle APEX App Builder User's Guide*
- Overview of Tables in *Oracle AI Database Concepts* for information about tables

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3.3.2 Viewing a Table

Select a table from the Object Tree and access tabs in the Object Detail View.

To browse a table:

1. In Object Browser, Object Tree, expand **Tables** and select a table.
2. The Object Detail View appears and displays the following tabs:
   - **Columns** - Displays the column name, data type, nullable status, default value, primary key, comments, and identify. Most commonly used actions display as buttons. Available actions include:
     - **Add Column**
     - **Modify Column**
     - **Rename Column**
     - **Drop Column**
     - **Refresh**
     - **More** - Less commonly used actions are accessible from the **More** menu. Available actions include:
       - **Rename Table**
       - **Copy Table**
       - **Drop Table**
       - **Truncate Table**
       - **Table Comment**
       - **Create Lookup Table**
       - **Create App**
       - **UI Defaults**
   - **Data** - Displays data in the current table. Available actions include:
     - **Insert Row** - Insert a row in the table.
     - **Columns** - Configure the columns to display.
     - **Filter** - Create a filter by selecting a column, operation, and value.
     - **Count Rows** - Displays the number of rows in the current table.
     - **Load Data** - Use the Load Data Wizard to upload a file or copy and paste CSV data.
     - **Download** - Download an XLSX file.
     - **Refresh** - Refresh the current view.
   - **Indexes** - Displays indexes associated with this table. Available actions include:
     - **Create**
     - **Drop**
     - **Refresh**
   - **Constraints** - Displays a list of constraints for the current table. Available actions include:

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  - **Create**
  - **Drop**
  - **Enable**
  - **Disable**
  - **Refresh**
- **Grants** - Details of grants for the current table, including privilege, grantee, grantable, grantor, and object name. Available actions include:
  - **Grant**
  - **Revoke**
  - **Refresh**
- **Statistics** - Displays collected statistics about the current table and columns. Table statistics include the number of rows and blocks, the average row length, and the data was last analyzed. Available actions include:
  - **Gather Statistics**
  - **Refresh**
- **Triggers** - Displays a list of triggers associated with the current table. To view trigger details, click the trigger name. Available actions include:
  - **Create**
  - **Drop**
  - **Enable**
  - **Disable**
  - **Refresh**
- **Dependencies** - Displays objects that use (or depend) on the current table and objects the table depends on. To link to an object, click the object name. Available actions include:
  - **Refresh**
- **DDL** - Displays the DDL necessary to re-create this table, including keys, indexes, triggers, table and column comments, and table definition. Edit the code using a fully functional Code Editor. Available actions include:
  - **Download**
  - **Refresh**

> **Tip**
>
> To learn more about the Code Editor, see Code Editor in Object Browser.

- **Sample Queries** - Displays sample queries for using the table. Includes Copy and Run capability. Available actions include:
  - **Refresh**

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3.3.3 Editing Table Columns

Select a table from the Object Tree and click the Columns tab.

To edit table columns:

1. In Object Browser, Object Tree, expand **Tables** and select a table.
2. On the Columns tab, click **Add Column**:
   a. Configure the attributes. At a minimum, enter a column name and select a type. Depending upon the column type, specify whether the column requires precision, scale, a default value, or is nullable. For more details on an attribute, see field-level Help.
   b. SQL - Displays the generated SQL used to add the column. To copy the displayed SQL, click the Copy icon.
   c. Click **Apply**.
3. On the Columns tab, click **Modify Column**:
   a. Configure the attributes.

      Data Redaction region may be shown if the current schema selected is granted execute on `DBMS_REDACT`.
   b. SQL - Displays the generated SQL used to modify the column. To copy the displayed SQL, click the Copy icon.
   c. Click **Apply**.
4. On the Columns tab, click **Rename Column**:
   a. Configure the attributes.
   b. SQL - Displays the generated SQL used to rename the column. To copy the displayed SQL, click the Copy icon.
   c. Click **Apply**.
5. On the Columns tab, click **Drop Column**:
   a. Drop Column - Review the details.
   b. SQL - Displays the generated SQL used to drop the column. To copy the displayed SQL, click the Copy icon.
   c. Click **Apply**.
6. **More** menu - Less commonly used actions are accessible from the **More** menu. Available actions include:
   - **Rename Table** - Rename the selected table. In **New Table Name**, enter the new name.
   - **Copy Table** - Copy the selected table. In **New Table Name**, enter the new name.
   - **Drop Table** - Delete the selected table and all table rows. See Dropping a Table.
   - **Truncate Table** - Empty the selected table completely.
   - **Table Comment** - Add or edit comments for both a table or table column.
   - **Create Lookup Table** - A table lookup finds a value corresponding to another known value, which is called the lookup basis.
   - **Create App** - Create an application on the currently selected table. See Creating an Application from a Table.

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- **UI Defaults** - Create Table Dictionnary defaults from the table or column definition in the database.

> **See Also**
>
> Using the Recycle Bin

3.3.4 Editing Table Data

Select a table from the Object Tree and click the Data tab.

To edit table data:

1. In Object Browser, Object Tree, expand **Tables** and select a table.
2. In Object Detail view, click the **Data** tab.

   More commonly used actions display as tabs.
3. **Insert Row** - In the Insert Row dialog, enter the data and click **Create**.
4. Modify existing row data:
   a. Find the row to edit and click the **Edit Row** icon.
   b. In the Edit Row dialog, edit the data and click **Save**.

> **Tip**
>
> To delete the row, click **Delete**.

5. **Columns** - Choose which columns to display.
6. **Filters** - Create column filters. In the Filters dialog:
   a. Select a Column, Operation, and Value and click **Add**.
   b. Click **Apply**.
7. **Count Rows** - Displays the number of rows in the current table.

   Count Rows function always provides the count of the total number of rows in a table. Applying filters does not affect count rows function.
8. **Load Data** - Use the Load Data Wizard to upload a file, copy and paste CSV data, or load a sample data set.
9. **Download** - Download a native XLSX file.
10. **Refresh** - Refresh the current view.

3.3.5 Dropping a Table

Select a table from the Object Tree, click the Columns tab, and select Drop Table from the More menu.

Dropping a table deletes the selected table and all table rows.

To drop a table:

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1. In Object Browser, Object Tree, expand **Tables** and select a table.

   The Object Detail View appears.
2. On the **Columns** tab, select **More**, and then **Drop Table**.
   a. Drop - Review the details.
   b. (Optional) Enable **Cascade Constraints** to drop all referential integrity constraints that refer to primary and unique keys in the dropped table. If disabled when referential integrity constraints exist, the database returns an error and cancels the drop procedure.
   c. SQL - Displays the SQL generated to drop the table.
   d. (Optional) Click the **Copy** icon to copy the displayed SQL.
   e. To confirm your selection, click **Drop** again.

> **See Also**
>
> Using the Recycle Bin

3.3.6 Creating an Application from a Table

Select a table from the Object Tree, click the Columns tab, and select Create App from the More menu.

APEX Data Dictionary analyzes the table data with `DBMS_STATS` and adds the following pages:

- Chart page, if chart recommendation was computed
- Calendar page, if any date or timestamp column type exists
- Interactive report and form page
- Dashboard with charts with columns for charting (these dashboard charts automatically include links to the interactive report page)
- Faceted search page (if valid facets are found)

To create an application from a table in Object Browser:

1. In Object Browser, Object Tree, expand **Tables** and select a table.

   The Object Detail View appears.
2. On the **Columns** tab, select the **More** menu, and then **Create App**.

   The Create Application Wizard appears.
3. On the confirmation page, click **Create App**.

   The Create Application Wizard appears.
4. Follow the instructions.

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> **Note**
>
> If table Data Dictionary Cache is out of sync with the database table information due to making changes to the table (such as modifications to the table structure or column names), Create Application Wizard may raise an error. To avoid the error, refresh the Data Dictionary Cache.

> **See Also**
>
> - Refreshing the Data Dictionary Cache in *Oracle APEX Administration Guide*
> - Creating Applications in *Oracle APEX App Builder User's Guide*

3.3.7 Analyzing Statistics of a Table

Select a table from the Object Tree and click the Statistics tab to examine various metrics of a table.

To view the statistics of a table:

1. In Object Browser, Object Tree, expand **Tables** and select a table.

   The Object Detail View appears.

2. Click the **Statistics** tab.

   The Statistics tab displays a number of metrics separated into **Table Statistics** for row analysis and **Column Statistics** for column analysis. The information presented depends on the table.

3. To refresh the displayed statistics, click one of the following:

   - **Gather Statistics** - Gathers table statistics using `DBMS_STATS`. "Gather statistics in progress..." displays as Last Analyzed column value while this process runs in the database background. Click Refresh to get the table and column statistics information. If the background process finishes, the statistics information should display with Last Analyzed column value updated.
   - **Refresh** - Refresh queries statistics information gathered already from `USER_TABLES` and `USER_TAB_COLUMNS` views.

   The Statistics tab refreshes.

3.3.8 Viewing Sample Queries for a Table

Select a table from the Object Tree and click the Sample Queries tab to view sample queries.

To view sample queries:

1. In Object Browser, Object Tree, expand **Tables** and select a table.

   The Object Detail View appears.

2. On the **Sample Queries** tab, choose from available actions:

   - **Refresh** - Refreshes the page.

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- **Copy** - Copies the query.
- **Run** - Runs the query.

3.4 Managing Views

A view is a logical representation of another table or combination of tables. Use Object Browser to create, view, edit, download, compile, and drop views.

A view does not contain or store data but derives its data from the views or tables on which it is based. These tables are called **base tables**. All operations performed on a view affect the base table of the view. In order to be updatable, a view cannot contain any of the following constructs: `SET` or `DISTINCT`, operators, aggregate or analytic functions, `GROUP BY`, `ORDER BY`, `CONNECT BY`, `START WITH` clauses, subqueries, or collection expressions in a `SELECT` list.

For an example where using a view might be preferable to a table, consider the `HR.EMPLOYEES` table, which has several columns and numerous rows. The `staff` view allows users to see only five of these columns:

```
CREATE VIEW staff AS
SELECT employee_id, last_name, job_id, manager_id, department_id
FROM employees
```

- Creating a View
  Create a view using Object Browser.
- Viewing a View
  Select a view from the Object Tree and access tabs in the Object Detail View.
- Editing a View Manually
  Select a view from the Object Tree and edit the view in Code Editor.
- Downloading a View
  Select a view from the Object Tree and click Download to save it as a file.
- Compiling a View
  Select a view from the Object Tree and click Save and Compile.
- Dropping a View
  Select a view from the Object Tree and click Drop.

> **See Also**
>
> Managing Views in *Oracle AI Database Administrator's Guide*

3.4.1 Creating a View

Create a view using Object Browser.

To create a view:

1. In Object Browser, click the **Create Database Objects** menu and select **View**.

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> **Tip**
>
> To create new objects from the Object Tree, right-click the object and select the **Create** option.

The Create View Wizard appears.

2. View Name - Enter the name of the view. The name must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore.
3. SQL Query - Enter a valid SQL query for the view. SQL Query features a functional Code Editor.

> **Tip**
>
> To learn more about the Code Editor, including Query Builder, see Code Editor in Object Browser.

4. Click one of the following:
   - Click **Preview SQL**. Review the SQL script used to generate the table and then click **Create View**.
   - Click **Create View**.

> **See Also**
>
> Using Query Builder

3.4.2 Viewing a View

Select a view from the Object Tree and access tabs in the Object Detail View.

To browse a view:

1. In Object Browser, Object Tree, expand **Views** and select a view.
2. The Object Detail View appears and displays the following tabs:
   - **Columns** - Displays the columns in the current view. Available actions include:
     - **Compile**
     - **Drop**
     - **Comment**.
     - **Refresh**
   - **Code** - Displays the code that creates this view. You can edit the code using the fully functional Code Editor. Available actions include:
     - **Download**
     - **Drop**.
     - **Save and Compile**
     - **Refresh**

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- **Data** - Displays the data in the columns in this view. Available actions include:
  - **Columns** - Select the columns to display.
  - **Filter** - Create filters by selecting the column, operator, and value.
  - **Count Rows** - Count rows in the view.
  - **Download**
  - **Refresh**
- **Errors** - Lists errors related to the current view. Available actions include:
  - **Refresh**
- **Grants** - Details of grants for the current view, including privilege, grantee, grantable, grantor, and object name. Available actions include:
  - **Grant**
  - **Revoke**
  - **Refresh**
- **Dependencies** - Displays objects referenced by this view, objects this view references, and synonyms for this view. Available actions:
  - **Refresh**
- **DDL** - Displays the SQL necessary to re-create this view. Available actions include:
  - **Download**
  - **Refresh**

> **See Also**
>
> Code Editor in Object Browser

3.4.3 Editing a View Manually

Select a view from the Object Tree and edit the view in Code Editor.

To edit a view manually:

1. In Object Browser, Object Tree, expand **Views** and select a view.

   The Object Detail View appears.
2. Select the **Code** tab and edit the source code directly using the Code Editor.

   > **Tip**
   >
   > To learn more about the Code Editor, see Code Editor in Object Browser.

   If you edit and make changes to a view, you must compile to save your changes.
3. Click **Save and Compile** to compile the view.

   Compiling re-creates the object in the database. If the compilation fails, an error message displays above the code.

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3.4.4 Downloading a View

Select a view from the Object Tree and click Download to save it as a file.

When working with views, **Download** is available on the **Code** and **DDL** tabs in Ojbect Detail View.

To save the current view as a file:

1. In Object Browser, Object Tree, expand **Views** and select a view.

   The Object Detail View appears.
2. To download the code that creates the view:
   a. Click the **Code** tab.
   b. Click the **Download**.
3. To download the DDL:
   a. Click the **DDL** tab.
   b. Click the **Download**.

3.4.5 Compiling a View

Select a view from the Object Tree and click Save and Compile.

If you edit and make changes to a view, you must compile to save your changes.

To compile the current view:

1. In Object Browser, Object Tree, expand **Views** and select a view.

   The Object Detail View appears.
2. Click the **Code** tab and then **Save and Compile**.

   Compiling re-creates the object in the database. If the compilation fails, an error message displays above the code.

3.4.6 Dropping a View

Select a view from the Object Tree and click Drop.

The **Drop** action is available on the **Columns** and **Code** tabs in Object Detail View.

To drop a view:

1. In Object Browser, Object Tree, expand **Views** and select a view.

   The Object Detail View appears.
2. Select either the **Columns** or **Code** tab and then click **Drop**.

   In the Drop dialog:
   a. Drop - Review the details.
   b. SQL - Displays the SQL generated to drop the view. To copy the displayed SQL, click the **Copy** icon.
   c. To confirm your selection, click **Drop** again.

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3.5 Managing Indexes

An index is an optional structure associated with tables and clusters. Use Object Browser to create, view, or drop an index.

You can create indexes on one or more columns of a table to speed access to data on those columns.

- Creating an Index
  Create an index using Object Browser.
- Viewing an Index
  Select an index from the Object Tree and access tabs in the Object Detail View.
- Dropping an Index
  Select an index from the Object Tree pane and click Drop on the Object Details tab.

3.5.1 Creating an Index

Create an index using Object Browser.

To create an index:

1. In Object Browser, click the **Create Database Objects** menu and select **Index**.

   > **Tip**
   >
   > To create new objects from the Object Tree, right-click the object and select the **Create** option.

   The Create Index Wizard appears.
2. Table - Select a table on which you wish to create the index.
3. Type of Index - Specify the type of index:
   - **Normal** - Generally used for indexing `NUMBER` and `VARCHAR` data.
   - **Text** - Generally used for indexing `CLOB` columns.
   - **Spatial** - Generally used for indexing `SDO_GEOMETRY` columns.
4. Index name - Enter the name of the index. The name must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore. This field contains an automatically generated name by default, based on the selected table name and type of index.
5. Unique Index - Indexes can be unique or non-unique. Unique indexes guarantee that no two rows of a table have duplicate values in the key column (or columns). Non-unique indexes do not impose this restriction on the column values.
6. Index Column 1 - Specify the column for the first position in index. When creating "Normal" index, select up to four index columns. When creating "Text" index or "Spatial" index, select only one column.
7. Click **Create Index**.

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3.5.2 Viewing an Index

Select an index from the Object Tree and access tabs in the Object Detail View.

To browse an index:

1. In Object Browser, Object Tree, expand **Indexes** and select a index to view.
2. The Object Detail View appears and displays the following tabs:
   - **Object Details** - Displays the index name, index type, table owner, table name, table type, uniqueness, compression, prefix length, tablespace name, status, last analyzed and also a listing of the indexed columns. Available actions include:
     - **Disable**
     - **Drop**
     - **Rebuild**
     - **Refresh**
   - **Statistics** - Displays collected statistics about the current view, including the number of rows, the compression status (enabled or disabled), and when the data was last analyzed. Available actions include:
     - **Gather Statistics** - Run a background process that gathers index statistics using `DBMS_STATS`. Clicking **Gather Statistics** displays `Gather statistics in progress...` in the Last Analyzed column value.

       Click **Refresh** to get the index statistics information. If the background process finishes, the statistics information displays with Last Analyzed column value updated.
     - **Refresh** - Refresh queries statistics information gathered already from `USER_INDEXES` view.
   - **DDL** - Displays the DDL necessary to re-create this index. Available actions include:
     - **Download**
     - **Refresh**

3.5.3 Dropping an Index

Select an index from the Object Tree pane and click Drop on the Object Details tab.

To drop an index:

1. In Object Browser, Object Tree, expand **Indexes** and select an index to view.

   The Object Detail View appears.
2. In the **Object Details** tab, click **Drop**.
   a. Drop - Review the details.
   b. SQL - Displays the SQL generated to drop the sequence. To copy the displayed SQL, click the **Copy** icon.
   c. To confirm your selection, click **Drop** again.

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3.6 Managing Sequences

A sequence generates a serial list of unique numbers for numeric columns of a database table. Use Object Browser to create, view, or drop a sequence.

Database sequences are generally used to populate table primary keys.

- Creating a Sequence
  Create a sequence using Object Browser.
- Browsing a Sequence
  Select a sequence from the Object Tree and access tabs in the Object Detail View.
- Dropping a Sequence
  Select a sequence from the Object Tree pane and click Drop on the Object Details tab.

3.6.1 Creating a Sequence

Create a sequence using Object Browser.

To create a sequence:

1. In Object Browser, click the **Create Database Objects** menu and select **Sequence**.

   > **Tip**
   >
   > To create new objects from the Object Tree, right-click the object and select the **Create** option.

   The Create Sequence Wizard appears.
2. On Create Sequence:
   a. Sequence Name - Enter the name of the sequence. The name must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore.
   b. Start With - Specify the first sequence number to be generated. This value must be a valid integer.

      Use this field to start an ascending sequence at a value greater than its minimum or to start a descending sequence at a value less than its maximum. For ascending sequences, the default value is the minimum value of the sequence. For descending sequences, the default value is the maximum value of the sequence.
   c. Increment By - Specify the interval between sequence numbers. This integer value can be any positive or negative integer, but it cannot be 0.

      The absolute of this value must be less than the difference of **Maximum Value** and **Minimum Value**. If this value is negative, then the sequence descends. If the value is positive, then the sequence ascends.
   d. Number to Cache - Enter a cache size. This value must be a valid positive integer greater than 1.

      The value is used to preallocate a set of sequence numbers and keep them in memory so that sequence numbers can be accessed faster. When the last of the sequence numbers in the cache has been used, the database reads another set of numbers into the cache.

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e. Minimum Value - Specify the minimum value of the sequence. This value must be a valid integer and must be less than or equal to **Start With** and must be less than **Maximum Value**. If no minimum value is specified, Oracle uses minimum value of 1 for an ascending sequence or -(1027 -1) for a descending sequence.

f. Maximum Value - Specify the maximum value the sequence can generate. This value must be a valid integer and equal to or greater than **Start With** and than **Minimum Value**. If no maximum value is specified, Oracle uses maximum value of `1027 -1` for an ascending sequence or `-1` for a descending sequence..

g. Cycle - Select this option to indicate that the sequence continues to generate values after reaching either its maximum or minimum value. After an ascending sequence reaches its maximum value, it generates its minimum value. After a descending sequence reaches its minimum, it generates its maximum value.

   Deselect this option to indicate that the sequence cannot generate more values after reaching its maximum or minimum value. This is the default.

3. Click **Create Sequence**.

3.6.2 Browsing a Sequence

Select a sequence from the Object Tree and access tabs in the Object Detail View.

To browse a sequence:

1. In Object Browser, Object Tree, expand **Sequences** and select a sequence.
2. The Object Detail View appears and displays four tabs:
   - **Object Details** - Displays details about the selected type. Available actions include:
     - **Alter**
     - **Drop**
     - **Refresh**
   - **Grants** - Displays a list of grants associated with the sequence. Available actions include:
     - **Grant**
     - **Revoke**
     - **Refresh**
   - **Dependencies** - Displays a list of objects that use (or depend) upon this sequence. Available actions include: **Refresh**.
   - **DDL** - Displays the DDL necessary to re-create this sequence. Available actions include:
     - **Download**.
     - **Refresh**

3.6.3 Dropping a Sequence

Select a sequence from the Object Tree pane and click Drop on the Object Details tab.

To drop a sequence:

1. In Object Browser, Object Tree, expand **Sequences** and select a sequence.

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The Object Detail View appears.

2. On the **Object Details** tab, click **Drop**.
   a. Drop - Review the details.
   b. SQL - Displays the SQL generated to drop the sequence. To copy the displayed SQL, click the **Copy** icon.
   c. To confirm your selection, click **Drop** again.

3.7 Managing Types

A type is a user-specified object or collection definition. Use Object Browser to create, view, or drop a type.

Oracle APEX currently only supports collection definitions. There are two categories of Oracle collections (SQL collections):

- Variable-length arrays (`VARRAY` types)
- Nested tables (`TABLE` types)

`VARRAY` types are used for one-dimensional arrays, while nested table types are used for single-column tables within an outer table.

- Creating a Type
  Create a type using Object Browser.
- Viewing a Type
  Select a type from the Object Tree and access tabs in the Object Detail View.
- Dropping a Type
  Select a type from the Object Tree pane and click Drop on the Object Details tab.

> **See Also**
> - *Oracle AI Database Concepts*
> - *Oracle AI Database PL/SQL Language Reference* and for information about collection types

3.7.1 Creating a Type

Create a type using Object Browser.

To create a collection type:

1. In Object Browser, click the **Create Database Objects** menu and select **Type**.

> **Tip**
>
> To create new objects from the Object Tree, right-click the object and select the **Create** option.

The Create Type Wizard appears.

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2. On Create Type:
   a. Type Name - Enter the name of the type.
   b. Set the Collection Type:
      - **VArray (variable-size array)** - Creates an ordered set of elements, each with the same data type.
      - **Nested Table** - Creates a named nested table of selected data type.
   c. Limit (VArray only) - Enter the number of elements in the VArray. This value must be a valid positive integer.
   d. Data Type - Specify the data type of the collection elements.
   e. Length - Enter the length of the selected data type. This value must be a valid positive integer.

      This field changes to Object for the configuration "Nested Table, < Nested Object >."
3. Click **Create Type**.

3.7.2 Viewing a Type

Select a type from the Object Tree and access tabs in the Object Detail View.

To browse a collection type:

1. In Object Browser, Object Tree, expand **Types** and select a type to view.
2. The Object Detail View appears and displays four tabs:
   - **Object Details** - Displays details about the selected type. Available actions include:
     – **Drop**.
     – **Refresh**
   - **Synonyms** - Displays a list of synonyms for the current type. Available actions include:**Refresh**.
   - **Grants** - Displays a list of grants associated with the type. Grant details include grantee, privilege, and grant options. Available actions include:
     – **Grant**
     – **Revoke**
     – **Refresh**
   - **DDL** - Displays the DDL necessary to re-create this type. Available actions include:
     – **Download**.
     – **Refresh**

3.7.3 Dropping a Type

Select a type from the Object Tree pane and click Drop on the Object Details tab.

To drop a collection type:

1. In Object Browser, Object Tree, expand **Types** and select a collection type.

   The Object Detail View appears.
2. On the **Object Details** tab, click **Drop**.

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a. Drop - Review the details.

b. SQL - Displays the SQL generated to drop the type. To copy the displayed SQL, click the **Copy** icon.

c. To confirm your selection, click **Drop** again.

3.8 Managing Packages

A package is a database object that groups logically related PL/SQL types, items, functions and procedures. Use Object Browser to view, create, edit, download, and drop packages.

Packages usually have two parts, a specification and a body. The **specification** is the interface to your application. The **body** implements the specification.

- Creating a Package
  Create packages using Object Browser.
- Viewing a Package
  Select a package from the Object Tree and access tabs in the Object Detail View.
- Editing a Package Manually
  Select a package from the Object Tree and edit the code in the Object Detail View.
- Compiling a Package
  Select a package from the Object Tree and click Save and Compile.
- Downloading a Package
  Select a package from the Object Tree and click Download to save it as a file.
- Dropping a Package While Viewing the Specification
  Select a package from the Object Tree and click Drop on the Specification tab.
- Dropping a Package While Viewing the Body
  Select a package from the Object Tree and click Drop on the Body tab.

> **See Also**
>
> PL/SQL Packages and PL/SQL Subprograms in *Oracle AI Database PL/SQL Language Reference* for additional information on PL/SQL packages.

3.8.1 Creating a Package

Create packages using Object Browser.

To create a package:

1. In Object Browser, click the **Create Database Objects** menu and select **Package**.

   > **Tip**
   >
   > To create new objects from the Object Tree, right-click the object and select the **Create** option.

   The Create Package Wizard appears.

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2. On Create Package:
   a. Name - Enter the name of the package to be created. The name must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore.
   b. Include Sample Code - Specify whether to include sample code while creating the package. Enable or disable this option.
3. Click **Create Package**.

3.8.2 Viewing a Package

Select a package from the Object Tree and access tabs in the Object Detail View.

To view a package:

1. In Object Browser, Object Tree, expand **Packages** and select a package.
2. The Object Detail View appears and displays five tabs:

> **Tip**
>
> The **Specification** and **Body** tabs feature a fully functional Code Editor. To learn more about the Code Editor, see Code Editor in Object Browser.

- **Specification** - Displays the package specification. The **package specification** defines the interface to your application and delcares the elements that can be referenced outside of the package. You can edit the code in this view using a fully functional Code Editor. Available actions include:
  - **Download**
  - **Save and Compile**
  - **Drop**.
  - **Refresh**
- **Body** - Displays the package body. The **packge body** is named collection of functions, procedures, variables, cursors, user-defined types, and records that are referenced using the package name. You can edit the code in this view using a fully function Code Editor. Available actions include:
  - **Download**
  - **Save and Compile**
  - **Drop**.
  - **Refresh**
- **Dependencies** - Displays objects that use (or depend on) on the current package and objects the package depends on. Available actions include **Refresh**.
- **Errors** - Lists errors related to the current package. Available actions include **Refresh**.
- **Grants** - Lists details of grants for the current package, including privilege, grantee, grantable, grantor, and object name. Available actions include:
  - **Grant**
  - **Revoke**

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- **Refresh**

3.8.3 Editing a Package Manually

Select a package from the Object Tree and edit the code in the Object Detail View.

When you edit a package, you can edit the code manually, perform a search and replace, and then compile the package.

To edit a package manually:

1. In Object Browser, Object Tree, expand **Packages** and select a package.

   The Object Detail View appears.

   The **Specification** tab defines the interface to your application. The **Body** tab displays the package body, if one exists, for the selected package.

2. Select the appropriate tab (**Specification** or **Body**) and edit the source code directly using the Code Editor.

   > **Tip**
   >
   > To learn more about the Code Editor, see Code Editor in Object Browser.

   If you edit and make changes to a view, you must compile to save your changes.

3. Click **Save and Compile** to compile the current package.

   Compiling re-creates the object in the database. If the compilation fails, an error message displays above the code.

3.8.4 Compiling a Package

Select a package from the Object Tree and click Save and Compile.

If you edit and make changes to a package, you must compile to save your changes.

The **Save and Compile** action is available on both the **Specification** and **Body** tabs in Object Detail View.

To compile a package:

1. In Object Browser, Object Tree, expand **Packages** and select a package.

   The Object Detail View appears.

2. Click the appropriate tab (**Specification** tab or **Body**) and then click **Save and Compile**.

   Compiling re-creates the object in the database. If the compilation fails, an error message displays above the code.

3.8.5 Downloading a Package

Select a package from the Object Tree and click Download to save it as a file.

Both the Specification and Body tabs feature a fully functional Code Editor. To download the displayed source code in either tab, click **Download**.

To download a package:

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1. In Object Browser, Object Tree, expand **Packages** and select a package.

   The Object Detail View appears.
2. To save the current package as a file:
   a. Select the appropriate tab (**Specification** or **Body**).
   b. Click **Download** .

3.8.6 Dropping a Package While Viewing the Specification

Select a package from the Object Tree and click Drop on the Specification tab.

The **package specification** defines the interface to your application and delcares the elements that can be referenced outside of the package.

To drop a package specification:

1. In Object Browser, Object Tree, expand **Packages** and select a package.

   The Object Detail View appears.
2. On the **Specification** tab, click **Drop**.
   a. Drop - Review the details.
   b. SQL - Displays the SQL generated to drop the package. To copy the displayed SQL, click the **Copy** icon.
   c. To confirm your selection, click **Drop** again.

3.8.7 Dropping a Package While Viewing the Body

Select a package from the Object Tree and click Drop on the Body tab.

The **package body** is a named collection of functions, procedures, variables, cursors, user-defined types, and records that are referenced using the package name.

To drop a package while viewing the Body:

1. In Object Browser, Object Tree, expand **Packages** and select a package.

   The Object Detail View appears.
2. On the **Body** tab, click **Drop**.

   In the Drop dialog:
   a. Drop - Review the details.
   b. SQL - Displays the SQL generated to drop the package body. To copy the displayed SQL, click the **Copy** icon.
   c. Confirm your selection and click **Drop** again.

3.9 Managing Procedures

A procedure is a subprogram that performs a specific action. Use Object Browser to view, create, edit, download, and drop procedures.

- Creating a Procedure
  Create procedures using Object Browser.

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- Viewing a Procedure
  Select a procedure from the Object Tree and access tabs in the Object Detail View.
- Editing a Procedure
  Select a procedure from the Object Tree and edit it in the Code tab.
- Compiling a Procedure
  Select a procedure from the Object Tree and click Save and Compile.
- Downloading a Procedure
  Select a procedure from the Object Tree and click Download to save it as a file.
- Dropping a Procedure
  Select a procedure from the Object Tree and click Drop.

> **See Also**
>
> Overview of PL/SQL in *Oracle AI Database PL/SQL Language Reference*

3.9.1 Creating a Procedure

Create procedures using Object Browser.

To create a procedure:

1. In Object Browser, click the **Create Database Objects** menu and select **Procedure**.

   > **Tip**
   >
   > To create new objects from the Object Tree, right-click the object and select the **Create** option.

   The Create Procedure Wizard appears.
2. On Create Procedure:
   a. Procedure Name - Enter the name of the procedure to be created. This name must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore.
   b. Include Sample Code - Specify whether to include sample code while creating the procedure.

   > **Tip**
   >
   > The **SQL Script** region displays the SQL generated by this wizard. To copy the SQL, click the **Copy** icon.
3. Click **Create Procedure**.

3.9.2 Viewing a Procedure

Select a procedure from the Object Tree and access tabs in the Object Detail View.

To view a procedure:

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1. In Object Browser, Object Tree, expand **Procedures** and select a procedure.
2. The Object Detail View appears and displays four tabs:
   - **Code** - Displays the source code for the procedure. You can edit the source code in this view using a fully functional Code Editor. Available actions include:
     - **Download**
     - **Save and Compile**
     - **Drop**.
     - **Refresh**

     > **Tip**
     >
     > To learn more about the Code Editor, see Code Editor in Object Browser.
   - **Dependencies** - Displays objects that use (or depend) on the current procedure and objects the procedure depends on. To link to an object, click the object name.
   - **Errors** - Lists errors related to the current procedure.
   - **Grants** - Details of grants for the current procedure, including privilege, grantee, grantable, grantor, and object name. Available actions include:
     - **Grant**
     - **Revoke**
     - **Refresh**

3.9.3 Editing a Procedure

Select a procedure from the Object Tree and edit it in the Code tab.

To edit a procedure:

1. In Object Browser, Object Tree, expand **Procedures** and select a procedure.

   The Object Detail View appears. The **Code** tab displays the source code for the procedure and features a fully functional Code Editor.

   > **Tip**
   >
   > To learn more about the Code Editor, see Code Editor in Object Browser.
2. Edit the source code directly using the Code Editor.

   If you edit and make changes to a view, you must compile to save your changes.
3. Click **Save and Compile** to compile the current procedure.

   Compiling re-creates the object in the database. If the compilation fails, an error message displays above the code.

3.9.4 Compiling a Procedure

Select a procedure from the Object Tree and click Save and Compile.

If you edit and make changes to a procedure, you must compile to save your changes.

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To compile a procedure:

1. In Object Browser, Object Tree, expand **Procedures** and select a procedure.

   The Object Detail View appears.

2. On the **Code** tab, click **Save and Compile** to compile the current procedure.

   Compiling re-creates the object in the database. If the compilation fails, an error message displays above the code.

3.9.5 Downloading a Procedure

Select a procedure from the Object Tree and click Download to save it as a file.

To download a procedure:

1. In Object Browser, Object Tree, expand **Procedures** and select a procedure.

   The Object Detail View appears.

2. On the **Code** tab, click **Download** to save the current procedure as a file.

3.9.6 Dropping a Procedure

Select a procedure from the Object Tree and click Drop.

To drop a procedure:

1. In Object Browser, Object Tree, expand **Procedures** and select a procedure.

   The Object Detail View appears.

2. On the **Code** tab, click and then **Drop**.
   a. Drop - Review the details.
   b. SQL - Displays the SQL generated to drop the procedure. To copy the displayed SQL, click the **Copy** icon.
   c. To confirm your selection, click **Drop** again.

3.10 Managing Functions

A function is a subprogram that can take parameters and return a single value. You can use Object Browser to create, view, edit, compile, download, and drop functions.

- Creating a Function
  Create a function using Object Browser.
- Viewing a Function
  Select a function from the Object Tree and access tabs in the Object Detail View.
- Editing a Function
  Select a trigger from the Object Tree.
- Compiling a Function
  Select a function from the Object Tree and click Save and Compile.
- Downloading a Function
  Select a function from the Object Tree and click Download to save the function.
- Dropping a Function
  Select a function from the Object Tree and click Drop.

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> **See Also**
>
> - *Oracle AI Database SQL Language Reference* for information about PL/SQL functions
> - *Oracle AI Database PL/SQL Language Reference*

3.10.1 Creating a Function

Create a function using Object Browser.

To create a function:

1. In Object Browser, click the **Create Database Objects** menu and select **Function**.

   > **Tip**
   >
   > To create new objects from the Object Tree, right-click the object and select the **Create** option.

   The Create Function Wizard appears.
2. On Create Function:
   a. Name - Enter the name of the function. This name must conform to Oracle naming conventions and cannot contain spaces or start with a number or underscore.
   b. Include Sample Code - Specify whether to include sample code.
3. Click **Create Function**.

3.10.2 Viewing a Function

Select a function from the Object Tree and access tabs in the Object Detail View.

To view a function:

1. In Object Browser, Object Tree, expand **Functions** and select a function.
2. The Object Detail View appears and displays four tabs:
   - **Code** - View the source code for the function, or edit it manually. Available actions include:
     - **Download**
     - **Save and Compile**
     - **Drop**
     - **Refresh**
   - **Dependencies** - View objects that use (or depend) on the current function and objects that the function depends on. Select the **Refresh** button to refresh the list of functions.
   - **Errors** - View the errors related to the current function. Select the **Refresh** button to refresh the list of functions.
   - **Grants** - View the details of grants for the current function. Available buttons include:

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- **Grant**
- **Revoke**
- **Refresh**

3.10.3 Editing a Function

Select a trigger from the Object Tree.

1. In Object Browser, Object Tree, expand **Functions** and select a trigger.

   The Object Detail View appears.
2. In the Code tab, edit the code. Other edit controls include:
   - **Undo**
   - **Redo**
   - **Find**
   - **Auto Complete**

   > **Tip**
   >
   > To learn more about the Code Editor, see Code Editor in Object Browser.
3. Select **Save and Compile** to save your changes.

3.10.4 Compiling a Function

Select a function from the Object Tree and click Save and Compile.

If you edit and make changes to a function, you must compile to save your changes. Compiling re-creates the function in the database.

To compile a function in Object Browser:

1. In Object Browser, Object Tree, expand **Functions** and select a function.

   The Object Detail View appears.
2. On the **Code** tab, click **Save and Compile**.

   If the compilation fails, an error message displays. Correct the error and compile the function again.

3.10.5 Downloading a Function

Select a function from the Object Tree and click Download to save the function.

To download a function:

1. In Object Browser, Object Tree, expand **Functions** and select a function.

   The Object Details View appears.
2. On the **Code** tab, click **Download**.
3. Enter a file name for the file and click **Save**.

   The file saves in `.sql` format.

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3.10.6 Dropping a Function

Select a function from the Object Tree and click Drop.

To drop a function in Object Browser:

1. In Object Browser, Object Tree, expand **Functions** and select a function.

   The Object Details View appears.
2. On the **Code** tab, click **Drop**.
   a. Drop - Review the details.
   b. SQL - Displays the SQL generated to drop the function. To copy the displayed SQL, click the **Copy** icon.
   c. To confirm your selection, click **Drop** again.
3. To confirm, click **Drop**.

3.11 Managing Triggers

A database trigger is a stored subprogram associated with a database table, view, or event. You can use Object Browser to create, view, edit, compile, download, drop, and disable or enable a trigger.

The trigger can be called once, for example when an event occurs, or many times, for example for each row affected by an INSERT, UPDATE, or DELETE statement.

- Creating a Trigger
  Create a trigger using Object Browser.
- Viewing a Trigger
  Select a trigger from the Object Tree and access tabs in the Object Detail View.
- Editing a Trigger
  Select a trigger from the Object Tree.
- Compiling a Trigger
  Select a trigger from the Object Tree and click Save and Compile.
- Downloading a Trigger
  Select a trigger from the Object Tree and click Download to save the trigger as a file.
- Disabling and Enabling a Trigger
  Select a trigger from the Object Tree and click Enable or Disable.
- Dropping a Trigger
  Select a trigger from the Object Tree and click Drop.

See Also

- *Oracle AI Database Concepts*
- *Oracle Database Advanced Application Developer's Guide*

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3.11.1 Creating a Trigger

Create a trigger using Object Browser.

To create a trigger in Object Browser:

1. In Object Browser, click the **Create Database Objects** menu and select **Trigger**.

   > **Tip**
   >
   > To create new objects from the Object Tree, right-click the object and select the **Create** option.

   The Create Trigger Wizard appears.
2. On Create Trigger:
   a. Table - Select the table you want to create a trigger on.
   b. Trigger Name - Trigger name is automatically generated based on selected table. Modify the trigger name, if required. This name must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore.
   c. Firing Point - Specify the firing point:
      - **Before** - Causes the database to fire the trigger before running the triggering event.
      - **After** - Causes the database to fire the trigger after running the triggering event.
3. Click **Create Trigger**.

3.11.2 Viewing a Trigger

Select a trigger from the Object Tree and access tabs in the Object Detail View.

To view a trigger:

1. In Object Browser, Object Tree, expand **Triggers** and select a trigger.
2. The Object Detail View appears and displays four tabs:

   > **Tip**
   >
   > The **Code** and **DDL** tabs feature a fully functional Code Editor. To learn more about the Code Editor, see Code Editor in Object Browser.

   - **Code** - View the trigger code, or edit it manually. Available actions include:
     – **Download**
     – **Save and Compile**
     – **Drop**
     – **Refresh**
   - **Errors** - View errors related to the current trigger. Select the **Refresh** button to refresh the list of errors.

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- **Object Details** - View the details of the trigger. Available actions include:
  - **Compile**
  - **Drop**
  - **Enable**
  - **Disable**
  - **Refresh**
- **DDL** - Displays the DDL necessary to re-create the trigger. Available actions include:
  - **Download**
  - **Refresh**

3.11.3 Editing a Trigger

Select a trigger from the Object Tree.

1. In Object Browser, Object Tree, expand **Triggers** and select a trigger.

   The Object Detail View appears.
2. In the Code tab, edit the code. Other edit controls include:
   - **Undo**
   - **Redo**
   - **Find**
   - **Auto Complete**

   > **Tip**
   >
   > To learn more about the Code Editor, see Code Editor in Object Browser.
3. Select **Save and Compile** to save your changes.

3.11.4 Compiling a Trigger

Select a trigger from the Object Tree and click Save and Compile.

To compile a trigger in Object Browser:

1. In Object Browser, Object Tree, expand **Triggers** and select a trigger.

   The Object Detail View appears.
2. Compile the trigger:
   - On the **Code** tab, click **Save and Compile**.
   - On the **Object Details** tab, click **Compile**.

   If the compilation fails, an error message displays. Correct the error, and compile the trigger again.

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3.11.5 Downloading a Trigger

Select a trigger from the Object Tree and click Download to save the trigger as a file.

To download a trigger as a file:

1. In Object Browser, Object Tree, expand **Triggers** and select a trigger.

   The Object Details View appears.
2. Download the trigger:
   - On the **Code** tab, click **Download**.
   - On the **DDL** tab, click **Download**.
3. Enter a file name for the file and click **Save**.

   The file saves in `.sql` format.

3.11.6 Disabling and Enabling a Trigger

Select a trigger from the Object Tree and click Enable or Disable.

To disable and enable a trigger in Object Browser:

1. In Object Browser, Object Tree, expand **Triggers** and select a trigger.

   The Object Detail View appears.
2. On the **Object Details** tab, click **Enable** or **Disable**.

> **Tip**
>
> Trigger Status, on the **Object Details** tab, indicates whether the trigger is currently `ENABLED` or `DISABLED`.

The Trigger Status updates.

3.11.7 Dropping a Trigger

Select a trigger from the Object Tree and click Drop.

To drop a trigger:

1. In Object Browser, Object Tree, expand **Triggers** and select a trigger.

   The Object Detail View appears.
2. Drop the trigger:
   - On the **Code** tab, click **Drop**.
   - On the **Object Details** tab, click **Drop**.
3. Click **Drop** to drop the trigger.

3.12 Managing Database Links

A database link is a schema object in one database that enables you to access objects in another database. Use Object Browser to create, browse, or drop a database link.

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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 name of the database link.

- Creating a Database Link
  Create a database link using Object Browser.
- Viewing a Database Link
  Select a database link from the Object Tree and access tabs in the Object Detail View.
- Dropping a Database Link
  Select a database link from the Object Tree and click Drop.

3.12.1 Creating a Database Link

Create a database link using Object Browser.

To create a database link:

1. In Object Browser, click the **Create Database Objects** menu and select **Database Link**.

   > **Tip**
   >
   > To create new objects from the Object Tree, right-click the object and select the **Create** option.

   The Create Procedure Wizard appears.
2. Database Link Name - Identifies the name of the database link. Database link names must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore.
3. Connect To Schema - Enter the name of the database schema on the remote system to access. Note that the schema name is case-sensitive.
4. Password - Enter the password for the remote database schema.
5. Remote Hostname or IP - Enter the hostname or IP address of the database server you wish to access.
6. Remote Host Port - Enter the network port number on which the Oracle Net Listener is accepting requests. This is typically `1521`.
7. Identified by - Choose how you want to identify the remote database. Select **Service Name** or **SID**.
8. SID or Service Name - What you enter here depends upon your selection in **Identified by**.
   - If **Identified by** is set to **SID**, enter the SID (Oracle System Identifier) name.
   - If for **Identified by** is set to **Service Name**, enter the service name.
9. Click **Create Database Link**.

3.12.2 Viewing a Database Link

Select a database link from the Object Tree and access tabs in the Object Detail View.

To browse a database link:

1. In Object Browser, Object Tree, expand **Database Links** and select a database link.
2. The Object Detail View appears and displays the following tabs:

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- **Object Details** - Displays details about the database link. Available actions include:
  - **Drop**
  - **Test**
  - **Refresh**
- **Synonyms** - Displays synonyms for this object. Available actions: **Refresh**.
- **DDL** - Displays the DDL necessary to re-create this database link.
  Available actions include:
  - **Download**
  - **Refresh**

3.12.3 Dropping a Database Link

Select a database link from the Object Tree and click Drop.

To drop a database link:

1. In Object Browser, Object Tree, expand **Database Links** and select a database link.
2. Click the **Object Details** tab and then **Drop**.

   In the Drop dialog:

   a. Drop - Review the details.

   b. SQL - Displays the SQL generated to drop the database link. To copy the displayed SQL, click the **Copy** icon.

   c. To confirm your selection, click **Drop** again.

3.13 Managing Materialized Views

A materialized view is a query result that is stored or *materialized* in advance as a schema object. Use Object Browser to view, or drop materialized views.

Materialized views summarize, compute, replicate, and distribute data. A materialized view often serves as a master table in replication and a fact table in data warehousing. Unlike an ordinary view, which does not take up any storage space or contain any data, a materialized view contains the rows resulting from a query against one or more base tables or views. A materialized view can be stored in the same database as its base tables or in a different database.

Materialized views are often used to improve performance, especially when storing data locally that is sourced from tables or views using a database link. Similarly, materialized views are often used instead of views when there are extensive calculations or summarizations, especially on particularly large data sets. Materialized views are refreshed at specified intervals which means the data is not always up-to-date but queries against them are significantly faster for the examples given above.

- Browsing a Materialized View
  Select a materialized view from the Object Tree and access tabs in the Object Detail View.
- Dropping a Materialized View
  Select a materialized view from the Object Tree and click Drop.

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> **See Also**
>
> Overview of Materialized Views in *Oracle AI Database Concepts*

3.13.1 Browsing a Materialized View

Select a materialized view from the Object Tree and access tabs in the Object Detail View.

To browse a materialized view:

1. In Object Browser, Object Tree, expand **Materialized View** and select a materialized view.
2. The Object Detail View appears and displays the following tabs:
   - **Columns** - Displays the columns in the current materialized view, including the Column Name, Data Type, Nullable flag, Default value, Primary Key, and Comment. Available actions include:
     - **Comment**
     - **Drop**
     - **Refresh**
   - **Data** - Displays the data in the columns. Available actions include:
     - **Columns** - Configure the columns to display.
     - **Filter** - Create a filter by selecting a column, operation, and value.
     - **Count Rows** - Displays the number of rows in the current view.
     - **Download** - Download an XLSX file.
     - **Refresh** - Refresh the current view.
   - Details - Displays object details stored in `DBA_SNAPSHOTS` such as updatable and status.
   - **Grants** - Displays grants on the current view, including privilege, grantee, grantable, grantor, and object name. Available actions include:
     - **Grant**
     - **Revoke**
     - **Refresh**
   - **Dependencies** - Displays a list of objects that use (or depend) upon this materialized view. Available actions include:
     - **Refresh**
   - **DDL** - Displays the DDL necessary to re-create the materialized view. Available actions include:
     - **Download** - Download an XLSX file.
     - **Refresh** - Refresh the current view.

3.13.2 Dropping a Materialized View

Select a materialized view from the Object Tree and click Drop.

To drop a materialized view:

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1. In Object Browser, Object Tree, expand **Materialized View** and select a materialized view.
2. Click the **Columns** tab and then **Drop**.

   In the Drop dialog:

   a. Drop - Review the details.

   b. SQL - Displays the SQL generated to drop the database link. To copy the displayed SQL, click the **Copy** icon.

   c. To confirm your selection, click **Drop** again.

3.14 Managing Synonyms

A synonym is an alias for a schema object. Use Object Browser to create, view and drop a synonym.

Synonyms can provide a level of security by masking the name and owner of an object and providing location transparency for remote objects of a distributed database. Synonyms are also convenient to use and reduce the complexity of SQL statements for database users.

- Creating Synonyms
  Use Object Browser to create synonyms.
- Viewing a Synonym
  View existing synonyms in Object Browser.
- Dropping a Synonym
  Select a synonym from the Object Selection pane and click Drop on the Object Details tab.

> **See Also**
>
> Managing Views_ Sequences_ and Synonyms in *Oracle AI Database Administrator's Guide* for information about synonyms

3.14.1 Creating Synonyms

Use Object Browser to create synonyms.

To create a synonym:

1. In Object Browser, click the **Create Database Objects** menu and select **Synonym**.

   > **Tip**
   >
   > To create new objects from the Object Tree, right-click the object and select the **Create** option.

   The Create Synonym dialog appears.

On Create Synonym:

2. Synonym Name - Identify the name of the synonym. Synonym names must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore.

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3. Object Owner - Specify the database schema (or username) that owns the object upon which you wish to create your synonym.
4. If your schema contains database links, additional fields display depending on configuration:
   a. Create Synonym On - Choose whether to create a synonym on a **Local Object** object from the local database or a **Remote Object** from a remote database.
   b. Remote Object - Enter the name of the remote object upon which you wish to create a synonym.
   c. Database Link - Select a database link to be used to access the Remote Object.
5. Object - Select an object upon which you wish to create a synonym.

> **Tip**
>
> The **SQL Script** region displays SQL generated by this dialog. To copy the SQL, click the **Copy** icon.

6. Click **Create Synonym**.

   The Object Details tab appears.

3.14.2 Viewing a Synonym

View existing synonyms in Object Browser.

To view an existing synonym:

1. In Object Browser, Object Tree, expand **Synonyms** and select a synonym to view.
2. The Object Detail View appears and displays the following tab:
   - **Object Details** - Displays details about the synonym. Clicking the object name (for example, a table name) displays the details of that object. Available actions include:
     – **Drop**
     – **Refresh**

3.14.3 Dropping a Synonym

Select a synonym from the Object Selection pane and click Drop on the Object Details tab.

To drop a synonym:

1. In Object Browser, Object Tree, expand **Synonyms** and select a synonym to view.

   The Object Detail View appears.
2. Click **Drop**.

   In the Drop dialog:
   a. Drop - Review the details.
   b. SQL - The **SQL Script** region displays the SQL generated to drop the synonym. To copy the displayed SQL, click the **Copy** icon.
   c. Confirm your selection and click **Drop** again.

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3.15 Managing SODA Collections

Use Object Browser to load data to a SODA collection as JSON, TXT, or ZIP files.

- About SODA Collections
  Learn about SODA collections.
- Creating a SODA Collection
  Use Object Browser to load documents and create a new SODA collection.
- Viewing a SODA Collection
  View existing SODA collections in Object Browser.
- Editing or Dropping a SODA Collection
  View a SODA collection in Object Browser, then use Load Data to upload a new version of the data or click the Drop button to remove the SODA collection from the workspace.

3.15.1 About SODA Collections

Learn about SODA collections.

Simple Oracle Document Access (SODA) is a set of NoSQL-style APIs that enable you to create and store, retrieve, and query collections of documents in Oracle Database without needing to know Structured Query Language (SQL) or how the documents are stored in the database.

SODA uses a SQL schema to store documents .Documents are generally JSON data but they can be any type of data, including video, images, sounds, or other binary content. Documents can be fetched from the database by key lookup or by using query-by-example (QBE) pattern-matching.

Requirements

- Database 18.3 or higher.
- The workspace user must have the **SODA_APP** role.

Supported Filetypes

You can upload the following filetypes to a SODA collection:

- **JSON files** - APEX supports JSON files containing an array with multiple JSON objects. APEX extracts each JSON object from the array and loads it as a single JSON document to the SODA collection. The array selector is auto-detected by default.
- **JSON lists** - JSON lists are files containing multiple JSON documents, one per line, separated by line feeds.
- **ZIP files** - ZIP files are automatically extracted and each file can be uploaded to a SODA collection. Depending on data load settings, non-JSON files within the ZIP archive are either skipped or also loaded to the collection. XML files can be converted to JSON before loading to the SODA collection.

3.15.2 Creating a SODA Collection

Use Object Browser to load documents and create a new SODA collection.

To load documents to a new SODA collection:

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1. In Object Browser, click the **Create Database Objects** menu and select **SODA Collection**.

   > **Tip**
   >
   > To create new objects from the Object Tree, right-click the object and select the **Create** option.

   The Create SODA Collection Wizard appears.

2. On Load Data into SODA Collection:
   - Drag and drop the desired JSON, TXT, or ZIP file into the dialog.
   - Click **Choose File** and browse your local system to the file location to upload it.

   The wizard prepares the next screen based on filetype.

3. JSON Selector Type - Specify how to extract JSON documents from the uploaded file. Options include:
   - **Auto-Detect** - APEX looks for the first JSON array within the uploaded file and uploads each JSON object within the array as a document to the SODA collection.
   - **Custom** - Requires that the uploaded file is a valid JSON document. APEX uses the user-provided JSON selector to reference a JSON array within the uploaded file, and uploads each JSON object within the array as a document to the SODA collection.
   - **Linefeed (JSON List)** - Requires a file containing multiple JSON documents with each document in one line, and separated by line feeds. This type of JSON upload supports individual JSON documents (line length) up to 32,767 bytes.

4. Load To - Decide whether to load into a new or existing SODA collection. Options include:
   - **New Collection** - Creates a new collection.
   - **Existing Collection** - Upload to an existing collection.
     If this option is selected, Existing SODA Collection appears. Choose an existing SODA collection to load data into.

     If prompted, choose whether your Update Method appends the data to the collection or replaces the data in the collection.

5. SODA Collection Name - Provide a name for the new SODA collection. Only upper case names are supported.

   > **Tip**
   >
   > If **Create Relational View** is enabled, Relational View Name populates automatically based on SODA Collection Name. You can change the Relational View Name if desired.

6. Skip invalid rows - If enabled, rows containing invalid JSON documents are skipped. If disabled, rows containing invalid JSON documents raise an error.

7. Create Relational View - If enabled and a name for the relational view is provided, APEX uses the Data Guide feature in order to generate a relational view on top of the SODA collection. The relational view can then be used to create an application.

8. Click **Load Data**.

   When the data has loaded, a confirmation message appears. This may take some time.

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9. When the upload completes, you can:
   - **View Collection** - Click this option to view the SODA collection in Object Browser.
   - **Create Application** - Click this option to jump to the Create Application Wizard in App Builder.
10. To return to Object Browser, click the **X** icon (top-right) or press **Esc** to close the dialog.

3.15.3 Viewing a SODA Collection

View existing SODA collections in Object Browser.

To view an existing SODA collection:

1. In Object Browser, Object Tree, expand **SODA Collections** and select a collection.
2. The Object Detail View appears and displays three tabs:
   - **Collection Contents** - View the general contents of the collection. Available buttons include:
     - **Load Data**
     - **Drop**
     - **Refresh**
   - **Data Guide** - View the Relational Views and full JSON Data Guide associated with the collection. Available buttons include:
     - **Create Search Index**
     - **Drop Search Index**
     - **Create Relational View** (for the relational view)
     - **Refresh**

     > **Tip**
     >
     > Clicking a view name navigates you to the view in Object Browser.
   - **Meta Data** - View the SODA REST Endpoint URL and full Collection Meta Data.

3.15.4 Editing or Dropping a SODA Collection

View a SODA collection in Object Browser, then use Load Data to upload a new version of the data or click the Drop button to remove the SODA collection from the workspace.

To edit or drop a SODA collection:

1. In Object Browser, Object Tree, expand **SODA Collections** and select a collection.

   The Object Detail View appears.
2. To edit the collection and upload more data:
   a. On the **Collection Contents** tab, click **Load Data**.
   b. Drag and drop a file into the wizard, or choose a file from your computer.
   c. Proceed through the wizard. For **Load To**, select **Existing Collection**.
3. To drop a SODA collection:

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a. On the **Collection Contents** tab, click **Drop**.

b. Confirm your selection and click **Drop** again.

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4

Using SQL Commands

Using SQL commands you can create, edit, view, run, and delete database objects.

- About SQL Commands
  You can use SQL Commands to create, edit, view, run, and delete database objects.
- Accessing SQL Commands
  Learn how to access SQL Commands.
- About the SQL Commands Home Page
  Learn about the SQL Commands home page.
- Using the Command Editor
  You use the command editor in SQL Commands to execute SQL commands within Oracle APEX.
- Saving an SQL Command
  You can save commands you enter in SQL Commands.
- Copying a Command
  Click Saved SQL from the SQL Commands page, click the name of the command to load into command editor, enter a name, and click Save.
- Viewing Results
  When you execute a SQL command, the results display in the display pane at the bottom of the SQL Commands home page.
- Using Explain Plan
  Explain plan parses a query and records the plan that Oracle devises to execute it.
- Using Saved Commands
  You can access the commands you save and commands saved by other users in the same workspace.
- Using SQL Command History
  You use SQL Command History to access commands you have executed in SQL Commands.

See Also

- *Oracle AI Database SQL Language Reference* for detailed information about SQL statements and other parts of SQL, such as operators, functions, and format models.
- *Oracle AI Database Concepts* for conceptual information about SQL.
- *Oracle AI Database Sample Schemas* for information about the `HR` sample schema that is used for examples in this chapter.

4.1 About SQL Commands

You can use SQL Commands to create, edit, view, run, and delete database objects.

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A SQL command can contain SQL statements or PL/SQL blocks.

When using SQL Commands, remember the following:

- SQL commands created in the Query Builder can be accessed from SQL Commands.
- Saved SQL commands must have unique names within a given workspace.
- There is no interaction between SQL Commands and SQL Scripts.
- You can cut and paste an SQL command from SQL Commands to run in the SQL Script Editor.

Tip

SQL commands created in the Query Builder can be accessed from SQL Commands.

See Also

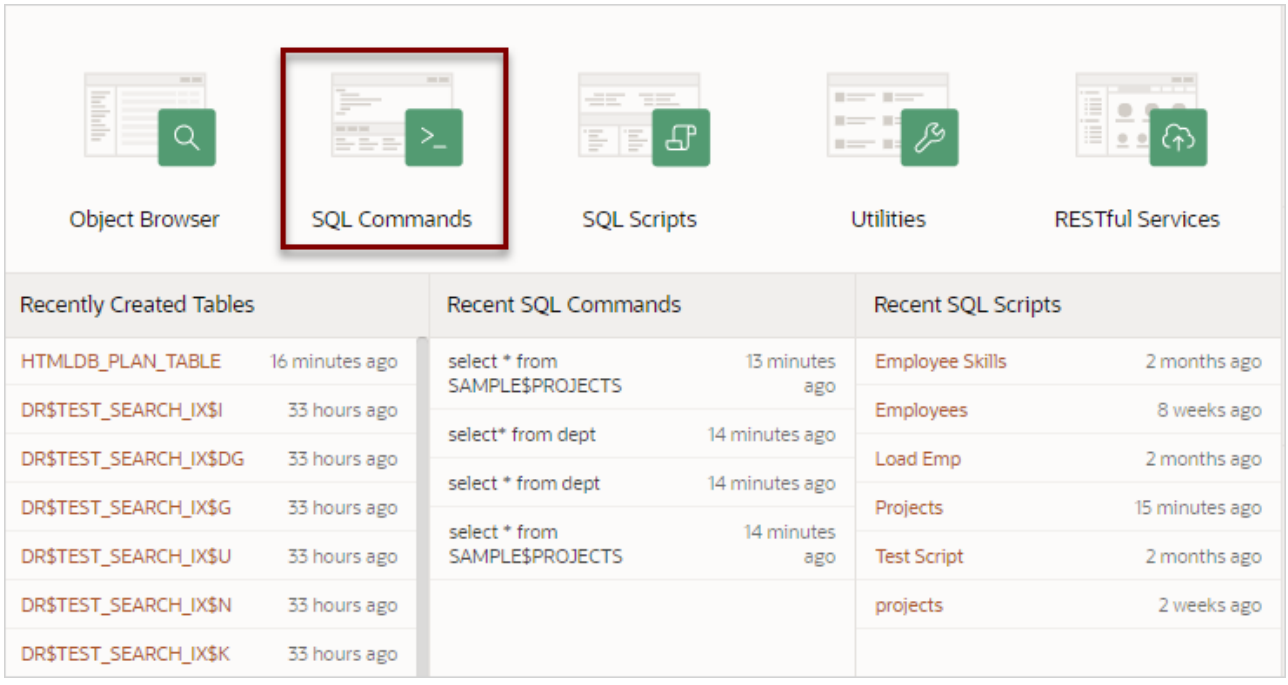
- Using SQL Scripts
- Using Query Builder

4.2 Accessing SQL Commands

Learn how to access SQL Commands.

To access SQL Commands:

1. On the Workspace home page, click **SQL Workshop**.
2. Click **SQL Commands**.



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The SQL Commands home page appears.

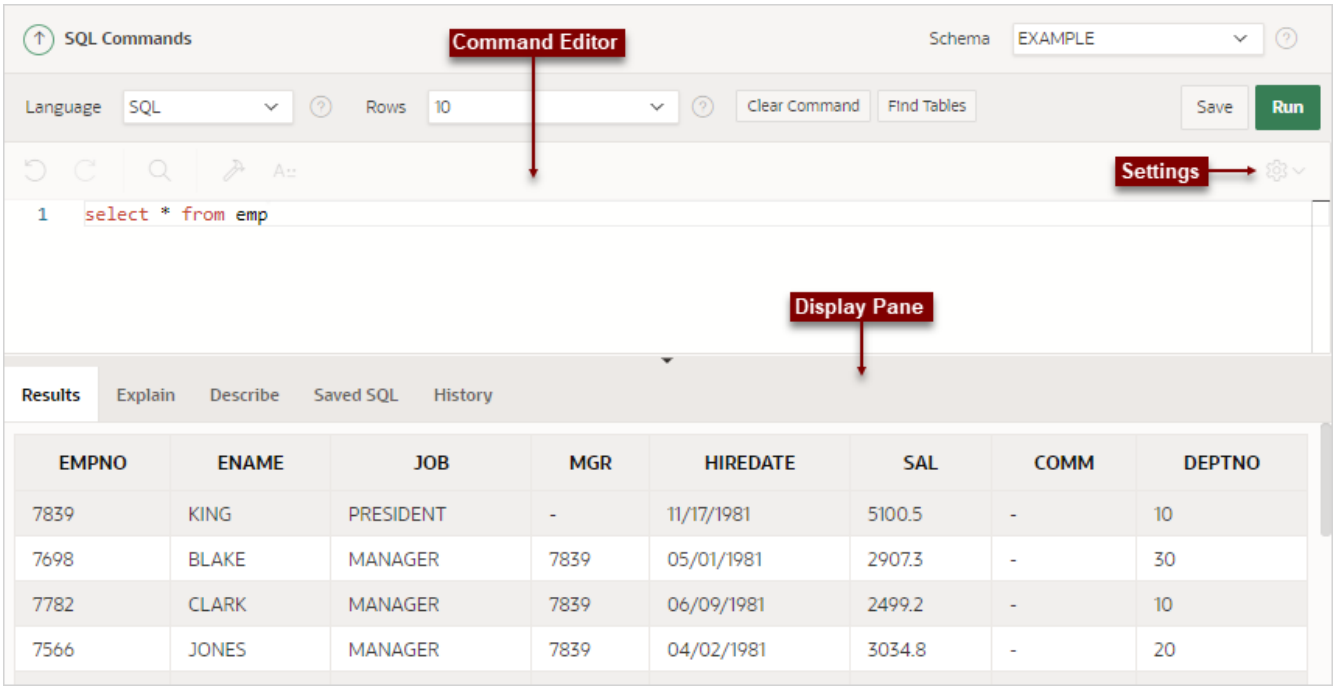
> **Note**
>
> If the instance administrator has disabled RESTful Services for this APEX instance, RESTful Services are not available for this instance and the RESTful Services icon does not display.

> **See Also**
>
> Configuring SQL Workshop in *Oracle APEX Administration Guide*

4.3 About the SQL Commands Home Page

Learn about the SQL Commands home page.

The SQL Commands home page is divided into two sections: a Command Editor and a Display pane. You use the Command Editor to execute SQL commands and the display pane to view output, saved command lists, and history lists.



Command Editor

The top of the SQL Commands home page features a Command Editor with the following controls:

- **Language**. Determines the language which should be used to execute the entered statement.

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- **Rows**. Select the number of rows of output to display simultaneously up to a maximum of 100,000. All rows of DBMS Output are displayed regardless of the Display list setting.
- **Clear Command**. Use the Clear Command button to clear the text in the command editor.
- **Find Tables**. Use the Find Tables button to view tables within the currently selected schema.
- **Save**. Click the **Save** button to save the contents of the command editor, or the currently highlighted content to a file. You are prompted to enter a name and an optional description. The command appears in the Saved SQL list.
- **Run**. Click the **Run** button (**Ctrl+Enter**) to run the command in the command editor, or the currently highlighted command in the command editor.

The text editor features the following controls:

- Undo (Ctrl+Z)
- Redo (Ctrl+Shift+Z)
- Find (Ctrl+F)
- Query Builder
- Auto Complete (Ctrl+Space)
- 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) - The Command Palette includes over 80 commands including: Replace (Ctrl+H), Replace with Next Value (Ctrl+Shift+.), and 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 - 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

Display Pane

The display pane is at the bottom of the SQL Commands home page and features the following five tabs:

- **Results**. Click the **Results** tab to see the results from the last successfully executed SQL command. Click **DBMS Output** at the bottom of the displayed results to display lines of DBMS output. This control only appears when there is DBMS output to display. Click **Download** to export results to a comma-delimited file on your local file system.

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- **Explain**. Click the **Explain** tab to examine the execution plan used by the optimizer for statements that make changes to the database. Objects in the output are linked to the Object Browser. Click the linked object to view its properties in the Object Browser.
- **Describe**. Enter Describe *object_name* and click **Run** to display column definitions for a table or view, or specifications for a function or procedure in the **Describe** tab. Select links in the Describe results to write that information into the command editor. For example, click a table name to add *owner.table*, click a column name to add the *column name*, click a procedure or function name to add the object call with parameters, or click a package name to add the package call.
- **Saved SQL**. Click the **Saved SQL** tab to display a list of all SQL commands saved in the current workspace. Click the command title to load it into the command editor.
- **History**. Click the **History** tab to list your recently executed commands. Your last 200 executed commands are saved.

See Also

- Using the Command Editor
- Selecting a Schema

4.4 Using the Command Editor

You use the command editor in SQL Commands to execute SQL commands within Oracle APEX.

- Running a SQL Command
  Enter the SQL command you want to run in the command editor and click Run.
- About Transactions in SQL Commands
  Transactional mode is a stateful transaction mode where you can, for example, perform an update, select data for review, and `COMMIT` or `ROLLBACK` changes. It is implemented using `DBMS_JOBS`.
- About Unsupported SQL*Plus Commands
  SQL Commands does not support SQL*Plus commands.
- Terminating a Command
  You can terminate a command in SQL Commands using a semicolon (;), a slash (/), or with nothing.
- Using Bind Variables
  Enter values for bind variables during command execution.
- Using the Find Tables Button
  Use the Find Tables button to view tables within the currently selected schema.

See Also

About the SQL Commands Home Page

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4.4.1 Running a SQL Command

Enter the SQL command you want to run in the command editor and click Run.

To execute a SQL Command:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Commands**.

   The SQL Commands page appears.
2. Enter the SQL command you want to run in the command editor.
3. Click **Run** (**Ctrl+Enter**) to execute the command.

   > **Tip**
   >
   > To execute a specific statement, select the statement you want to run and click **Run**.

   The results appear in the Results pane.
4. To export the resulting report as a comma-delimited file (.csv), click the **Download** link.

4.4.2 About Transactions in SQL Commands

Transactional mode is a stateful transaction mode where you can, for example, perform an update, select data for review, and `COMMIT` or `ROLLBACK` changes. It is implemented using `DBMS_JOBS`.

Consider the following behavior in transactional mode:

- Actions are not committed to the database until you enter an explicit `COMMIT` command.
- Exiting SQL Commands terminates and rolls back the current transaction.
- A session timeout terminates and rolls back the current transaction.

  Note that the Environment Setting, `SQL Commands Maximum Inactivity in minutes`, sets the time before an inactive session times out. The default timeout is 60 minutes.
- The **CSV Export** option is not available.

> **See Also**
>
> Configuring SQL Workshop in *Oracle APEX Administration Guide*

4.4.3 About Unsupported SQL*Plus Commands

SQL Commands does not support SQL*Plus commands.

If you attempt to enter an SQL Command Line command such as `SET ECHO` or `DEFINE` in SQL Commands, an error message displays.

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4.4.4 Terminating a Command

You can terminate a command in SQL Commands using a semicolon (;), a slash (/), or with nothing.

Consider the following valid alternatives:

```
SELECT * from emp;

SELECT * from emp
/

SELECT * from emp
```

The first example demonstrates the use of a semicolon (;), the second example demonstrates using a slash (/), and the final example demonstrates a command with no termination.

4.4.5 Using Bind Variables

Enter values for bind variables during command execution.

Bind variables are supported. You are prompted to enter values for bind variables during command execution. Bind variables are prefixed with a colon.

For example

```
SELECT * FROM emp WHERE deptno = :dept
```

4.4.6 Using the Find Tables Button

Use the Find Tables button to view tables within the currently selected schema.

To view tables within the current schema:

1. Navigate to SQL Commands.
2. From the Schema list, select a schema (optional).
3. Click **Find Tables**.

   The Table Finder appears. A search bar displaying the selected schema displays at the top of the page and contains the following controls:

   - **Search**. Search for a table name. Enter case insensitive keywords in the Search field and click **Go**. To view all tables, leave the Search field blank and click **Go**.
   - **Views**. Select the **Views** check box and click **Go** to include views in the resulting report.
   - **Rows**. Determine how many rows display in the resulting report. To change the number of rows that display, make a selection from the list and click **Go**.

   The Table Finder report appears displaying the table name, the number of rows, last analyzed date, and the object type.
4. Select a table name.

   The Table Finder report appears.

   This report displays the column names, data type, length, precision, scale and the SQL necessary to re-create the table that appears at the bottom of the page.

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5. Click **Append** to append SQL from the page to the existing command in the command editor.
6. Click **Replace** to replace existing command in the command editor with the SQL from the page.

4.5 Saving an SQL Command

You can save commands you enter in SQL Commands.

To save an SQL command:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Commands**.

   The SQL Commands page appears.
2. Enter the command in the command editor.
3. Click **Save** to save the command.

   You are prompted to enter a name and description for the command.
4. Click **Save**, or click **Cancel** to return to the command editor without saving.

   The saved command is listed in the display area.

4.6 Copying a Command

Click Saved SQL from the SQL Commands page, click the name of the command to load into command editor, enter a name, and click Save.

To copy a SQL command:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Commands**.

   The SQL Commands page appears.
2. Click **Saved SQL**.

   The Saved SQL list of commands appears in the display pane.
3. Click the name of the command to load it into the command editor
4. Click **Save** to save the command.
5. Enter a name for the command in the Name field and click **Save**.

   The command is copied to the new name.

4.7 Viewing Results

When you execute a SQL command, the results display in the display pane at the bottom of the SQL Commands home page.

The results of the last executed command are available until you execute another SQL command, or leave SQL Commands.

- Accessing the Results Pane
  From the SQL Commands page, click the Results tab.

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- About the Results Pane
  The Results pane displays SQL command results as HTML formatted table. The number of rows returned appears after the output, and the time taken. DBMS output appears as plain text after the HTML formatted results.

4.7.1 Accessing the Results Pane

From the SQL Commands page, click the Results tab.

To display SQL command results:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Commands**.

   The SQL Commands page appears.
2. Click the **Results** tab.

   The HTML formatted results appear in the display pane.
3. Click **DBMS Output** to display plain text DBMS output results.

   The **DBMS Output** control only appears if there are DBMS output results.

4.7.2 About the Results Pane

The Results pane displays SQL command results as HTML formatted table. The number of rows returned appears after the output, and the time taken. DBMS output appears as plain text after the HTML formatted results.

On the Results pane you can:

- **Display DBMS output.** Automatically displays HTML output or DBMS output depending on type of SQL command entered, SQL or PL/SQL block with DBMS output.
- **Download results.** Click **Download** to export results to a comma-delimited file on your local file system. You are prompted to enter a name and directory for the file. Only available for HTML output.

> **See Also**
>
> Accessing the Results Pane

4.8 Using Explain Plan

Explain plan parses a query and records the plan that Oracle devises to execute it.

By examining this plan, you can find out if Oracle is picking the right indexes and joining your tables in the most efficient manner. It is not necessary to execute the command to view the explain plan.

- Viewing an Explain Plan
  From the SQL Commands page, enter or load the command whose plan you want to view and click the Explain tab.

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4.8.1 Viewing an Explain Plan

From the SQL Commands page, enter or load the command whose plan you want to view and click the Explain tab.

To view the Explain Plan:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Commands**.

   The SQL Commands page appears.
2. Enter or load the command whose plan you want to view.
3. Click the **Explain** tab.

   The explain plan used by the optimizer appears in the display pane.

   The Explain Plan pane shows the plan used by the Oracle Optimizer to run your SQL command. It typically displays the Query Plan, Index Columns and Table Columns used.

   On the Explain Plan pane you can:

   - **View object definitions**. Click the object name in Query Plan to display the object definition in the Object Browser.
   - **View index definitions**. Click the index name in Table Columns to display the index definition in the Object Browser.

4.9 Using Saved Commands

You can access the commands you save and commands saved by other users in the same workspace.

You can also access SQL commands you and other users of the same workspace saved from the Query Builder.

- Accessing Saved Commands
  From the SQL Commands page, click the Saved SQL tab, click the title of the command to load it into the command editor, and click Run.
- About the Saved SQL Pane
  The Saved SQL pane displays a list of all commands saved under the current workspace.

4.9.1 Accessing Saved Commands

From the SQL Commands page, click the Saved SQL tab, click the title of the command to load it into the command editor, and click Run.

To access saved SQL commands:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Commands**.

   The SQL Commands page appears.
2. Click the **Saved SQL** tab.

   The Saved SQL list of commands appears in the display pane.
3. Click the title of the command to load it into the command editor.

   The command appears in the editor.
4. Click **Run** to execute the command.

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> **See Also**
>
> About the Saved SQL Pane

4.9.2 About the Saved SQL Pane

The Saved SQL pane displays a list of all commands saved under the current workspace.

The list displays commands saved from SQL Commands and SQL commands saved from Query Builder. Saved SQL commands must have unique names in the current workspace. The same name cannot be used in the Query Builder and SQL Commands.

Each command entry shows the owner name, the command name, a description if it exists, the first characters of the SQL command, who last updated the command and when.

On the Saved SQL pane you can:

- **Show commands by owner** - Make a selection from the Owner list to specify the user whose commands you want to display. To view all scripts select -All Users-.
- **Search for a command** - Enter a command name or partial name, or enter a code snippet in the Find field and click **Go**. To view all scripts, leave the Find field blank and click **Go**. You control how many rows display by making a selection from the Rows list.
- **Set the Number of Output Rows** - Make a selection from the Display list to specify the number of Saved SQL commands to display simultaneously.
- **Delete a command** - Click the check box associated with a command and click **Delete Checked**.

4.10 Using SQL Command History

You use SQL Command History to access commands you have executed in SQL Commands.

Commands you have executed are stored in the command history regardless of whether you explicitly save them.

- Accessing a Command from Command History
  From the SQL Commands page, click the History tab.
- About the History Pane
  The History pane displays a list of commands you have executed.

4.10.1 Accessing a Command from Command History

From the SQL Commands page, click the History tab.

To access history commands:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Commands**.

   The SQL Commands page appears.
2. Click the **History** tab.

   The list of commands in History appears in the display pane.
3. Click the partial command displayed in the SQL column.

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The command appears in the editor.

4.10.2 About the History Pane

The History pane displays a list of commands you have executed.

Each history entry shows the time the command was last executed, the first characters of the command, and the schema in which it was executed.

On the History pane you can:

- **Load a command** - Click the partial command displayed in the SQL column to load the command into the command editor. When the command loads, it also sets the schema in which it was last executed.

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5

Using SQL Workshop Utilities

SQL Workshop provides utilities to build SQL queries, load and unload data from an Oracle database, generate DDL, view object reports, manage UI Defaults, restore dropped database objects, compare schemas, monitor the database, and view database details.

- Using Data Workshop
  Use Data Workshop to load and unload data to the database.
- Using Data Generator
  Use the Data Generator utility to create Blueprints and then generate sample data.
- Using Query Builder
  Use Query Builder to build queries graphically by adding tables to a panel and selecting the columns to return.
- Using Quick SQL
  Rapidly design and prototype data models using a markdown-like shorthand syntax that expands to standards-based Oracle SQL.
- Using Sample Datasets
  Use sample datasets to build sample applications.
- Generating DDL
  Generate data definition language (DDL) statements from the Oracle data dictionary.
- Managing User Interface Defaults (UI Defaults)
  Managing User Interface Defaults (UI Defaults) enables you to assign default UI properties, create default wizards, modify the table UI defaults, add new attributes, and export the UI defaults.
- Comparing Schemas
  You can run a report that compares database objects in two schemas, displaying differences between them. You can compare all objects in the schemas or limit your report to specific objects.
- Navigating to Data Dictionary Cache
  Quickly navigate to Data Dictionary Cache in Administration Services.
- Managing Methods on Tables
  The Managing Methods on Tables utility enables you to create an application programming interface, or package, based on a specified table.
- Using the Recycle Bin
  You can use the Recycle Bin to view and restore dropped database objects.
- Viewing Object Reports
  SQL Workshop Utilities includes a variety of object reports to help you better manage the objects in your database.
- Creating a Data Model Using AI
  Create a data model using the Generative AI Service already configured on the workspace.
- Viewing Database Details
  If you have an account that has been granted a database administrator role, you can view details about your database on the About Database page.

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- Monitoring the Database
  The reports available on the Database Monitor page provide a database-wide view of the database sessions, system statistics, SQL statements, and longer operations.

5.1 Using Data Workshop

Use Data Workshop to load and unload data to the database.

- About the Load Data and Unload Data Wizards
  Use the Load Data and Unload Data wizards to load and unload data to and from the database.
- About Importing, Exporting, Loading, and Unloading Data
  You have several options when copying data between Oracle databases or between an Oracle database and external files. Data copying is accomplished by *exporting* and *importing* data, and by *unloading* and *loading* data.
- Import, Export, Load, and Unload Options
  The Oracle AI Database and Oracle APEX provide several powerful options for importing, exporting, loading, and unloading data.
- Accessing the Load Data and Unload Data Wizards
  Access the Load Data or Unload Data wizards in SQL Workshop by clicking Utilities and then Data Workshop.
- Loading Data
  Use the Load Data Wizard to copy and paste or upload data.
- Unloading Data
  Use the Unload Data page to export the contents of a table to a text file or XML document.
- Loading Data From the Oracle Cloud (Autonomous Database Only)
  Load data from the Oracle Cloud using Object Store References. (This function is only available for Autonomous Database users.)

5.1.1 About the Load Data and Unload Data Wizards

Use the Load Data and Unload Data wizards to load and unload data to and from the database.

These step-by-step wizards include the following features:

- Drag and drop delimited files (CSV, tab-delimited), XLSX files (Excel workbooks), JSON or XML files to load data into a new table.
- Copy and paste delimited data (CSV, tab-delimited), or select a sample data set to load data into a new table.
- Data load parser detects almost everything automatically so there is no need to manually pick data types, or provide format masks or decimal characters.
- Data Loading runs in the background which offers a number of advantages. If a larger file is being uploaded, the dialog can be dismissed. If bad rows cannot be inserted into the target table, the whole load is not lost. All failed rows are saved in error table and can be post-processed manually.
- With Oracle Database 12c or later, you can choose whether the Primary Key column will be generated using the Identity Column feature or whether a globally unique identifier (`SYS_GUID`) shall be used. The difference is values and space requirements. Identity Column values are like sequences in that they start with 1 and increase. `SYS_GUID` values

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are globally unique, hard to predict, but require more space than the compact Identity Column numbers.

- The main dialog displays up to 10 columns and 5 rows in the preview. You can configure load settings such as column headers, file encoding, column delimiter / enclosed by (for CSV or TXT), and Select Sheet (for XLSX with multiple worksheets).
- You can view a full preview and change more settings by clicking the Configure button. The Configure dialog displays a maximum of 100 columns and 100 rows. Users can configure the same setting as settings in the main dialog plus maximum Rows to Sample and columns to load/unload.
- Settings changes will change the preview both in main and configure dialogs. They also affect data load result.

> **Note**
>
> If file size is greater than (>) or equal (=) to 2097152 bytes and you select to sample All Rows, the following confirmation message displays: `Sampling all rows can take a while for larger files. Do you really want to sample the whole file?`

- Select table owner, enter table name and error table name.

> **Note**
>
> By default, all table names are converted to upper case. If data load succeeds without any error, the error table is dropped automatically.

- The wizards load and unload table data only. They do not load or unload other kinds of schema objects.
- You can load and unload to and from your own schema only. This is also true for users with administrator privileges.
- You can load or unload only a single table at a time.

Supported unload formats include:

- Text such as comma-delimited or tab-delimited data in dialog page.
- XML documents

> **See Also**
>
> Import, Export, Load, and Unload Options

5.1.2 About Importing, Exporting, Loading, and Unloading Data

You have several options when copying data between Oracle databases or between an Oracle database and external files. Data copying is accomplished by *exporting* and *importing* data, and by *unloading* and *loading* data.

The following table defines these terms.

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Term	Definition
Exporting	Copying database data to external files for import into another Oracle database only. The files are in a proprietary binary format.
Importing	Copying data into the database from external files that were created by exporting from another Oracle database.
Unloading	Copying database data to external text files for consumption by another Oracle database or another application (such as a spreadsheet application). The text files are in an industry-standard format such as tab-delimited or comma-delimited (CSV).
Loading	Copying data into the database from external text files that are in either a standard delimited format or in any of the formats that are supported by the Oracle SQL*Loader utility.

You can export data from any Oracle Database edition (Express Edition, Standard Edition, and Enterprise Edition) into any other edition.

5.1.3 Import, Export, Load, and Unload Options

The Oracle AI Database and Oracle APEX provide several powerful options for importing, exporting, loading, and unloading data.

The following table describes options for importing, exporting, loading, and unloading data.

Feature or Utility	Description
Load Data /Unload Data wizards in APEX	• Easy to use graphical interface • Supports CSV, XLSX, TXT, XML or JSON files) or Copy and Paste (supports ONLY comma or tab delimited data) • Loads/unloads tables only, one table at a time • Access only to schema of logged-in user • No data filtering on upload
SQL*Loader utility	• Command-line interface, invoked with `sqlldr` command • Bulk-loads data into the database from external files • Supports numerous input formats, including delimited, fixed record, variable record, and stream • Loads multiple tables simultaneously • Powerful data filtering capabilities
Data Pump Export and Data Pump Import utilities	• Command-line interface, invoked with `expdp` and `impdp` commands • Exports and imports from one Oracle database to another (proprietary binary format) • Imports/exports all schema object types • Imports/exports entire database, entire schema, multiple schemas, multiple tablespaces, or multiple tables • Powerful data filtering capabilities • High speed

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Feature or Utility	Description
Export and Import utilities	• Command-line interface, invoked with `exp` and `imp` commands • Exports and imports from one Oracle database to another (proprietary binary format) • Supports XMLType data • Does not support the `FLOAT` and `DOUBLE` data types • Capabilities similar to Data Pump; Data Pump is preferred

#unique_146/unique_146_Connect_42_CBHEBFBD provides several load, unload, import, and export scenarios and suggests the appropriate option to use for each.

Import/Export Scenario	Recommended Option
You have fewer than 10 tables to load, the data is in spreadsheets or tab-delimited or comma-delimited text files, and there are no complex data types (such as objects or multivalued fields).	Load Data /Unload Data wizards in APEX
You have to load data that is not delimited. The records are fixed length, and field definitions depend on column positions.	SQL*Loader
You have tab-delimited text data to load, and there are more than 10 tables.	SQL*Loader
You have text data to load, and you want to load only records that meet certain selection criteria (for example, only records for employees in department number 3001).	SQL*Loader
You want to import or export an entire schema from or to another Oracle database.	Data Pump Export and Data Pump Import
You want to import or export data from or to another Oracle database. The data contains XMLType data and contains no `FLOAT` or `DOUBLE` data types.	Import (`imp`) and Export (`exp`)

See Also

Oracle AI Database Utilities for more information on Data Pump, the Import and Export utilities, and SQL*Loader

5.1.4 Accessing the Load Data and Unload Data Wizards

Access the Load Data or Unload Data wizards in SQL Workshop by clicking Utilities and then Data Workshop.

Use Data Workshop page to load data from various file formats such as XLSX, CSV, XML, and JSON into your workspace. You can also use the Unload Data wizard to export your data in text or XML format.

To access Load Data or Unload Data wizards:

1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **Data Workshop**.

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The Data Workshop page appears.

4. Click the appropriate icon to load data and unload data:
   - **Load Data**
   - **Unload Data**

5.1.5 Loading Data

Use the Load Data Wizard to copy and paste or upload data.

- About Loading Data
  Load data into the Oracle APEX by copying and pasting CSV data, selecting a sample data set, or uploading a file.
- Copying and Pasting CSV data or Selecting a Sample Data Set
  You can copy and paste CSV data, or select a sample data set sample into the Load Data Wizard.
- Loading an XML Document
  Load an XML document using Load Data Wizard.
- Loading a JSON File
  Load a JSON file using Load Data Wizard.
- Loading a XLSX File
  Load a XLSX file using Load Data Wizard.

> **See Also**
>
> Import, Export, Load, and Unload Options

5.1.5.1 About Loading Data

Load data into the Oracle APEX by copying and pasting CSV data, selecting a sample data set, or uploading a file.

Key capabilities when loading data into the APEX include:

- Copy and paste CSV data, or select a sample data set.
- Upload a file (supports CSV, XLSX, TXT, XML or JSON files).

> **Note**
>
> Configure load settings such as column headers, file encoding, column delimiter / enclosed by (for CSV or TXT), and Select Sheet (for XLSX with multiple worksheets).

- View full preview and change more settings by clicking **Configure** button. Configure dialog displays maximum of 100 columns and 100 rows. You can configure same setting as settings in the main dialog plus maximum Rows to Sample and columns to load/unload.
- In Configure dialog, under **Columns to Load** tab, you can enter case insensitive value that will be treated as `NULL`. For example, `"tbd"`, `"n/a"`, `"unknown"`, `"-"`.

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- Post loading, if any rows fail, up to 10 rejected rows display. To view more rows which have error, click **Open in Object Browser** button. You can optionally click **Drop** Table and **Reload** button to try the data load again.
- Settings change will change preview both in main and configure dialogs. They also affect data load result.
- Select table owner, enter table name and error table name

> **Note**
>
> By default, all table names are converted to upper case. If data load succeeds without any error, the error table is dropped automatically.

- Post loading, a **View Table** button and **Continue to Create Application Wizard** button display if there are no failed rows. The load is successful if ta table is created and displayed.

5.1.5.2 Copying and Pasting CSV data or Selecting a Sample Data Set

You can copy and paste CSV data, or select a sample data set sample into the Load Data Wizard.

To load data by copying and pasting CSV data or selecting a sample data set:

1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **Data Workshop**.
4. Under Get Started, click **Load Data**.

   The Load Data Wizard appears.
5. Click **Copy and Paste**.

   Under Copy and Paste, you can either copy and paste CSV data or select a sample data set from the drop down menu.
6. Click **Next**.
7. Under **Load to Table**, edit the following:
   a. **Table Owner** - Select the database schema you would like to create and load data into.
   b. **Table Name** - Identify the table name you would like to create. By default, all table names are converted to upper case.
   c. **Error Table Name** - Identify the error table name you would like to save errors during data load.

   > **Note**
   >
   > By default, all table names are converted to upper case. If data load succeeds without any error, this error table is dropped automatically.

   d. **Primary Keys** - Select how to set the primary key (Oracle Database 12c or later). Primary keys can be set using **SYS_GUID** or **Identity Column**.

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SYS_GUID generates and returns a globally unique identifier. On most platforms, this generated identifier is based on a host identifier, a process or thread identifier of the process or thread invoking the function, and a non-repeating value (sequence of bytes). **SYS_GUID** consumes more space, but is unpredictable. **Identity Column** is compact, but can be predictable

e. **Use Column Data Types** - Select to use the column types parsed from the file. If not selected, the table columns will be created as `VARCHAR2(4000)`.

8. To view the full preview, configure data load settings, and set which columns to load, Click **Configure**.

   Make the appropriate changes and click **Save Changes**.

9. Click **Load Data**.

5.1.5.3 Loading an XML Document

Load an XML document using Load Data Wizard.

XML files can also be uploaded to Oracle APEX. However, APEX only supports flat XML structures which can easily be mapped to a table and columns. XML structures with multiple levels of nesting cannot be loaded by the Data Loading wizard.

To load an XML document:

1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **Data Workshop**.
4. Click **Load Data**.
5. Under Upload a File, Click **Choose File**.
6. Select the appropriate `xml` file.

> **Note**
>
> There are no delimiter or enclosing characters to choose for XML file load. Also the column names are derived from the XML tag names, so there is no **First lines contains headers** checkbox. XML files are limited to 10MB each.

7. Under **Load to Table**, do the following:
   a. **Table Owner** - Select the table owner.
   b. **Table Name** - Enter the table name.
   c. **Error Table Name** - Enter the error table name to save errors during data load.

> **Note**
>
> By default, all table names are converted to upper case. If data load succeeds without any error, the error table is dropped automatically.

8. (Optional) To view the full preview, configure data load settings, and set which columns to load, click **Configure**.
9. (Optional) Make appropriate changes and click **Save Changes**.

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10. Click **Load Data**.

Once Data Loading is finished, a success message is displayed. If some rows cannot be loaded to the target table, they will be stored to the error table and error table is displayed.

5.1.5.4 Loading a JSON File

Load a JSON file using Load Data Wizard.

Loading JSON files works similar to loading XML files.

> **Note**
>
> Only flat structures are supported - deeply nested JSON structures cannot be loaded.

To load a JSON file:

1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **Data Workshop**.
4. Click **Load Data**.
5. Under Upload a File, Click **Choose File**.
6. Select the appropriate `JSON` file .

> **Note**
>
> JSON files are limited to 20MB on 11g and 12.1 databases. For Oracle Database 12.2 or higher, there is no size limit for JSON files.

7. Under **Load to Table**, edit the following:
   a. **Table Owner** - Select the database schema you would like to create and load data into.
   b. **Table Name** - Identify the table name you would like to create. By default, all table names are converted to upper case.
   c. **Error Table Name** - Identify the error table name you would like to save errors during data load.

   > **Note**
   >
   > By default, all table names are converted to upper case. If data load succeeds without any error, this error table is dropped automatically.

   d. **Primary Keys** - Select how to set the primary key (Oracle Database 12c or later). Primary keys can be set using **SYS_GUID** or **Identity Column**.

      SYS_GUID generates and returns a globally unique identifier. On most platforms, this generated identifier is based on a host identifier, a process or thread identifier of the process or thread invoking the function, and a non-repeating value (sequence of

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bytes). **SYS_GUID** consumes more space, but is unpredictable. **Identity Column** is compact, but can be predictable

e. **Use Column Data Types** - Select to use the column types parsed from the file. If not selected, the table columns will be created as `VARCHAR2(4000)`.

8. To view the full preview, configure data load settings, and set which columns to load, Click **Configure**.

   Make the appropriate changes and click **Save Changes**.

9. Click **Load Data**.

   Once Data Loading is finished, a success message displays. If some rows cannot be loaded to the target table, they will be stored to the error table and error table is displayed.

5.1.5.5 Loading a XLSX File

Load a XLSX file using Load Data Wizard.

Loading XLSX files is similar to loading CSV files. There is no need to detect or to choose delimiter or enclosing characters.

To load a XLSX file:

1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **Data Workshop**.
4. Click **Load Data**.
5. Under Upload a File, Click **Choose File**.
6. Select the appropriate `XLSX` file .

> **Note**
>
> If the uploaded XLSX file contains multiple worksheets, **Load Data** wizard picks the first sheet by default. To load another sheet, pick it from the **Select Sheet** select list. The **First lines contains headers** checkbox works similar to CSV files. The same is true for the **Configure** dialog, the behavior is the same as it is for CSV files. Uploading XLSX files is limited to 20MB for each file.

7. Under **Load to Table**, edit the following:

   a. **Table Owner** - Select the database schema you would like to create and load data into.

   b. **Table Name** - Identify the table name you would like to create. By default, all table names are converted to upper case.

   c. **Error Table Name** - Identify the error table name you would like to save errors during data load.

> **Note**
>
> By default, all table names are converted to upper case. If data load succeeds without any error, this error table is dropped automatically.

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d. **Primary Keys** - Select how to set the primary key (Oracle Database 12c or later). Primary keys can be set using **SYS_GUID** or **Identity Column**.

   SYS_GUID generates and returns a globally unique identifier. On most platforms, this generated identifier is based on a host identifier, a process or thread identifier of the process or thread invoking the function, and a non-repeating value (sequence of bytes). **SYS_GUID** consumes more space, but is unpredictable. **Identity Column** is compact, but can be predictable

e. **Use Column Data Types** - Select to use the column types parsed from the file. If not selected, the table columns will be created as `VARCHAR2(4000)`.

8. To view the full preview, configure data load settings, and set which columns to load, Click **Configure**.

   Make appropriate changes and click **Save Changes**.

9. Click **Load Data**.

   Once Data Loading is finished, a success message is displayed. If some rows cannot be loaded to the target table, they will be stored to the error table and error table is displayed.

5.1.6 Unloading Data

Use the Unload Data page to export the contents of a table to a text file or XML document.

- Unloading a Text File
  Use the Unload Data wizard to export the contents of a table to a text file. For example, you could export an entire table to a comma-delimited file (.csv).
- Unloading to an XML Document
  Use the Unload Data wizard to export the contents of a table to an XML document adhering to the Canonical XML specification.

> **See Also**
>
> Import, Export, Load, and Unload Options

5.1.6.1 Unloading a Text File

Use the Unload Data wizard to export the contents of a table to a text file. For example, you could export an entire table to a comma-delimited file (.csv).

To unload a table to a text file:

1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **Data Workshop**.
4. Under Get Started, click **Unload Data**.

   The Unload Data Wizard appears.

5. Select **Text Format** and click **Next**.

   The **Unload to Text - Columns** appears.

6. On Unload Text - Columns, edit the following:

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a. Schema - Select the database schema that owns the object you would like to export.

b. Table - Select the database table you would like export to a plain text format.

c. Columns - Highlight the columns you would like to be part of this plain text file. Only Oracle built in data types except BLOB and BFILE are supported to unload.

d. Where Clause - Enter SQL `WHERE` clause to limit the rows that are selected. For example: `DEPTNO = 10`

e. Click **Next**.

7. For Options, enter the following:

a. Separator - Specify the type of separator used to separate the column values on each line. The default value is a comma (,). To use a tab as a column separator, enter a backslash followed by the letter "t" ().

b. Optionally Enclosed By - Use this option to specify how to identify text strings in a column. You can specify single or double quotation marks.

c. Include Column Names - Check this box to include the name of each column in the text file.

d. File Format - Select **DOS** to have the lines in the resulting file terminated by carriage returns and line feeds. Select **UNIX** to have the lines in the resulting file contain terminated by line feeds.

e. File Character Set - Select the character set to encode the export file.

8. Click **Unload Data**.

   The file is downloaded.

5.1.6.2 Unloading to an XML Document

Use the Unload Data wizard to export the contents of a table to an XML document adhering to the Canonical XML specification.

To unload a table to an XML document:

1. On the Workspace home page, click the **Utilities** icon.
2. Click **Data Workshop**.
3. Under data Unload, click **to XML**.

   The Unload to XML Wizard appears.
4. Under Get Started, click **Unload Data**.

   The Unload Data Wizard appears.
5. Select **XML Format** and click **Next**.

   The **Unload to XML - Columns** appears.
6. Select the appropriate schema.
7. Select the table to unload.
8. Highlight the columns to include.
9. (Optional) Enter a Where clause to limit the records unloaded, and click **Unload Data.**

   The File Download window appears.
10. Click **Save** to download the file.

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5.1.7 Loading Data From the Oracle Cloud (Autonomous Database Only)

Load data from the Oracle Cloud using Object Store References. (This function is only available for Autonomous Database users.)

- Granting Privileges to the Workspace Schema
  Before you can load data from the cloud, you must grant privileges to the workspace schema.
- User Interface Differences for Oracle Cloud Users
  For Oracle Cloud users, Data Workshop includes an additional **Load from Cloud** button on the Data Workshop home page.
- About Object Store References
  Data Workshop uses Object Store References to reference cloud-based URLs for loading data. Use Object Store References to create External Tables from the Cloud, which you can then import into your workspace or connect to your applications.
- Creating an Object Store Reference
  Create a new Object Store Reference.
- Creating an External Table from Cloud
  Create a table from an external source with an Object Store Reference.
- Loading Avro or Parquet Files into Object Browser from Cloud
  For Avro and Parquet files, first prepare an external table then load it into your workspace for local use.
- Loading Other Files into Object Browser from Cloud
  For non-Avro and non-Parquet files, view the Object Store Reference in Data Workshop then import the file into your workspace for local use.

5.1.7.1 Granting Privileges to the Workspace Schema

Before you can load data from the cloud, you must grant privileges to the workspace schema.

Grant the following privileges to the workspace schema:

- `EXECUTE ON DBMS_CLOUD`
- `READ,WRITE ON DIRECTORY DATA_PUMP_DIR`

For example, run the following as ADMIN:

```
GRANT EXECUTE ON DBMS_CLOUD TO {schema};
GRANT READ,WRITE ON DIRECTORY DATA_PUMP_DIR TO {schema};
```

Where:

- *schema* is the workspace schema

See Also

- DBMS_CLOUD Subprograms and REST APIs in *Using Oracle Autonomous Database Serverless*
- GRANT in *Oracle AI Database SQL Language Reference*

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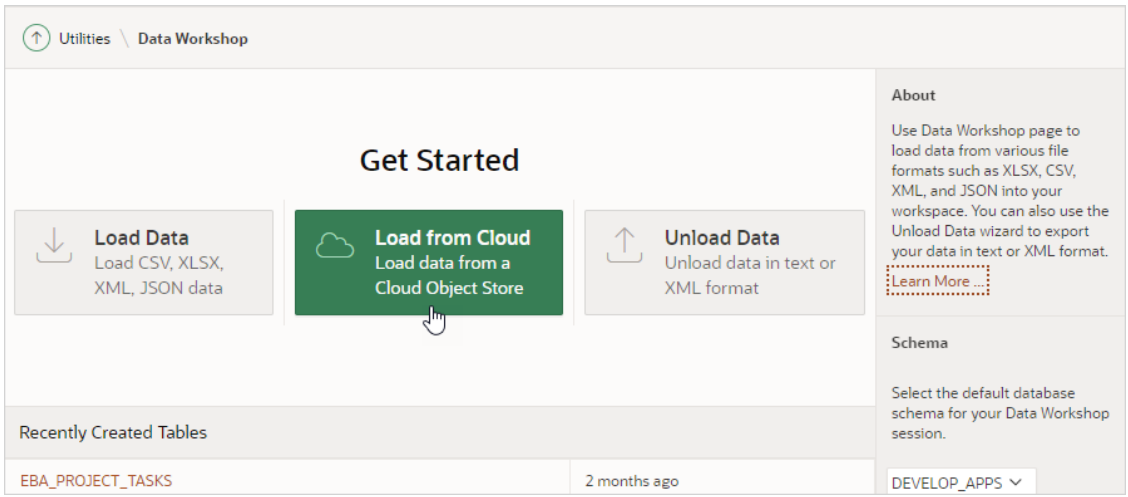
5.1.7.2 User Interface Differences for Oracle Cloud Users

For Oracle Cloud users, Data Workshop includes an additional **Load from Cloud** button on the Data Workshop home page.

APEX On-premise users only see Load Data and Unload Data buttons on the Data Workshop home page.

Oracle Cloud users also see the **Load from Cloud** button.



5.1.7.3 About Object Store References

Data Workshop uses Object Store References to reference cloud-based URLs for loading data. Use Object Store References to create External Tables from the Cloud, which you can then import into your workspace or connect to your applications.

Creating an Object Store Reference is the first step to creating external tables in the cloud. Essentially, the Object Store Reference preserves the necessary credentials to authorize your APEX workspace to access external data, and therefore enable your apps to access external data.

You can store the following types of credentials in an Object Store Reference:

- **Username/Password** - Basic two-field username and password.
- **OCI Native** - Use the Oracle Cloud Infrastructure (OCI) protocol: User OCID, Private Key, Tenancy OCID, and Fingerprint.
- **Web Credential** - Reuse a web credential already stored in the workspace.
- **DBMS_CLOUD Credential** - Reuse a DBMS_CLOUD credential already stored in the workspace.

For Parquet and Avro files, Data Workshop asks for an external table name and where to derive the schema. Other file types can be up to 50MB.

When using an Object Store Reference to create an external table, APEX calls the data using the `DBMS_CLOUD.CREATE_EXTERNAL_TABLE` procedure.

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> **See Also**
>
> DBMS_CLOUD.CREATE_EXTERNAL_TABLE Procedure in *Using Oracle Autonomous Database Serverless*

5.1.7.4 Creating an Object Store Reference

Create a new Object Store Reference.

Required

Before you begin, ensure you know the URL of the Object Store Bucket you want to call from Autonomous Data Warehouse.

Procedure

To create a new Object Store Reference:

1. Click the **Create New** button.

   The Object Store Reference dialog displays.

2. Enter the following information:

   a. **URL** - The URL is the URI of the Object Store bucket **excluding** the filename.

   > **Note**
   >
   > To learn more about the DBMS_CLOUD Package File URI format, see DBMS_CLOUD Package File URI Formats in *Using Oracle Autonomous Database Serverless*

   b. **Reference Name** - Copied from the URL field. You can change the Reference Name to something easier, such as `Project Bucket`.

   c. **Credential Type** - Select the authentication scheme used to access the Object Store bucket.

   > **Tip**
   >
   > For Amazon Web Services (AWS):
   >
   > - **Username** - Access Key ID
   > - **Password** - Secret access key

   d. Enter the requested credentials for the selected Credential Type (options vary between credential type).

   > **Note**
   >
   > Enable **Create a Web Credential** to create a reusable authorization stored in the workspace. Web Credentials are useful for granting access to a data source without providing the full username and password, for example.

   e. Click **Apply Changes**.

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The Object Store References page reloads with the success message `Object Store Reference saved`.

5.1.7.5 Creating an External Table from Cloud

Create a table from an external source with an Object Store Reference.

To view an Object Store Reference:

1. In Data Workshop, click **Load from Cloud**.
2. Select the Object Store Reference from the drop-down menu.

   The associated Object Store Bucket loads. A list of object names populates below.

To create an external table:

3. Click the filename of an object. Click more than one name to select multiple files to externalize.

   The Load File from Object Store dialog displays below. The selected filename appears in the File Name Pattern field.

   If selecting multiple files, the names appear in the order selected, separated by commas.

   > **Tip**
   >
   > Click the X icon to clear the File Name Pattern field of all selections.

4. Configure the Load File from Object Store section:
   a. File Type - Select whether the object file type is **Avro**, **Parquet**, or **Other**.
   b. Derive Data Definition - Choose **First File** to apply the schema to the rest of the batch. Choose **All Files** to preserve multiple schemas.
   c. External Table Name - Enter a name for the table.
   d. Click **Create External Table**.

   APEX loads the data (depending on size, this may take some time).
5. When loading is complete, do one of the following:
   - To review the table, click **View Table**. The Review External Table page displays.
   - To launch the Create App wizard, click **Create Application**.

5.1.7.6 Loading Avro or Parquet Files into Object Browser from Cloud

For Avro and Parquet files, first prepare an external table then load it into your workspace for local use.

To create an external table:

1. In Data Workshop, click **Load from Cloud**.
2. Select an Object Store Reference from the drop-down menu.

   The associated Object Store Bucket loads. A list of object names populates below.
3. Click the object names you wish to import.

   If selecting multiple files, the names appear in the order selected, separated by commas.

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> **Tip**
>
> Click the X icon to clear the File Name Pattern field of all selections.

4. For File Type, select **Avro** or **Parquet**.
5. Click **Create External Table**.

   The Review External Table page displays.

To load the data to a local table:

6. On the Review External Table page under Load Data, configure how APEX imports the external table into the workspace:
   a. Load Into - Choose whether to create a **New Table** or overwrite an **Existing Table**.
   b. New Table Name - Enter a name for the table. Click the **Configure** button to choose which columns to load.
   c. Monitor Progress - Toggle whether to view a progress bar during import. (Useful for large tables.)
   d. Commit Interval - Choose the rate of row inserations at which a `COMMIT` operation is executed.
   e. Drop External Table after Load - Enable to retain the external table afterward. Disable to drop the selected external table.

   A preview of the final import version displays at the bottom.
7. Click **Load Data to Local Table**.

5.1.7.7 Loading Other Files into Object Browser from Cloud

For non-Avro and non-Parquet files, view the Object Store Reference in Data Workshop then import the file into your workspace for local use.

To import the file to your workspace from Cloud:

1. In Data Workshop, click **Load from Cloud**.
2. Select an Object Store Reference from the drop-down menu.

   The associated Object Store Bucket loads. A list of object names populates below.
3. Click the name of the object you wish to import.
4. For File Type, select **Other**.
5. Click **Import**.

   APEX loads the data.

   The Load Data dialog displays.
6. Configure how APEX imports the resulting table:
   a. Load To - Choose whether to create a **New Table** or overwrite an **Existing Table**.
   b. Table Owner - Choose a table owner.
   c. Table Name - Name the table. Note: For new tables, the name must be unique to the workspace.

   A preview of the first few rows displays at the bottom of the dialog.

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7. Click **Load Data**.

5.2 Using Data Generator

Use the Data Generator utility to create Blueprints and then generate sample data.

Use the sample data to iterate your app and blueprints.

> **Tip**
>
> If you are new to Blueprints, follow the Create a Blueprint from Scratch procedure with the Starter Table option enabled.
>
> See Creating a Blueprint from Scratch.

- About Blueprints
  Blueprints are JSON files that define the tables and columns that store generated data. You can use existing tables in your schema, import valid blueprints, or create a blueprint from scratch using Blueprint Designer.
- Accessing Data Generator
  Learn how to access Data Generator.
- Creating Blueprints
  Create Blueprints using the Create Tables Blueprint wizard by clicking the Create Blueprint button.
- Running Blueprints
  Quickly run a blueprint on the Data Generator home page or generate data in Blueprint Designer.
- Modifying Blueprints
  Use Blueprint Designer to modify the columns in a blueprint.
- Previewing Blueprints
  Preview data for the tables and columns.
- Exporting Blueprints
  View the JSON of the blueprint for export.
- Deleting Blueprints
  Delete blueprints in Blueprint Designer.

5.2.1 About Blueprints

Blueprints are JSON files that define the tables and columns that store generated data. You can use existing tables in your schema, import valid blueprints, or create a blueprint from scratch using Blueprint Designer.

Blueprints are the primary object you use in Data Generator. Blueprints enable you to transfer entire apps and data sets between workspaces or populate a new workspace with custom apps.

Each Blueprint can contain one or more tables, columns, and custom data sources. Each column has a Data Source type with many customization options available. When generating data, a number of rows per table are produced and a downloadable file can be obtained.

Download options are:

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- JSON or comma-separated values (CSV) files
- A SQL script with inserts ready to run against a workspace with matching tables and columns

Quick Table Inserts with Data Generator

If there are tables in your schema that match the table and column names in the Blueprint, you have the option to run inserts of generated data against these tables.

> **Note**
>
> Currently the Data Generator does **not** consider the table constrains when inserting data. You must adjust the Blueprint column data sources configuration so that generated data can be inserted successfully into the schema tables.

The fastest option to quickly generate data is to create a **Blueprint from Scratch** that includes a sample table, several columns with different data source types, and a custom data source. From there you can Preview its data, make any adjustments necessary, and Generate Data.

Generate Data is the process of using the Data Generator API to quickly populate rows of data based on the Blueprint customizations. It can be used to quickly insert thousands of rows into existing tables in your schema or produce JSON, CSV or SQL insert files that can be used against other apps, tables or for quick report prototyping.

For instance, you might have an APEX application with reports, graphs, and other page items and regions linked to tables existing in your schema. Using Data Generator to insert thousands of rows of data into these tables enables you to more realistically test your application in a safe environment so that you can identify the necessary adjustments for your tables or reports, rather than having these issues appear when dealing with real-world information in a production environment.

> **See Also**
>
> About Blueprint Designer

5.2.2 Accessing Data Generator

Learn how to access Data Generator.

To access Data Generator:

1. On the Workspace home page, click **SQL Workshop**.
2. Click **Utilities**.
3. Click **Data Generator**.

The Data Generator home page appears.

5.2.3 Creating Blueprints

Create Blueprints using the Create Tables Blueprint wizard by clicking the Create Blueprint button.

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- Creating a Blueprint from Existing Tables
  Select existing tables from your schema to quickly build a blueprint that enables fast inserts of generated data into them.
- Creating a Blueprint from Scratch
  Create a new blueprint from scratch based on a sample table with provided columns that enables you to quickly generate sample data. Use Blueprint Designer to add tables to the blueprint after creation.
- Importing a Blueprint
  Upload a valid blueprint from a JSON file or copy-paste your JSON data into the required fields.

5.2.3.1 Creating a Blueprint from Existing Tables

Select existing tables from your schema to quickly build a blueprint that enables fast inserts of generated data into them.

1. On the Data Generator home page, click the **Create Blueprint** button.

   The Create Tables Blueprint wizard appears.
2. Click **Use Existing Tables**.
3. Do one of the following:
   - **Select from list** - (Default) Choose an existing table in your workspace schema to base the blueprint on.
     a. Blueprint Name - Name the blueprint.
     b. List of tables - Click the checkboxes of the tables to include in the blueprint. Use the search bar to filter the list of tables by name. Use the Reset button to remove all search filters applied to the list of tables.
     c. (Optional) Rows Column - Double-click a cell in the Rows column or toggle the **Edit** button to change the number of rows to include from the table (default `50`).
     d. (Optional) Excluded Columns - Input a list of column names to exclude from the auto column generation in the format `column1,column2,column3`. The Excluded Columns parameter applies to all selected tables.
   - **Copy and Paste** - Use copy and paste to insert a large amount of tables more easily than selecting from the **Select from list** option.
     a. Blueprint Name - Name the blueprint.
     b. Tables - Input a comma-separated list of tables and the number of records to generate by default. The format for each table is `TABLE_NAME:ROWS_TO_GENERATE` (for example: `PRODUCTS:10,CUSTOMERS:50,SALES:1000`).
     c. (Optional) Excluded Columns - Input a list of column names to exclude from the auto column generation in the format `column1,column2,column3`. The Excluded Columns parameter applies to all selected tables.
4. Click **Create Blueprint**.

The wizard generates the blueprint. Oracle APEX navigates to the blueprint in Blueprint Designer.

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5.2.3.2 Creating a Blueprint from Scratch

Create a new blueprint from scratch based on a sample table with provided columns that enables you to quickly generate sample data. Use Blueprint Designer to add tables to the blueprint after creation.

1. On the Data Generator home page, click the **Create Blueprint** button.

   The Create Tables Blueprint wizard appears.
2. Click **From Scratch**.
3. Name - Name the blueprint.
4. (Optional) Description - Enter a description for the blueprint.
5. Add Starter Table - (Enabled by default) Enable to add both a sample table populated with sample data and a Custom Data Source object. You can view these in Blueprint Designer.
6. Click **Create Blueprint**.

The wizard generates the blueprint. Oracle APEX navigates to the blueprint in Blueprint Designer.

5.2.3.3 Importing a Blueprint

Upload a valid blueprint from a JSON file or copy-paste your JSON data into the required fields.

1. On the Data Generator home page, click the **Create Blueprint** button.

   The Create Tables Blueprint wizard appears.
2. Click **Import JSON File**.
3. Do one of the following:
   - **Upload a File** - (Default) Upload a valid JSON blueprint file.
     a. Drag and drop your blueprint (must be a valid JSON file) into the field, or click **Choose File** to browse your system for the file.
     b. (Optional) Override Name - Enter a blueprint name to override the value set in the JSON. You must also enable the **Replace** switch to override the name.
   - **Copy and Paste** - Input a valid JSON object that you want to generate into a blueprint. This option is useful for iterating between blueprints where you adjust some values in the JSON before creating a blueprint from it.
     a. Enter the Blueprint JSON text.
     b. (Optional) Override Name - Enter a blueprint name to override the value set in the JSON. You must also enable the **Replace** switch to override the name.
4. Click **Import Blueprint**.

The wizard generates the blueprint. Oracle APEX navigates to the blueprint in Blueprint Designer.

5.2.4 Running Blueprints

Quickly run a blueprint on the Data Generator home page or generate data in Blueprint Designer.

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- Selecting Data Generation Schema
  On the Data Generator home page, click the drop-down list under Data Generation Schema to select the database schema to be used for data generation. The Data Generator home page reloads.
- Generating Data from a Blueprint
  Click the corresponding **Generate Data** button for the blueprint you want to populate with sample data. For valid tables, you can generate an exportable file or insert the data into corresponding tables in the workspace.

5.2.4.1 Selecting Data Generation Schema

On the Data Generator home page, click the drop-down list under Data Generation Schema to select the database schema to be used for data generation. The Data Generator home page reloads.

The Data Generator home page only shows blueprints created for a specific schema. If you change the schema, the list of available blueprints also changes.

5.2.4.2 Generating Data from a Blueprint

Click the corresponding **Generate Data** button for the blueprint you want to populate with sample data. For valid tables, you can generate an exportable file or insert the data into corresponding tables in the workspace.

> **Note**
>
> The Insert Into Database option overwrites existing data.

1. Do one of the following:
   - On the Data Generator home page, click **Generate Data** for the chosen blueprint.
   - Open a blueprint in Blueprint Designer and click **Generate Data**.

   The Generate Blueprint Data dialog displays.
2. For Action, select one of the following:
   - a. **File Export** - Generates an object to download onto your local system.
     b. Output Format - Choose whether to export a JSON, CSV, or SQL file.

     > **Note**
     >
     > For CSV, if there is only one table in the blueprint, this process generates one CSV file. If multiple tables exists, this process generates one ZIP file containing one CSV file per table inside.

     c. (Optional) Row Scaling - (Default **1x**) Change this value to change the amount of generated data. For example, **.25x** generates a quarter of the provided rows; **100x** generates one hundred times the number of provided rows.
     d. Click **Generate Data**.
   - a. **Insert Into Database** - Inserts all generated data into matching tables in the schema.

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> **Note**
>
> The Insert Into Database option overwrites existing data. Ensure you know table constraints and triggers that may prevent successful insert operations before inserting.

b. Insert Method - **Insert Into** inserts one row at a time (if there are errors on this action, the row is discarded and the next insert attempts to run). **Fast Insert Into** inserts all rows at once (if the insert fails on a table, adds no records).

c. (Optional) Row Scaling - (Default **1x**) Change this value to change the amount of generated data. For example, **.25x** generates a quarter of the provided rows; **100x** generates one hundred times the number of provided rows.

d. Click **Insert Data**.

5.2.5 Modifying Blueprints

Use Blueprint Designer to modify the columns in a blueprint.

- About Blueprint Designer
  You can access Blueprint Designer by clicking the name of a blueprint on the Data Generator home page.
- Modifying Blueprint Table and Column Attributes
  Select a table or column in Blueprint Designer to view and update its attributes.
- Adding and Deleting Tables and Columns
  Use the context menu in the file tree of Blueprint Designer to add or remove tables and columns.
- Saving Blueprints
  You must save your changes in Blueprint Designer before exiting. Changes do **not** save automatically.

5.2.5.1 About Blueprint Designer

You can access Blueprint Designer by clicking the name of a blueprint on the Data Generator home page.

Use the tree view on the left to select a blueprint, table, column or custom data source object and modify its attributes.

Create new tables, columns, and custom data sources using the context menu.

Using the Generate Data and Preview Data buttons, you can preview data for the tables and columns, and export the data to a JSON, CSV, or SQL file. If a table exists in the schema with the same name, data can be inserted into the corresponding columns.

Click the Options icon (wrench) for shortcuts for exporting and deleting blueprints.

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5.2.5.2 Modifying Blueprint Table and Column Attributes

Select a table or column in Blueprint Designer to view and update its attributes.

> **Important**
>
> Ensure you save your changes before exiting Blueprint Designer.

1. In Blueprint Designer, click a table or column in the tree.

   The attributes for the object appear in the central pane.
2. Update the desired attribute. Use the arrow icons to expand or collapse the attribute categories.
3. Click **Save** (top-right).

   A Blueprint Saved message displays.

5.2.5.3 Adding and Deleting Tables and Columns

Use the context menu in the file tree of Blueprint Designer to add or remove tables and columns.

Tables and columns in the blueprint appear in a parent-child hierarchy in the file tree.

> **Tip**
>
> For the following procedures, you can also click the name of an object and then click the Rendering Menu icon at the top-right of the tree to display the same options.

> **Important**
>
> Ensure you save your changes before exiting Blueprint Designer.

To add a table:

1. In Blueprint Designer, right-click **Tables** near the top of the tree, below the name of the blueprint.
2. Click **Add Table**.

   A new table object appears at the bottom of the tree.

To delete a table:

3. Right-click the table.
4. Select **Delete Table**.

To add a column:

5. Right-click the table.
6. Select **Add Column**.

   A new column appears at the bottom of the list of columns within the table.

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To delete a column:

7. Right-click the column.
8. Select **Delete Column**.

> **Important**
>
> Ensure you save your changes before exiting Blueprint Designer.

To save your changes:

9. Click **Save** (top-right).

   A Blueprint Saved message displays.

5.2.5.4 Saving Blueprints

You must save your changes in Blueprint Designer before exiting. Changes do **not** save automatically.

> **Tip**
>
> While the Save button quickly saves your changes to the blueprint, the Generate button also saves the blueprint and inserts the data into the matching table according to the updated attributes.

1. Complete your changes to the blueprint.
2. Click **Save** (top-right).

A Blueprint Saved message displays.

5.2.6 Previewing Blueprints

Preview data for the tables and columns.

Previewing enables you to quickly review a few rows of data rather than generating a full JSON, CSV, or SQL script file to learn what adjustments you must make to the configuration.

1. On the Data Generator home page, click the name of the blueprint you want to preview.

   The blueprint opens in Blueprint Designer.
2. Click the **Preview Data** button.

   The Preview Blueprint Data dialog displays.

   > **Note**
   >
   > The preview data may take several seconds to populate.
3. Use the **Table List** and **Preview Size** menus to expand what you want to preview.
4. Do one of the following:
   - To proceed to the Generate Blueprint Data wizard, click the **Generate Data** button.
   - To cancel, press Esc or click the **Cancel** button.

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5.2.7 Exporting Blueprints

View the JSON of the blueprint for export.

Because blueprints are stored as JSON files, you can quickly export (and import) blueprints with copy and paste or download them as a JSON file.

1. On the Data Generator home page, locate the blueprint you want to export.
2. Click the corresponding **Export** button.

   The JSON for the blueprint displays in a dialog.

   > **Tip**
   >
   > If you are in Blueprint Designer, click the Options icon (wrench) and select Export.

3. Click **Export Blueprint**.

   The blueprint JSON file downloads to your local system.

5.2.8 Deleting Blueprints

Delete blueprints in Blueprint Designer.

1. On the Data Generator home page, click the name of the blueprint you want to delete.

   The blueprint displays in Blueprint Designer.
2. Click the **Options icon** (wrench).
3. Click **Delete**.
4. On the confirmation dialog, click **Delete**.

The Data Generator home page reloads.

5.3 Using Query Builder

Use Query Builder to build queries graphically by adding tables to a panel and selecting the columns to return.

Query Builder's graphical user interface enables database developers to build SQL queries without the need for manual SQL coding.

Using Query Builder, you can search and filter database objects, select objects and columns, create relationships between objects, view formatted query results, and save queries with little or no SQL knowledge.

> **Tip**
>
> SQL commands created in the Query Builder can be accessed from SQL Commands.

- Query Builder Home Page
  Learn about Query Builder home page.

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- Accessing Query Builder
  Learn how to access Query Builder.
- Understanding the Query Building Process
  Learn how to build a query in Query Builder.
- Using the Object Selection Pane
  Use the Object Selection pane to search for and view tables, views, and materialized views within the current schema as well as select objects.
- Using the Design Pane
  Learn about how to use the Design pane.
- Specifying Query Conditions
  As you select columns within an object, you can specify conditions on the Conditions tab.
- Creating Relationships Between Objects
  You can create relationships between objects by creating a join.
- Working with Saved Queries
  You can create queries and save the query for later use.
- Viewing Generated SQL
  The SQL view presents a read-only, formatted representation of the SQL generated by Query Builder. You can copy the SQL code that appears in the SQL View for use in other tools such as SQL Command Processor or App Builder.
- Viewing Query Results
  Execute a query, once you select objects and determine what columns to include in your query.

> **See Also**
>
> Using SQL Commands

5.3.1 Query Builder Home Page

Learn about Query Builder home page.

The Query Builder page is divided into three sections:

- **Object Selection pane** displays on the left side of the page and contains a list objects from which you can build queries. Only objects in the current schema display.
- **Design pane** displays to the right of the Object Selection pane and above the Conditions, SQL, Results, and Saved SQL tabs. When you select an object from the Object Selection pane, it appears in the Design pane.
- **Output pane** displays below the Design pane. Once you select objects and columns, you can create conditions, view the generated SQL, or view query results.

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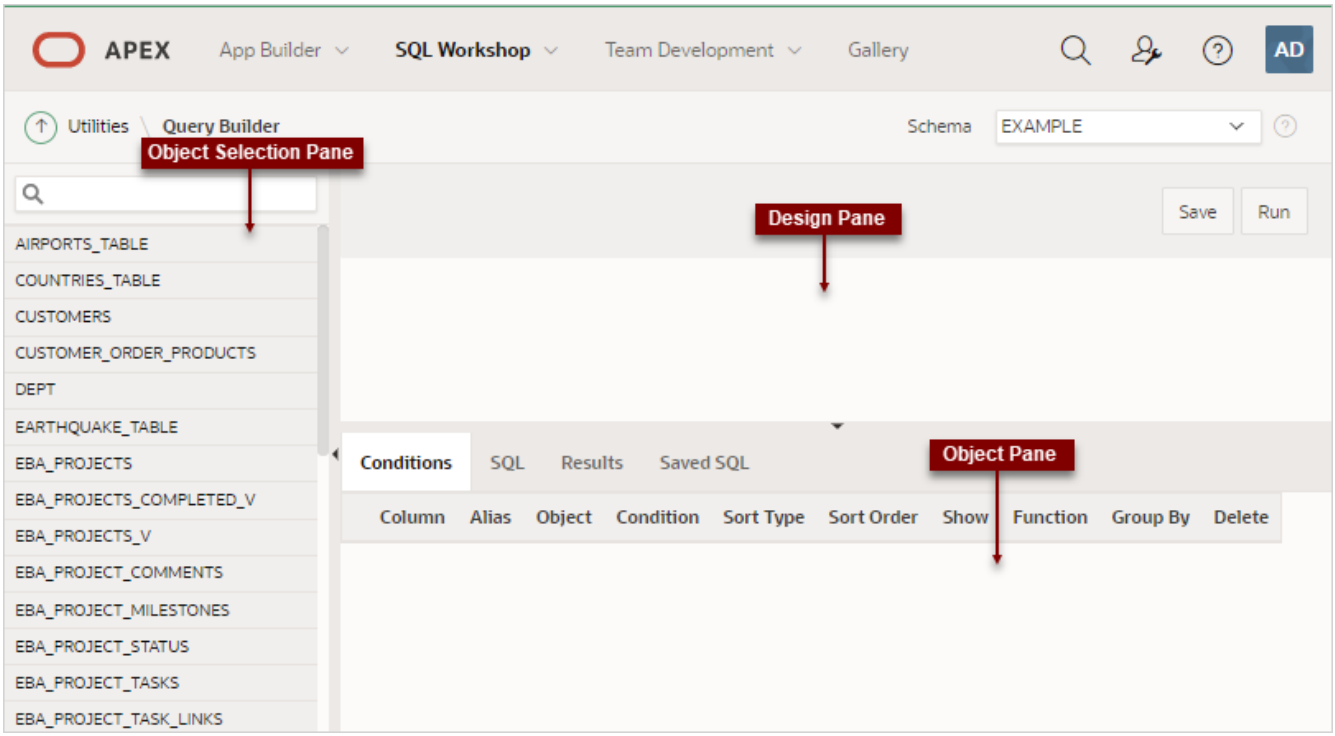

> **See Also**
>
> Selecting a Schema

5.3.2 Accessing Query Builder

Learn how to access Query Builder.

To access Query Builder:

1. On the Workspace home page, click **SQL Workshop**.
2. Click **Utilities**.
3. Click **Query Builder**.

The Query Builder home page appears.

> **Tip**
>
> You can also access Query Builder from a code editor in many part of Oracle APEX by clicking the Query Builder button when editing a SQL attribute.

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5.3.3 Understanding the Query Building Process

Learn how to build a query in Query Builder.

To build a query in Query Builder, you perform the following steps:

1. Select objects from the Object Selection pane. See Using the Object Selection Pane.
2. Add objects to the Design pane and select columns. See Selecting Objects.
3. **Optional**: Establish relationships between objects. See Creating Relationships Between Objects.
4. **Optional**: Create query conditions. See Specifying Query Conditions.
5. Execute the query and view results. See Viewing Query Results.

See Also

- Viewing Generated SQL
- Working with Saved Queries

5.3.4 Using the Object Selection Pane

Use the Object Selection pane to search for and view tables, views, and materialized views within the current schema as well as select objects.

- Searching and Filtering Objects
  Use the Object Selection pane to search for and view tables, views, and materialized views within the current schema.
- Hiding and Restoring the Object Selection Pane
  You can hide the Object Selection pane by selecting the Collapse control.
- Selecting Objects
  Use the Object Selection pane to select objects.

5.3.4.1 Searching and Filtering Objects

Use the Object Selection pane to search for and view tables, views, and materialized views within the current schema.

To search or filter objects:

1. On the Workspace home page, click **SQL Workshop** and then **Query Builder**.

   Query Builder appears.
2. In the search field at the top of the Object Selection pane, enter a case insensitive query.

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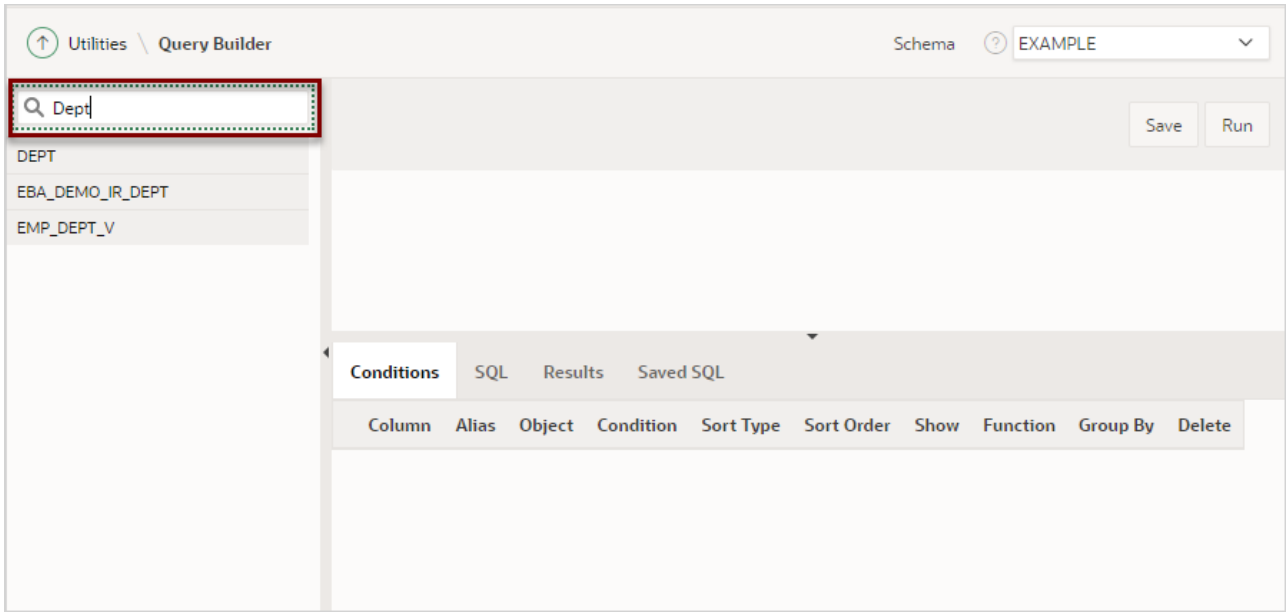

3. To view all tables or views within the currently selected schema, leave the search field blank.

5.3.4.2 Hiding and Restoring the Object Selection Pane

You can hide the Object Selection pane by selecting the Collapse control.

The Collapse control displays on the right side of the Object Selection pane. If the Object Selection pane displays, selecting this control hides it. Similarly, if the Object Selection pane is hidden, selecting this control causes the pane restores it. Select the Left Splitter (click above or below the Collapse control to manually resize the Object Selection pane.

5.3.4.3 Selecting Objects

Use the Object Selection pane to select objects.

The Design pane displays to the right of the Object Selection pane. When you select an object from the Object Selection pane, it appears in the Design pane. You use the Object Selection pane to select objects (that is, tables, views, and materialized views) and the Design pane to identify how those selected objects are used in a query.

5.3.5 Using the Design Pane

Learn about how to use the Design pane.

Information on how to use how to use the Design pane includes the following topics:

- About Supported Column Types
  Columns of all types available in Oracle Database 10*g* Release (10.2) or later display as objects in the Design pane.
- Adding an Object to the Design Pane
  You add an object to the Design pane by selecting it from the Object Selection pane.
- Resizing the Design and Results Panes
  As you select objects, you can resize Design and Results panes by selecting the Bottom Splitter in the center of the page.

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- Removing or Hiding Objects in the Design Pane
  You remove or hide objects in the Design pane by selecting controls at the top of the object.

5.3.5.1 About Supported Column Types

Columns of all types available in Oracle Database 10*g* Release (10.2) or later display as objects in the Design pane.

Note the following column restrictions:

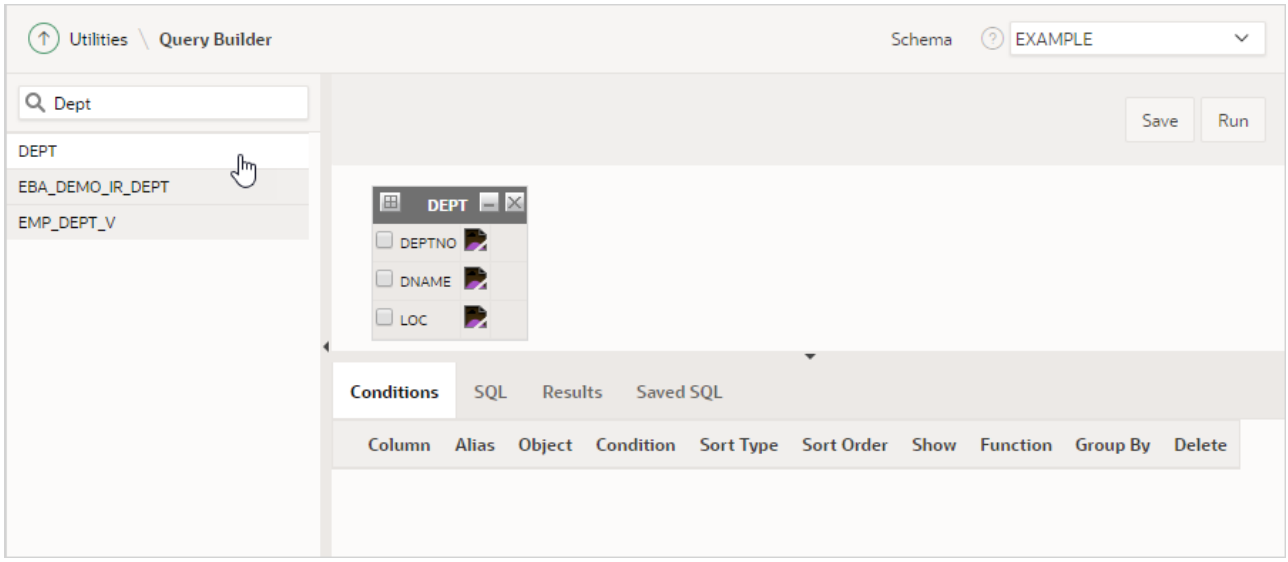
- You may only select a maximum of 60 columns for each query.
- The following column types are not selectable and cannot be included in a generated query:
  - `BLOB`
  - `NCLOB`
  - `RAW`
  - `LONG`
  - `LONG RAW`
  - `XMLType`
  - Any other nonscalar column types

5.3.5.2 Adding an Object to the Design Pane

You add an object to the Design pane by selecting it from the Object Selection pane.

To add an object to the Design pane:

1. On the Workspace home page, click **SQL Workshop** and then **Query Builder**.
   Query Builder appears.
2. Select an object from the Object Selection pane.



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The selected object appears in the Design Pane. The icon next to the column name represents the type of the column.

3. Select the columns to be included in your query by clicking the check box to the left of the column name.

   When you select a column you are indicating it is included in the query. As you select a column, it appears on the Conditions tab. Note that the Show check box on the Conditions tab controls whether a column is included in query results. By default, this check box is selected.

   To select the first twenty columns, click the **Table Actions** icon in the upper left corner of the object. The Actions window appears. Select **Check All**.

4. To execute the query and view results, click **Run** (**Ctrl+Enter**).

   The Results pane displays the query results.

> **See Also**
>
> Specifying Query Conditions

5.3.5.3 Resizing the Design and Results Panes

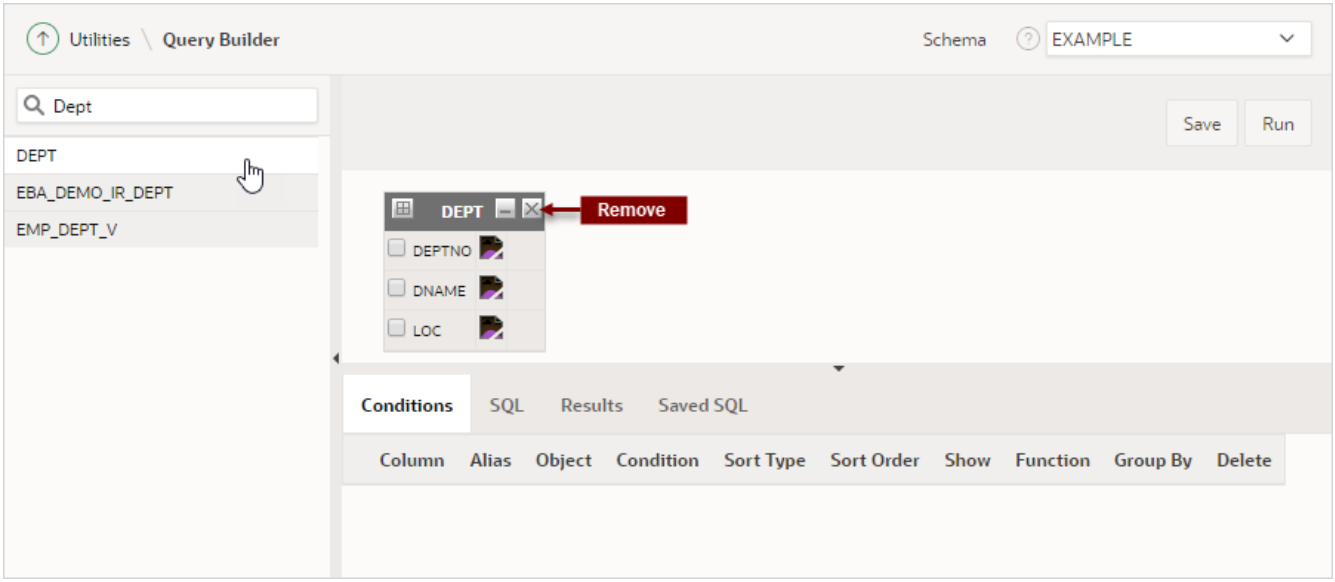
As you select objects, you can resize Design and Results panes by selecting the Bottom Splitter in the center of the page.

The Bottom Splitter resembles a gray horizontal rule in the center of the page. Move the Bottom Splitter up and down to shrink and expand the Design pane.

5.3.5.4 Removing or Hiding Objects in the Design Pane

You remove or hide objects in the Design pane by selecting controls at the top of the object.

To remove an object, select the **Remove** icon in the upper right corner. To temporarily hide the columns within an object, click the **Show/Hide Columns** icon.



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5.3.6 Specifying Query Conditions

As you select columns within an object, you can specify conditions on the Conditions tab.

Conditions enable you to filter and identify the data you want to work with. You can use these attributes to modify the column alias, apply column conditions, sort columns, or apply functions.

To specify query conditions:

1. On the Workspace home page, click **SQL Workshop** and then **Query Builder**.

   Query Builder appears.

2. Select an object from the Object Selection pane.

   The selected object appears in the Design Pane.

3. Select the columns to be included in your query by clicking the box to the left of the column name.

   When you select a column, you are indicating you want to include it in your query. As you select each column, it appears as a separate row in the Conditions view. #unique_187/unique_187_Connect_42_BABBDEFF describes the attributes available on the Conditions tab.

Condition Attribute	Description
Up and Down Arrows	Controls the order that the columns to be displayed in the resulting query. Click the arrow buttons to move columns up and down.
Column	Displays the column name.
Alias	Specify an optional column alias. An **alias** is an alternative column name. Aliases make a column name more descriptive, shorten the column name, or prevent possible ambiguous references.
Object	Specifies table or view name.

Condition	Specify a condition for the column.
	The condition you enter modifies the query's `WHERE` clause. When specifying a column condition, you must include the appropriate operator and operand. Consider the following examples:
	`>=10`
	`='VA'`
	`IN (SELECT dept_no FROM dept)`
	`BETWEEN SYSDATE AND SYSDATE + 15`

Sort Type	Select a sort type. Options include: • Ascending (`Asc`) • Descending (`Desc`)
Sort Order	Enter a number (1, 2, 3, and so on) to specify the order in which selected columns should display.

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Condition Attribute	Description
Show	Select this check box to include the column in your query results. It is not necessary to select Show to add a column to the query for filtering only. For example, suppose you want to create following query: `SELECT ename FROM emp WHERE deptno = 10` To create this query in Query Builder: a. From the Object list, select **emp**. b. In the Design Pane, select `ename` and `deptno`. c. For the deptno column, in Condition enter `=10` and deselect the Show check box.
Function	Select an argument function. Available functions are dependent on the column type and include: • **NUMBER columns** - `COUNT`, `COUNT DISTINCT`, `AVG`, `MAX`, `MIN`, `SUM` • **VARCHAR2, CHAR columns** - `COUNT`, `COUNT DISTINCT`, `INITCAP`, `LENGTH`, `LOWER`, `LTRIM`, `RTRIM`, `TRIM`, `UPPER` • **DATE, TIMESTAMP columns** - `COUNT`, `COUNT DISTINCT`, `TO_CHAR YEAR`, `TO_CHAR QUARTER`, `TO_CHAR MONTH`, `TO_CHAR DAY`, `TO_CHAR DAY OF YEAR`, `TO_CHAR WEEK`
Group By	Specify columns to be used for grouping when an aggregate function is used. Only applicable for columns included in output.
Delete	Deselect the column, excluding it from the query.

As you select columns and define conditions, Query Builder writes the SQL for you.

4. To view the underlying SQL, click the **SQL** tab.

> **See Also**
>
> Viewing Query Results

5.3.7 Creating Relationships Between Objects

You can create relationships between objects by creating a join.

A **join** identifies a relationship between two or more tables, views, or materialized views.

- About Join Conditions
  A join condition determines how the rows from one object combine with the rows from another object.
- Joining Objects Manually
  You can create a join manually by selecting the Join column in the Design pane.
- Joining Objects Automatically
  Learn how to join objects automatically.

5.3.7.1 About Join Conditions

A join condition determines how the rows from one object combine with the rows from another object.

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When you write a join query, you specify a condition that conveys a relationship between two objects. This condition is called a **join condition**.

Query Builder supports inner, outer, left, and right joins. An **inner join** (also called a **simple join**) returns the rows that satisfy the join condition. An outer join extends the result of a simple join. An **outer join** returns all rows that satisfy the join condition and returns some or all of those rows from one table for which no rows from the other satisfy the join condition.

> **See Also**
>
> *Oracle AI Database SQL Language Reference* for information about join conditions

5.3.7.2 Joining Objects Manually

You can create a join manually by selecting the Join column in the Design pane.

To join two objects manually:

1. On the Workspace home page, click **SQL Workshop** and then **Query Builder**.

   Query Builder appears.

2. From the Object Selection pane, select the objects you want to join.

   The objects display in the Design pane.

3. Identify the columns you want to join.

   You create a join by selecting the Join column adjacent to the column name. The Join column displays to the right of the datatype, beneath the Remove icon. When your cursor is in the appropriate position, the following tooltip displays:

   ```
   Click here to select column for join
   ```

4. Select the appropriate Join column for the first object.

   When selected, the Join column displays as a dark gray. To deselect a Join column, simply select it again or press **ESC**.

5. Select the appropriate Join column for the second object.

   > **Tip**
   >
   > You can also join two objects by dragging and dropping. Select a column in the first table and then drag and drop it onto a column in another table.

   When joined, a line connects the two columns.

6. Select the columns to be included in your query. You can view the SQL statement resulting from the join by positioning the cursor over the line.

7. Click **Run** to execute the query.

   The Results pane displays the query results.

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5.3.7.3 Joining Objects Automatically

Learn how to join objects automatically.

When you join objects automatically, the Query Builder suggests logical, existing parent and child relationships between existing columns.

To join objects automatically:

1. On the Workspace home page, click **SQL Workshop** and then **Query Builder**.

   Query Builder appears.

2. From the Object Selection pane, select an object.

   The object displays in the Design pane.

3. Click the small icon in the upper left corner of the object. Depending upon the selected object, the icon label displays as **Table Actions** or **View Actions**.

   The Actions window appears. Use the Actions window to select all columns within the current object or objects related to the current object.

4. In the Actions window, select the appropriate options:

   - **Check All** - Select this option to select the first twenty columns in the current object.
   - **Add Parent** - Displays tables that are referenced as a foreign key to the current object.
   - **Add Child** - Displays tables that reference the current object in a foreign key.

   If using Add Parent or Add child, the selected object appears and a line connects the foreign key columns.

5. Select additional columns to be included in your query.

   You can view the SQL statement resulting from the join by positioning the cursor over the green line.

6. Click **Run** to execute the query.

   The Results pane displays the query results.

5.3.8 Working with Saved Queries

You can create queries and save the query for later use.

As you create queries, you can save them by clicking the Save button in the Design pane. Once you save a query, you can access it later in the Saved SQL view.

> **Tip**
>
> The Saved SQL view only displays queries saved in Query Builder. In SQL Commands you can view queries saved in both SQL Commands and Query Builder.

- Saving a Query
  Learn how to save a query.
- Editing a Saved Query
  Once you save a query, you can access it in the Saved SQL view and edit.

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- Deleting a Saved Query
  Learn how to delete a saved SQL query.

5.3.8.1 Saving a Query

Learn how to save a query.

To save a query:

1. Build a query:
   a. On the Workspace home page, click **SQL Workshop** and then **Query Builder**.

      Query Builder appears.
   b. Select objects from the Object Selection pane.
   c. Add objects to the Design pane and select columns.
   d. Execute the query.
2. Click **Save**.
3. Enter a name and description and click **Save**.

   The saved query displays in the Saved SQL view.

Note that Query Builder does not support duplicate query names. If you open an existing query, keep the existing name, and save it again, Query Builder over-writes the existing query. If you change the name of an existing query and save it again, Query Builder saves the query again under the new name.

5.3.8.2 Editing a Saved Query

Once you save a query, you can access it in the Saved SQL view and edit.

To edit a Saved SQL query:

1. On the Workspace home page, click **SQL Workshop** and then **Query Builder**.

   Query Builder appears.
2. Select the **Saved SQL** tab.
3. To filter the display, you can:
   - Make a selection from the Owner list and click **Go**.
   - Enter a search query in the Name field and click **Go**.
4. To edit a query, select the appropriate name.

   The saved query appears. The selected objects display in the Design pane and the Conditions view appears.

5.3.8.3 Deleting a Saved Query

Learn how to delete a saved SQL query.

To delete a Saved SQL query:

1. On the Workspace home page, click **SQL Workshop** and then **Query Builder**.

   Query Builder appears.
2. Select the **Saved SQL** tab.

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3. Select the queries to be deleted and click **Delete Checked**.

5.3.9 Viewing Generated SQL

The SQL view presents a read-only, formatted representation of the SQL generated by Query Builder. You can copy the SQL code that appears in the SQL View for use in other tools such as SQL Command Processor or App Builder.

To access the SQL view:

1. On the Workspace home page, click **SQL Workshop** and then **Query Builder**.

   Query Builder appears.
2. Select an object from the Object Selection pane.

   The selected object appears in the Design Pane.
3. Select the columns to be included in your query.
4. Click the **SQL** tab.

   The SQL code generated by Query Builder appears.

> **See Also**
>
> Using SQL Commands

5.3.10 Viewing Query Results

Execute a query, once you select objects and determine what columns to include in your query.

Execute a query by:

- Clicking the **Run** button (or pressing **Ctrl+Enter**)
- Selecting the **Results** tab

The Results view appears, displaying formatted query results. To export the report as a comma-delimited file (.csv) file, click the **Download** link at the bottom of the page.

5.4 Using Quick SQL

Rapidly design and prototype data models using a markdown-like shorthand syntax that expands to standards-based Oracle SQL.

> **Note**
>
> As described in Getting Started with Quick SQL, Quick SQL requires Oracle REST Data Services (ORDS) 23.3.0 or later.

- Getting Started with Quick SQL
  Learn about common Quick SQL use cases and the basic rules of Quick SQL shorthand syntax.

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- Accessing Quick SQL
  Access Quick SQL by clicking SQL Workshop, Utilities, and then Quick SQL.
- About the Quick SQL Page
  Learn about the layout and controls available on the Quick SQL page.
- Accessing Quick SQL Help
  Access Quick SQL Help by clicking Help above the left Quick SQL pane.
- Loading Quick SQL Sample Models
  Learn about Quick SQL shorthand syntax by loading Quick SQL sample models.
- Generating SQL with SQL Shorthand Syntax
  Generate a SQL script for simple tables and views by entering SQL shorthand syntax in the the left Quick SQL pane.
- Managing Quick SQL Models and Scripts
  Save entered Quick SQL shorthand syntax as a model for future use, or save the generated SQL as a SQL script.
- Creating an Application from a Generated SQL Script
  Create an application from a saved script in SQL Scripts.
- Configuring Quick SQL Settings
  Configure settings inline to explicitly set SQL syntax generation options, or click the Settings button at the top of the right pane to declaratively set the generation options.
- Recommendations When Using Quick SQL
  Learn about recommended approaches to creating effective data models.
- Database Terminology Used in Quick SQL
  Learn about common database terms used in Quick SQL.
- About Supported Data Types
  Learn about supported data types.

5.4.1 Getting Started with Quick SQL

Learn about common Quick SQL use cases and the basic rules of Quick SQL shorthand syntax.

- Web Server Requirements
  Learn about web server requirements for Quick SQL.
- About Quick SQL
  Quickly develop a script for simple tables and views.
- About Quick SQL Shorthand Syntax
  Use Quick SQL shorthand syntax to generate the SQL from an indented text document.

5.4.1.1 Web Server Requirements

Learn about web server requirements for Quick SQL.

Quick SQL requires Oracle REST Data Services (ORDS) 23.3.0 or later.

5.4.1.2 About Quick SQL

Quickly develop a script for simple tables and views.

Quick SQL provides a quick way to generate the SQL required to create a relational data model from an indented text document.

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Quick SQL is designed to reduce the time and effort required to create SQL tables, triggers, and index structures. This tool is not designed to be a replacement for data modeling. Instead, Quick SQL is simply a quick way to develop a script for simple tables and views. Once you have generate the SQL, you can then tweak and expand it.

Quick SQL Use Cases include:

- Quickly create robust data models
- Easily generate random data
- View syntax using provided examples and learn syntax for create table, select, insert, index, trigger, and PL/SQL package

You can also generate Quick SQL scripts with AI. For more information, see Creating a Data Model Using AI.

5.4.1.3 About Quick SQL Shorthand Syntax

Use Quick SQL shorthand syntax to generate the SQL from an indented text document.

Rules for using Quick SQL shorthand syntax include:

- **Parent table names** - Enter parent table names without any indention.
- **Table column names** - Enter table columns with a uniform indention of two or more spaces.
- **Parent/child relationships** - Create parent child relationships by indenting child tables under parent tables. Indent the child tables to the same level as the columns in the parent table.

> **Note**
>
> As a best practice, do not specify primary keys, the system generates them for you.

> **Tip**
>
> To learn more about Quick SQL shorthand syntax, click **Help** at the top of the Quick SQL Shorthand pane.

About Settings

To view and configure generation options, click the Settings button. You can automatically add Audit columns which indicate who created or last updated a given row and when. You can add a Row Version column that automatically increments by one on each row update. A Row Version can be useful to simplify lost update detection. You can also generate a PL/SQL API which provides a package per table and provides procedures to query, insert, update, and delete rows. Some applications benefit by having each change captured in a history table, logging of old and new values, which is also an option.

> **See Also**
>
> Configuring Quick SQL Settings

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5.4.2 Accessing Quick SQL

Access Quick SQL by clicking SQL Workshop, Utilities, and then Quick SQL.

To access the Quick SQL page:

1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **Quick SQL**.

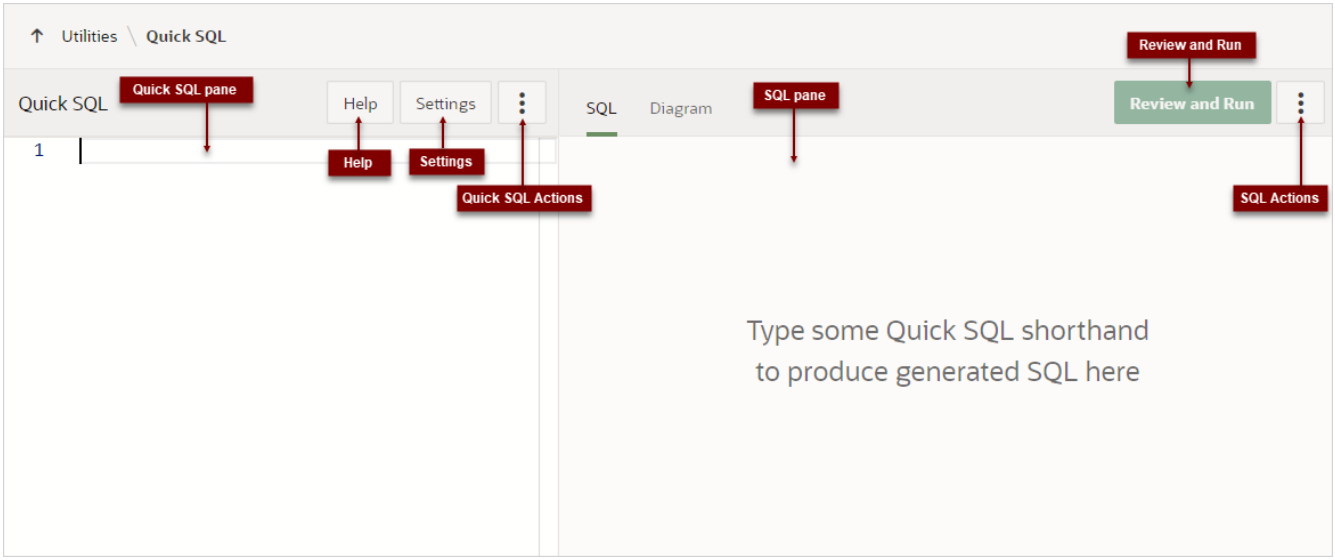
   The Quick SQL page appears. To learn more, see About the Quick SQL Page.

> **Tip**
>
> You can also access Quick SQL on the SQL Scripts page by clicking the **Quick SQL** button. See Using SQL Scripts .

5.4.3 About the Quick SQL Page

Learn about the layout and controls available on the Quick SQL page.

The Quick SQL page is divided into two panes: **Quick SQL** and **SQL**.



Quick SQL Pane

The **Quick SQL** pane displays on the left side of the page. Enter SQL shorthand syntax into the **Quick SQL** pane and instantly generate a SQL script in the SQL pane.

Available controls on the **Quick SQL** pane include:

- **Help** - Learn more about using Quick SQL.
- **Settings** - Displays the Settings dialog to declaratively configure generation options.

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- **Quick SQL Actions menu** - Displays as three vertical dots ( ). Available options include:
  - **Load** - Load an existing saved Quick SQL model.
  - **Save Model** - Save a Quick SQL model.
  - **Save Model As** - Rename a Quick SQL model. Only displays for previously saved models.
  - **Reset** - Remove previously entered text in the Quick SQL pane.
  - **Properties** - View properties of the current loaded Quick SQL model.

SQL Pane

The **SQL** pane displays on the right side of the page. Use this pane to view generated SQL. Available controls include:

- **SQL tab** - Displays generated SQL.
- **Diagram tab** - Displays a entity relationship diagram of your data model's tables, columns, datatypes, and relationships.
- **Review and Run** - Access SQL Scripts to review and run the script.
- **SQL Actions menu** - Displays as three vertical dots ( ). Available options include:
  - **Save SQL Script** - Save generated SQL as a script.
  - **Download** - Download a generated SQL script locally.

5.4.4 Accessing Quick SQL Help

Access Quick SQL Help by clicking Help above the left Quick SQL pane.

To access the Quick SQL Help:

1. Navigate to the Quick SQL page:
   a. On the Workspace home page, click the **SQL Workshop** icon.
   b. Click **Utilities**.
   c. Click **Quick SQL**.
2. Click **Help** above the left Quick SQL pane.

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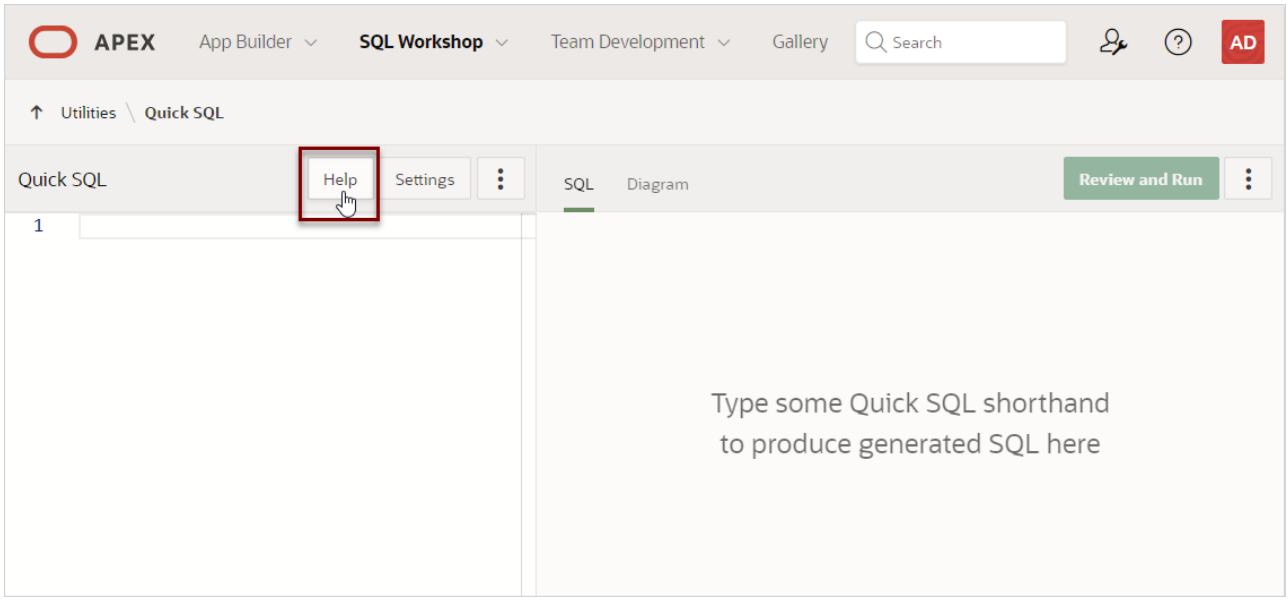

The Quick SQL Help window appears and displays the following tabs:

- **About** - Provides an overview of Quick SQL together with tips on getting started and the steps needed to create the database objects.
- **Data Types** - Lists data types that can applied to each column.
- **Table Directives** - Describes commands used to modify tables.
- **Column Directives** - Describes commands used to extend column definitions.
- **Views** - Details the syntax for defining a view.
- **Settings** - Describes available inline settings to explicitly set SQL syntax generation options. See .
- **Samples** - View and load samples to learn about SQL shorthand syntax.

See Also

- Generating SQL with SQL Shorthand Syntax
- Configuring Quick SQL Settings
- Loading Quick SQL Sample Models

5.4.5 Loading Quick SQL Sample Models

Learn about Quick SQL shorthand syntax by loading Quick SQL sample models.

- About Quick SQL Sample Models
  Learn about available Quick SQL sample models.
- Loading a Quick SQL Sample Model
  Access Quick SQL sample models by selecting the Load action from the Quick SQL Actions menu, or by clicking Help and selecting Samples.

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5.4.5.1 About Quick SQL Sample Models

Learn about available Quick SQL sample models.

Quick SQL includes the following Quick SQL sample models:

- **Departments and Employees** - Creates a `DEPARTMENTS` and `EMPLOYEES` tables with an additional `EMP_V` join view. Random data is also generated using `/INSERT` syntax. The `/NN` adds a `NOT NULL SQL` column constraint. Indented lists are used to define tables, columns and child tables. Primary and foreign key columns are automatically added. You do not need to supply any primary or foreign key columns.
- **Employee Skills** - Creates a `DEPARTMENTS`, `EMPLOYEES`, and `SKILLS` table using indentation to identify parent and child tables. Shorthand syntax `VC255` specifies the SQL datatype. The `/INSERT` syntax is used to generate ten rows of random data and provides example values (`/VALUES`). Defines legal values with a check constraint (`/CHECK`). Illustrates adding a column comment in square brackets.
- **Product Sales** - Creates a star schema with `PRODUCTS`, `CUSTOMERS`, `CHANNELS`, `PROMOTIONS`, and `SALES` tables. The `SALES` table contains foreign key references to the other tables. A `SQL VIEW` is also created which joins all five tables. Random sample data is also generated. Numeric column are identified with `NUM` syntax.
- **Project Management** - Defines project management schema with a `PROJECTS` parent table and four child tables: `MILESTONES`, `LINKS`, `ATTACHMENTS`, and `ACTION_ITEMS`. Adds the view `PROJECT_MS` joining `PROJECTS` and `MILESTONES` and `PROJECT_AI` combining `PROJECTS` and `ACTION_ITEMS`. Specifies legal values (`/CHECK`), example values (`/VALUES`), and generates sample rows (`/INSERT`). Adds audit columns in SQL syntax directives after `#-sign (auditcols: true)`.
- **ToDos** - Creates `ASSIGNEES` and `TODOS` tables. Defines NOT NULL constraints (`/NN`). Specifies legal values (`/CHECK`). Generates sample data (`/INSERT`). Adds audit columns (`#auditcols: true`). This sample is designed as a starting point to enable the creation of a customized ToDo system within minutes.

5.4.5.2 Loading a Quick SQL Sample Model

Access Quick SQL sample models by selecting the Load action from the Quick SQL Actions menu, or by clicking Help and selecting Samples.

To load the Quick SQL samples:

1. Navigate to the Quick SQL page:
   a. On the Workspace home page, click the **SQL Workshop** icon.
   b. Click **Utilities**.
   c. Click **Quick SQL**.

   The Quick SQL page appears. You can load Quick SQL samples in two ways:
   - From **Help**.
   - From the **Quick SQL Actions** menu.
2. To load samples from Help:
   a. In the left pane, click **Help** and then select the **Samples** tab.
   b. Choose a sample and click **Load Model**.

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3. To load samples from the Quick SQL Actions menu:
   a. In the left pane, click the **Quick SQL Actions** menu (three vertical dots) and select **Load**.

      The Load dialog appears with the Samples tab selected.

   b. Choose a sample and click **Load Model**.

The sample loads. Quick SQL shorthand syntax displays in the left pane and the corresponding generated SQL displays in the right pane.

5.4.6 Generating SQL with SQL Shorthand Syntax

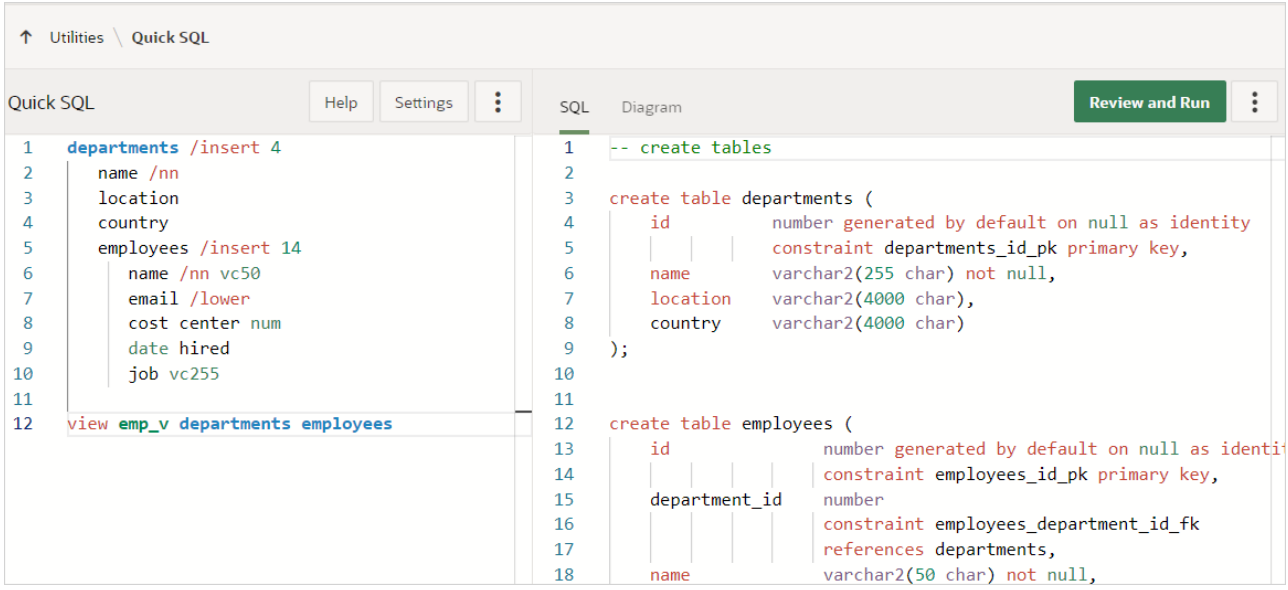
Generate a SQL script for simple tables and views by entering SQL shorthand syntax in the the left Quick SQL pane.

> **Tip**
>
> Viewing samples is a great way to learn about Quick SQL shorthand syntax. To learn more, see Loading Quick SQL Sample Models.

To generate a SQL script with SQL shorthand syntax:

1. Navigate to the Quick SQL page:
   a. On the Workspace home page, click the **SQL Workshop** icon.
   b. Click **Utilities**.
   c. Click **Quick SQL**.
2. In the left pane, enter SQL shorthand syntax.

   The generated SQL displays in the right pane under the **SQL** tab.



You can save the generated script, or review and run the script.

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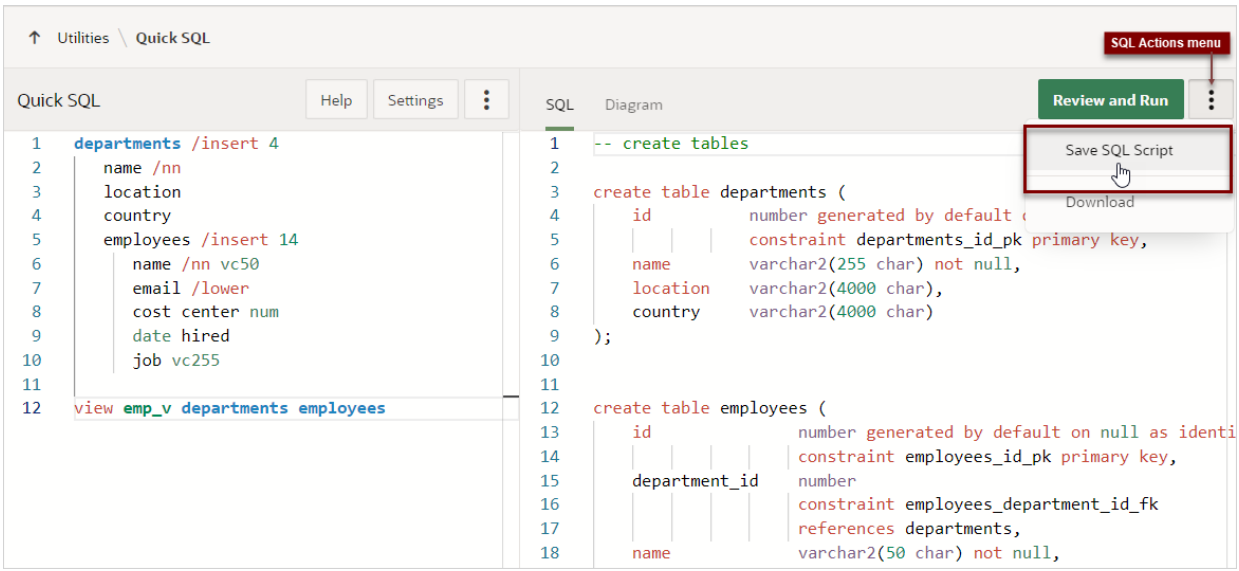
3. To save the generated SQL script:
   a. In the right pane, click the **SQL Actions** menu (three vertical dots) and select **Save SQL Script**.



   The Save Script dialog appears.
   b. In the Save Script dialog:
      - Script Name - Enter a name.
      - Click **Save Script**.

      The script is saved in SQL Scripts.
4. To run the SQL script, click **Review and Run** above the right pane.

   SQL Scripts appears. To learn more, see Using SQL Scripts .
5. To reset Quick SQL and remove any entered text:
   - In the left pane, click the **Quick SQL Actions** menu (three vertical dots) and select **Reset**.

     Any previously entered text and corresponding SQL disappears.

> **See Also**
> - Saving a Generated SQL Script
> - Configuring Quick SQL Settings

5.4.7 Managing Quick SQL Models and Scripts

Save entered Quick SQL shorthand syntax as a model for future use, or save the generated SQL as a SQL script.

- Saving a Quick SQL Model
  Reuse Quick SQL shorthand syntax by saving a model.

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- Loading a Saved Quick SQL Model
  Load saved Quick SQL models from the Load window.
- Saving a Quick SQL Model Under a Different Name
  Save a Quick SQL model under a different name.
- Deleting a Quick SQL Model
  Delete an existing Quick SQL model with the Save Model dialog.
- Viewing an Entity Relationship Diagram
  View an entity relationship diagram of a data model's tables, columns, datatypes, and relationships.
- Saving a Generated SQL Script
  Save generated SQL as a script in SQL Scripts.
- Downloading SQL Scripts
  Download a generated SQL script locally.

5.4.7.1 Saving a Quick SQL Model

Reuse Quick SQL shorthand syntax by saving a model.

To save a Quick SQL model:

1. On the Quick SQL page, click the **Quick SQL Actions** menu (three vertical dots) and select **Save Model** for an unsaved model or **Update Model** for a pre-existing model.

   The Save Model dialog appears.
2. In the Save Model dialog:
   a. Model Name - Enter a name.
   b. Description - Enter a description for the model.
   c. Click **Save Model** or **Update Model**.

   The `Model saved` message appears.

5.4.7.2 Loading a Saved Quick SQL Model

Load saved Quick SQL models from the Load window.

Developers can view and load their own saved models on the Load window under **My Models** or all workspace developer models under **Workspace Models**.

To load a saved Quick SQL model:

1. On the Quick SQL page, click the **Quick SQL Actions** menu (three vertical dots) and select **Load** .

   The Load windows appears and displays three tabs:
   - Samples
   - My Models
   - Workspace Models
2. To load a saved model:
   a. Under either **My Models** or **Workspace Models**, choose a model.
   b. Click **Load Model**.

   The selected model appears.

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3. To edit the model name or description, or delete a saved model:
   a. View the Load window.

      On the Quick SQL page, click the **Quick SQL Actions** menu (three vertical dots) and select the **Load** action.
   b. Under either **My Models** or **Workspace Models**, choose a model.
   c. Click the model name.

      The Edit Model dialog appears.
   d. Edit the model name or description and click **Save**.
   e. To delete the model, click **Delete**.

5.4.7.3 Saving a Quick SQL Model Under a Different Name

Save a Quick SQL model under a different name.

To save a Quick SQL model under a different name:

1. On the Quick SQL page, click the **Quick SQL Actions** menu (three vertical dots) and select **Save Model As**.

   The Save Model dialog appears.
2. In the Save Model dialog:
   a. Model Name - Enter a new model name.
   b. Description - (Optional) Enter a description for the model.
   c. Click **Save Model**.

   The `Model saved` message appears.

5.4.7.4 Deleting a Quick SQL Model

Delete an existing Quick SQL model with the Save Model dialog.

To delete a model:

1. On the Quick SQL page, click the **Quick SQL Actions** menu (three vertical dots) and click **Update Model**.

   The Save Model dialog appears.
2. Click **Delete**.
3. Click **Delete** again in the confirmation dialog.

   The model is deleted.

5.4.7.5 Viewing an Entity Relationship Diagram

View an entity relationship diagram of a data model's tables, columns, datatypes, and relationships.

To view entity relationship diagram of a data model's tables, columns, datatypes, and relationships:

1. On the Quick SQL page, load a Quick SQL model.
2. On the right pane, click the **Diagram** tab.

   The entity relationship diagram appears.

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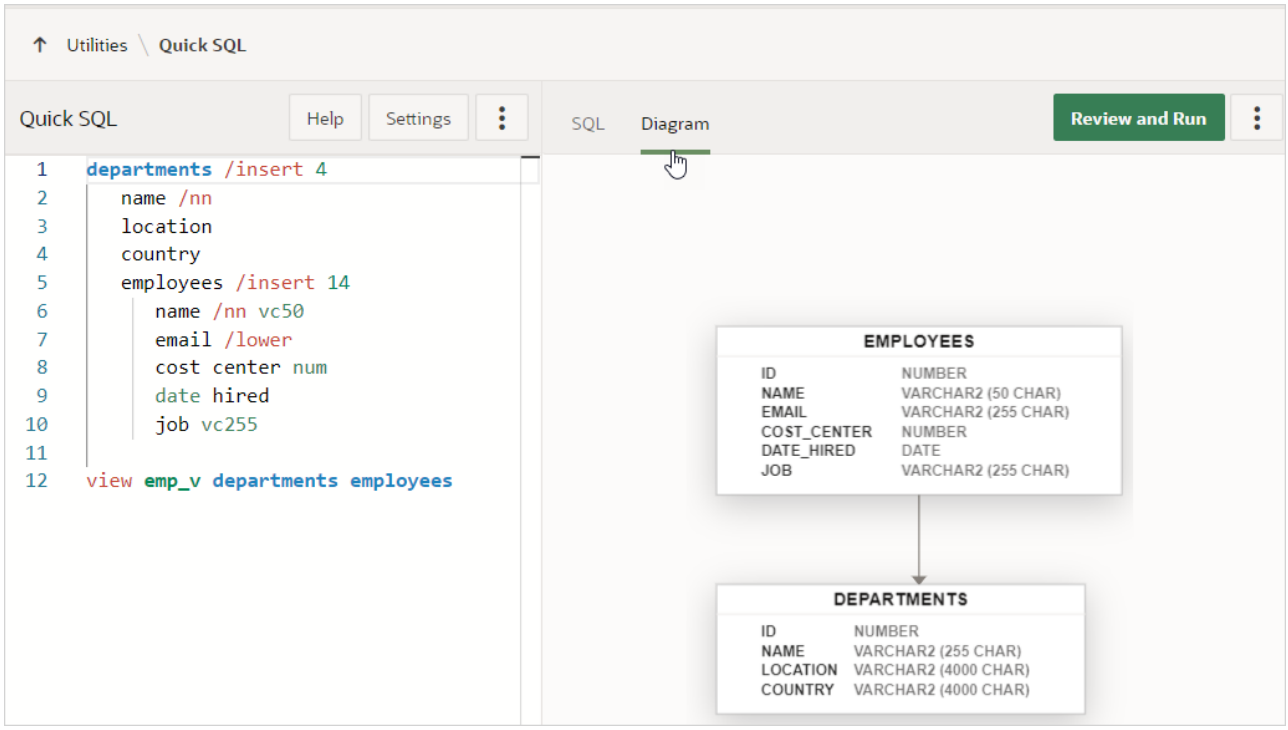

5.4.7.6 Saving a Generated SQL Script

Save generated SQL as a script in SQL Scripts.

To save generated SQL as a script:

1. On the Quick SQL page, enter Quick SQL shorthand syntax in the left pane.

   The generated SQL displays in the right pane.
2. In the right pane, click the **SQL Actions** menu (three vertical dots) and select **Save SQL Script** .
3. In the Save Script dialog:
   a. Script Name - Enter a name.
   b. Click **Save Script**.
      - Script Name - Enter a name.
      - Click **Save Script**.

   The script is saved in SQL Scripts.

> **See Also**
>
> - Generating SQL with SQL Shorthand Syntax
> - Using SQL Scripts

5.4.7.7 Downloading SQL Scripts

Download a generated SQL script locally.

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To download a generated SQL script:

1. On the Quick SQL page, enter Quick SQL shorthand syntax in the left pane.

   The generated SQL displays in the right pane.

2. Scroll through generated SQL in right pane.

   At the bottom, the line starting with `-- Generated by Quick SQL` is the SQL shorthand syntax. If you specified any settings they display after the line starting with `# settings = .` Consider the following example:

```
-- Generated by Quick SQL undefined 12/7/2023, 12:20:47 PM

/*
departments /insert 4
   name /nn
   location
   country
   employees /insert 14
      name /nn vc50
      email /lower
      cost center num
      date hired
      job vc255

view emp_v departments employees

--- Non-default options:
# settings = {"apex":"Y","db":"19c"}

*/
```

3. In the right pane, click the **SQL Actions** menu (three vertical dots) and select **Download** .

5.4.8 Creating an Application from a Generated SQL Script

Create an application from a saved script in SQL Scripts.

When you save a script, you can view, run, and modify the script in SQL Scripts. After you run the saved script, you can run the Create Application Wizard from SQL Scripts page. The wizard recognizes any tables and adds report and form pages for each table.

To create an application from saved SQL script:

1. Save generated SQL as a script as described in Saving a Generated SQL Script.
2. Click **SQL Workshop** and then **SQL Scripts**.

   The SQL Script page appears.

3. Run the saved script:

   a. Locate the script and click **Run**.

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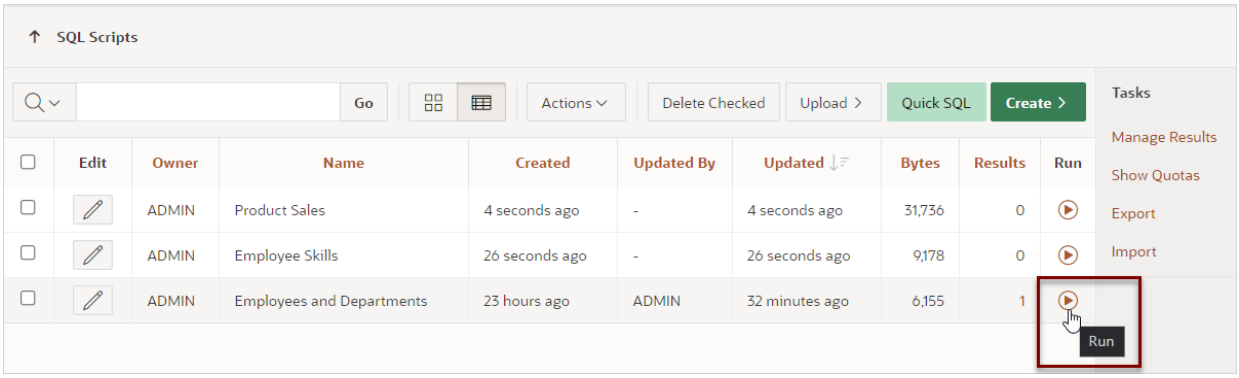

b. On Run Script, click **Run Now**.

   The Results page appears.

4. To create an application, click **Create App**.

   The Create Application Wizard appears.

> **Note**
>
> Creating a database application is a multiple step process. Once you specify the application name and appearance, you add pages, select features, and configure application settings.

5. On the Create an Application page:

   a. Enter the application name, select an appearance, add pages, select features, and configure application settings.

   b. Click **Create Application**.

> **See Also**
>
> Running the Create Application Wizard and Understanding Page Types, Features, and Settings in the *Oracle APEX App Builder User's Guide*

5.4.9 Configuring Quick SQL Settings

Configure settings inline to explicitly set SQL syntax generation options, or click the Settings button at the top of the right pane to declaratively set the generation options.

- Configuring Settings Declaratively
  Configure settings declaratively by clicking the Settings button at the top of the right pane.
- Configuring Settings Inline
  Configure settings inline to explicitly set SQL syntax generation options.

5.4.9.1 Configuring Settings Declaratively

Configure settings declaratively by clicking the Settings button at the top of the right pane.

To configure settings declaratively:

1. On the Quick SQL page, click **Settings** above the right pane.

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The Settings page appears. Configure the appropriate attributes.

2. Table:
   - Object Prefix - Identifies common prefix for all objects, automatically separated by an underscore.
   - Schema - Prefix object names with a schema name. The default is no schema prefix for object names.
   - Compression - Enable to compress each table's data to optimize space.
     Table compression saves disk space and reduces memory use in the buffer cache. Table compression can also speed up query execution during reads. There is, however, a cost in CPU overhead for data loading and DML. Table compression is completely transparent to applications. It is especially useful in online analytical processing (OLAP) systems, where there are lengthy read-only operations, but can also be used in online transaction processing (OLTP) systems.
   - Generate Inserts - If disabled, disables all sample data generation.
     Generating inserts can be time consuming and impact usability. Consider turning off the generation of inserts as you refine your data model, then turning on when you are ready to generate data.
3. Primary Key:
   - Add Primary Key - Generates a ID primary key column for each table.
   - Population Method - Choose a primary key strategy of identity. Options include:
     - **SYS_GUID** - Populates the primary key with a globally unique identifier. It generates a numeric random number that is non sequential and non uniform in length. This method is useful in that it can be more secure, it can also allow data to be merged from different databases with out fear of primary key conflict.
     - **Identity Column** - Sets the primary key by default to an ever increasing number.
     - **Sequence** - Increments the primary key using number sequence. This primary key population is implemented via a database trigger.
     - **None** - This method will not populate the primary key with any value.
   - Prefix primary keys with table name - Prefixes primary key column with table name (for example, `EMPLOYEE_ID`).
4. Column:
   - Date Data Type - Defines what type of date to use to store columns identified as dates. Options include:
     - **Date**
     - **Timestamp**
     - **Timestamp with time zone**
     - **Timestamp with local time zone**
   - Semantics- Set `VARCHAR2` column length semantics to one of the following:
     - **Default** - Default to the database setting. If you are unsure what this is, select **Default**.
     - **CHAR** - Indicates that the column will have character semantics.
     - **BYTE** - Indicates that the column will have byte length semantics.
5. Additional Columns:

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- Include - Additional columns to automatically add to your table. Options include:
  - **Audit Columns**
  - **Row Version Number**
  - **Row Key**

6. Options:
   - PL/SQL API - Select **On** to generate a PL/SQL package API for each table to query, insert, update, and delete its data. Select **Off** to only generate PL/SQL APIs for tables that include an `/api` at the end of the name. For example:

     ```
     employees /api
        name
        email
        phone num
     ```

   - Include Drops - Include drop object commands in the output. When set to **On**, a drop command is generated for each database object created. For example:

     ```
     drop table X including contents;
     drop table Y including contents;
     ```

   - Editionable - When generating PL/SQL objects including triggers and packages make these editionable.
   - APEX Enabled - Controls whether audit column triggers use the APEX-aware expression to set the <code>created_by</code> and <code>updated_by</code> column values:

     ```
     'coalesce(sys_context(''APEX$SESSION'',''APP_USER''),user)'
     ```

     When not enabled the following function is used:

     ```
     'user'
     ```

   - Compatibility - Select an Oracle Database release. Ensures generated SQL is compatible with the database release selected.
7. Audit Columns:
   - Created Column Name - Overrides default audit column name for when row was created.
   - Created By Column Name - Overrides default audit column name for user who created a row.
   - Updated Column Name - Overrides default audit column name for when a row was last updated.
   - Updated By Column Name - Overrides default audit column name for user who last updated a row.
8. To save your configuration, click **Save Changes**
9. To reset to the default settings, click **Reset**

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5.4.9.2 Configuring Settings Inline

Configure settings inline to explicitly set SQL syntax generation options.

You can configure settings inline to explicitly set SQL syntax generation options. When configuring setting inline:

- Settings must start on a new line. To enter multiple settings, begin with `# settings =`. To enter a single setting per line, use `#`.
- All values are case insensitive.
- Brackets, spaces, and commas can be added for clarity but are ignored.
- To have all settings generated use `# verbose: true`

To configure settings inline:

1. On the Quick SQL page, enter Quick SQL shorthand syntax in the left pane.

   The generated SQL displays in the right pane.

2. Scroll through generated SQL in right pane.

   At the bottom, the line starting with `-- Generated by Quick SQL` is the SQL shorthand syntax. Consider the following example:

   ```
   -- Generated by Quick SQL undefined 12/7/2023, 12:20:47 PM

   /*
   departments /insert 4
      name /nn
      location
      country
      employees /insert 14
         name /nn vc50
         email /lower
         cost center num
         date hired
         job vc255

   view emp_v departments employees

   --- Non-default options:
   # settings = {"apex":"Y","db":"19c"}

   */
   ```

3. Specify settings after the line starting with `# settings =` .

   Entering settings directly into the right pane ensures the same SQL generation options are utilized even if you download the script and later paste it back. For example, enter the following to prefix all table names with TEST and generate for schema OBE:

   ```
   # settings = { prefix: "test", schema: "OBE" }.
   Alternatively, enter each setting on a separate line for the same result:
   # prefix: "test"
   # schema: "OBE"
   ```


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> **Tip**
>
> To view a listing of settings, by click **Help** and then the **Settings** tab.

5.4.10 Recommendations When Using Quick SQL

Learn about recommended approaches to creating effective data models.

Although there are many valid approaches to creating an effective data model, Oracle recommends the following:

- **Table Naming** – Define your tables as plural and columns as singular. Since tables are designed to store many rows it makes sense to have them plural. For example `Employees`.
- **Column Naming** – Define your column names as singular. For example `First Name`.
- **Primary Keys** – Every table should have a primary key, primary keys are used to uniquely identify each row and can be used to associate child table data.
- **Primary Key Column Naming** – Every table will have a primary key and it should be called `ID` and it should be numeric.
- **Table Constraints** – The best way to ensure data integrity is to have the database only allow proper data. For example, if a column is required ensure you have a `not null` constraint. If a column is unique ensure you have a unique constraint.
- **Referential Integrity** – Most relational database models have a parent-child relationship, also known as a one-to-many relationship. They frequently also have many to many relationships. Using declarative primary key and foreign key syntax you can have the database enforce these relationships to ensure the integrity of your data. By defining the referential integrity you ensure all child tables do in fact relate to parent tables.

5.4.11 Database Terminology Used in Quick SQL

Learn about common database terms used in Quick SQL.

Quick SQL includes references to the following database terms:

- **BLOB** – A binary large object or `CLOB`. BLOBs store binary data and do not impose any character set encoding. `BLOB` size can store 4GB or more depending on system configuration.
- **Check Constraint** – A check constraint is a declarative way to limit the values a given column may contain.

```
create table projects (
             id     number primary key,
             name   varchar2(50),
             status varchar2(30) check (status in ('OPEN','CLOSED'))
             );
```

- **CLOB** – A character large object or `CLOB`. The maximum size of a `VARCHAR2` datatype is 32,767 bytes, however a `CLOB` size can be store up to 4GB of character data.
- **Column** – RDBMS tables store data in tables that are comprised of rows and columns. Each column is named. For example, `first_name`.

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- **Database** – A structured set of data held in a computer, especially one that is accessible in various ways.
- **Data Model** – A Data Model is a method of organizing elements of data and defining how they relate to one another. A model typically organizes data into entities that when they are transformed into a physical database model are converted into tables and columns. This tool is a very rudimentary tool that creates physical data models from indented text. For serious data modeling it is recommended that you use a proper data modeling tool Oracle SQL Data Modeler. It is a free graphical tool that enhances productivity and simplifies data modeling tasks.
- **Data Type** – Each column in a table has a data type. Data types are frequently character (`VARCHAR2`), `number`, or `dates`.
- **DML** – Data Manipulation Language. SQL commands that include the following:
  - `INSERT` - SQL statement used to add new rows to a table.
  - `UPDATE` - SQL statement used to update one or more rows of data within a table.
  - `DELETE` - SQL statement used to remove one or more rows of data from a table.
- **Foreign Key** – A column(s) in a table that references another table. For example, if employees are organized by departments, a `department_id` in the employees table could be a foreign key to the primary key of the `employee` table. By defining foreign keys you are declaratively defining a relationship between tables.
- **Join** – A join is a SQL query that combines rows from two or more tables or views. A query is a join query whenever multiple tables appear in the `FROM` clause. A major benefit of the relational database model is that you can store data that repeats in one location. For example, assume we have two table departments, and employees. Here is a query that selects data from both tables.

  ```
  select d.name, d.location, e.name, e.job
          from   departments d, employees e
          where  e.department_id = e.id
  ```

  Note if the department name or location changes it is changed in only one place.
- **Relational Database** – A database model that organizes data in a relational model. The relational model organizes data into one or more tables, also known as relations, of columns and rows. The standard language to access data within a relational database and to define database objects is SQL.
- **RDBMS** – Relational Database Management System.
- **Object** – A database object is a named widget used to store or manage data. For example `tables`, `views`, `triggers`, and `synonyms` are all considered database objects.
- **PL/SQL** – Oracle procedural extension to the SQL language. PL/SQL stands for Procedural Language SQL. PL/SQL is a server-side, stored procedural language that can be used to perform procedural operations on Oracle database data.
- **Query** – To access / query data in your relational database you use a SQL `SELECT` statement. In SQL a `SELECT` statement can query data from one or more tables or views.
  - Query of 3 columns from a table called projects

    ```
    select id, name, status
        from projects
        where status = 'OPEN';
    ```


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- Aggregate Query

```
select count(*) count_of_projects,
          sum(case when status = 'OPEN' then  1 else 0) open_projects,
          sum(case when status = 'CLOSED' then  1 else 0)
closed_projects
    from projects;
```

- **Reserved Word** – A name that cannot be used as an object identifier. For example `SELECT` cannot be used as a table name.
- **Row** – RDBMS tables store data in tables that are comprised of rows and columns. Each row is made up of one or more columns.
- **Sequence** – Sequences are database objects from which multiple users can generate unique integers. The sequence generator generates sequential numbers, which can help to generate unique primary keys automatically, and to coordinate keys across multiple rows or tables. A sequence can be created with the following Syntax:

```
create sequence project_seq;
```

  The sequence values can be referenced using `project_seq.currval` (current value) or `project_seq.nextval` (next value). Each time the `nextval` is access the sequence increments. The default increment is1.
- **Schemas** – A schema is a namespace for creating database objects such as tables. You do not create database tables in databases you create them within schemas within a database. Each database can store any number of schemas. Schemas are also sometimes called users. When you have a new database you first create a schema (or user, they are the same thing) then create your tables within the schema or user. You can create schemas using the SQL `create schema` or `create user` command. Schemas are a way of organizing database objects within a database.
- **SQL** – Structure Query Language. The language used to define database tables, and to manipulate the data within the tables.
- **Structured Data** – Relational database data is frequently referred to as structured because data is organized cleanly into rows and columns. Unstructured typically refers to data that has no structure imposed on it.
- **Table** – A database object that stores related data organized into rows and columns.
  - Creating a table

```
create table projects (
        id     number primary key,
        name   varchar2(50),
        status varchar2(30)
        );
```

  - Inserting rows into a table

```
insert into projects (id, name, status)
      values (1, 'My Project','OPEN');
```


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- Querying the data with the table

```
select id, name, status
      from projects
      where status = 'OPEN';
```

- **Trigger** – A database trigger is procedural code that is automatically executed in response to certain events on a particular table. For example before or after insert of a row. The following trigger forces a column to lower case.

```
create or replace trigger PROJECTS_BIU
           before insert or update
           on PROJECTS
           for each row
        begin
            :new.OWENER_EMAIL := LOWER(:new.OWENER_EMAIL);
        end;
    /
```

- **View** – A database view is a virtual table based on the result-set of an SQL statement. A view is also known as a stored query. You can create a view that joins multiple tables. Once the view is created you can query it as if it was a table. Following is an example of the SQL to create a view:

```
create view department_employees as
select d.name, d.location, e.name, e.job
    from   departments d, employees e
    where  e.department_id = e.id;
```

5.4.12 About Supported Data Types

Learn about supported data types.

Quick SQL supports the following data types:

- `NUMBER`
- `INTEGER`
- `DATE`
- `TIMESTAMP`
- `TIMESTAMP WITH LOCAL TIME ZONE`
- `VARCHAR2(4000)`
- `VARCHAR2(NNN)` Where `NNN` identifies a number between 1 and 32767.
- `VARCHAR2(32767)`
- `CLOB`
- `BLOB`
- `CLOB CHECK (<Column Name> IS JSON)`

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> **Tip**
>
> To learn more about Quick SQL shorthand syntax for supported data types, click **Help** and select **Data Types**.

5.5 Using Sample Datasets

Use sample datasets to build sample applications.

- About Sample Datasets
  Sample datasets enable you to easily build sample applications. Sample datasets includes sufficient data to build pages with various different components.
- Accessing Sample Datasets
  Access the Sample Dataset page by clicking Utilities and then Sample Datasets.
- Installing a Sample Dataset
  Install a sample dataset in your workspace.
- Refreshing a Sample Dataset
  Refresh an installed sample dataset to update the objects or replace the language or schema.
- Changing the Schema for a Sample Dataset
  Change the schema for an installed sample dataset.
- Removing a Sample Dataset
  Remove an installed sample dataset.

5.5.1 About Sample Datasets

Sample datasets enable you to easily build sample applications. Sample datasets includes sufficient data to build pages with various different components.

Install, refresh, or replace sample datasets within one of the schemas associated with your workspace. The database objects can also be easily removed. Each dataset includes various database objects and sample data. The sample data is available in one or more languages.

> **Note**
>
> Only a single language can be loaded into the sample database objects. If you select a different language, the currently loaded data is replaced.

5.5.2 Accessing Sample Datasets

Access the Sample Dataset page by clicking Utilities and then Sample Datasets.

To access the Sample Datasets page:

1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **Sample Datasets**.

   The Sample Datasets page appears with a list of datasets.

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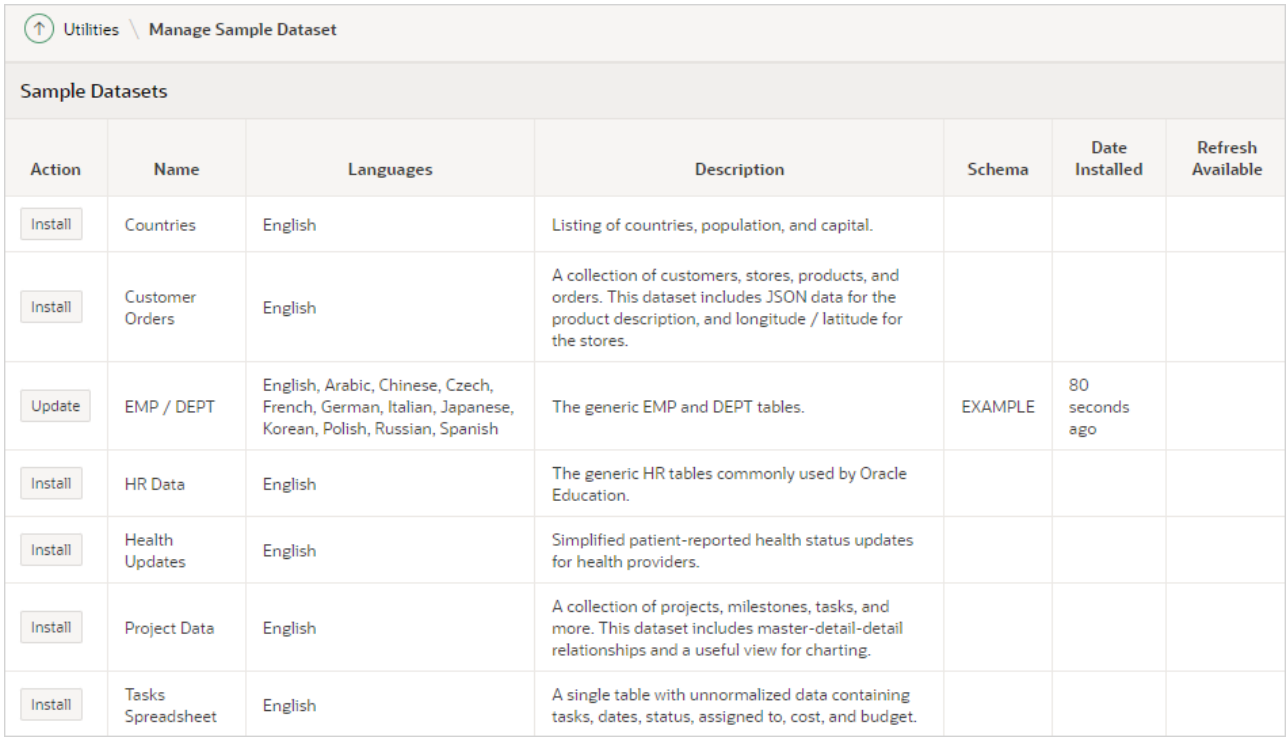

Utilities \ Manage Sample Dataset

Sample Datasets

Action	Name	Languages	Description	Schema	Date Installed	Refresh Available
Install	Countries	English	Listing of countries, population, and capital.			
Install	Customer Orders	English	A collection of customers, stores, products, and orders. This dataset includes JSON data for the product description, and longitude / latitude for the stores.			
Update	EMP / DEPT	English, Arabic, Chinese, Czech, French, German, Italian, Japanese, Korean, Polish, Russian, Spanish	The generic EMP and DEPT tables.	EXAMPLE	80 seconds ago	
Install	HR Data	English	The generic HR tables commonly used by Oracle Education.			
Install	Health Updates	English	Simplified patient-reported health status updates for health providers.			
Install	Project Data	English	A collection of projects, milestones, tasks, and more. This dataset includes master-detail-detail relationships and a useful view for charting.			
Install	Tasks Spreadsheet	English	A single table with unnormalized data containing tasks, dates, status, assigned to, cost, and budget.			

> **Note**
>
> Some Sample Datasets are incompatible with older versions of Oracle AI Database. The datasets available to you may differ from the ones shown in the previous image.

5.5.3 Installing a Sample Dataset

Install a sample dataset in your workspace.

> **Tip**
>
> After installing a sample dataset, you have the option to build an application with prepopulated components built on the dataset.

To install a sample dataset:

1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **Sample Datasets**.

   The Sample Datasets page appears with a list of datasets.
4. On the Sample Datasets page:
   a. Determine the dataset to install.
   b. Under Action, click **Install**.

   The Manage Sample Dataset page appears.

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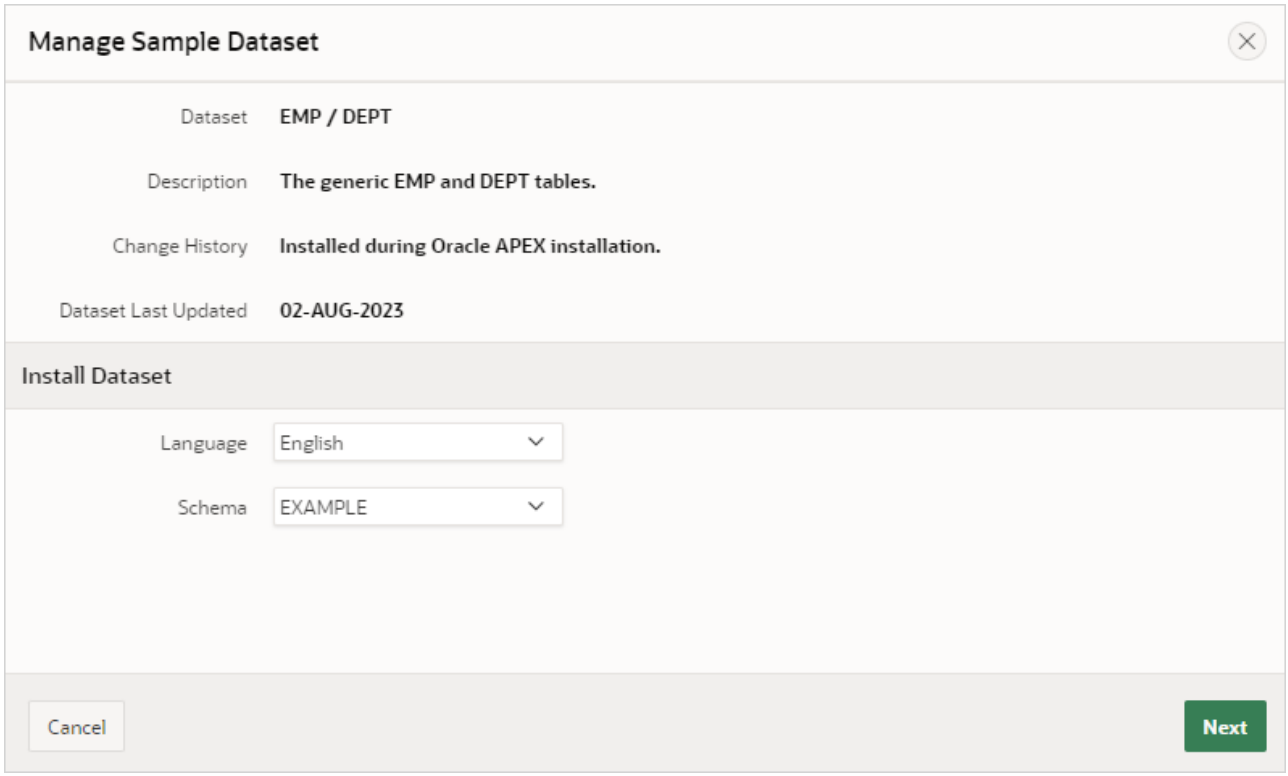

5. On the Manage Sample Dataset page:
   a. Language - Select a language to install.

      Only a single language can be loaded into the sample database objects. If you select a different language, the currently loaded data will be replaced.

   b. Schema - Select a schema.
   c. Click **Next**.

   The Load Sample Dataset page appears listing the database objects to be installed.
6. Click **Install Dataset**.

   The Load Sample Dataset - Result page appears with a list of installed database objects.
7. On the Load Sample Dataset - Result page:
   - **Create Application** - Launches the Create Application Wizard and prepopulates it with components built on the sample dataset.
   - **Exit**- Exits the Load Sample Dataset wizard.

> **See Also**
>
> Running the Create Application Wizard

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5.5.4 Refreshing a Sample Dataset

Refresh an installed sample dataset to update the objects or replace the language or schema.

> **Tip**
>
> After updating a sample dataset, you have the option to build an application with prepopulated components built on the dataset.

To refresh an installed dataset:

1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **Sample Datasets**.

   The Sample Datasets page appears with a list of datasets. Installed datasets display the Schema and Date Installed.
4. Under Action, click **Update**.
5. On the Manage Sample Dataset page:
   a. New Language - Select a new language to install.

      Only a single language can be loaded into the sample database objects. If you select a different language, the currently loaded data will be replaced.
   b. New Schema - Select a new schema.
   c. Click **Next**.

      The Load Sample Dataset page appears listing the database objects to be replaced.
6. On Load Sample Dataset, click one of the following:

   > **Tip**
   >
   > The button that displays changes depending upon your previous selections.

   - **Refresh Existing Dataset**
   - **Replace Language**
   - **Replace Schema**
   - **Replace Language and Schema**
7. On the Load Sample Dataset - Result page:
   - **Create Application** - Launches the Create Application Wizard and prepopulates it with components built on the sample dataset.
   - **Exit**- Exits the Load Sample Dataset wizard.

   > **See Also**
   >
   > Running the Create Application Wizard

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5.5.5 Changing the Schema for a Sample Dataset

Change the schema for an installed sample dataset.

To change the schema for an installed dataset:

1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **Sample Datasets**.

   The Sample Datasets page appears with a list of datasets. Installed datasets display the Schema and Date Installed.
4. Under Action, click **Update**.

   The Manage Sample Dataset page appears.
5. On the Manage Sample Dataset page:
   a. New Schema - Select a new schema. The New Schema list only displays if you have more than one schema associated with your workspace.
   b. Click **Next**.

      The Load Sample Dataset page appears listing the database objects to be replaced.
6. On Load Sample Dataset, click **Replace Schema**.

5.5.6 Removing a Sample Dataset

Remove an installed sample dataset.

To remove installed dataset:

1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **Utilities**.
3. Click **Sample Datasets**.

   The Sample Datasets page appears with a list of datasets. Installed datasets display the Schema and Date Installed.
4. Under Action, click **Update**.
5. On Manage Sample Dataset, click **Remove Dataset**.
6. Confirm your selection and click **Remove Dataset** again.

5.6 Generating DDL

Generate data definition language (DDL) statements from the Oracle data dictionary.

You can use these scripts to create or re-create database schema objects. The scripts can be generated to display inline or saved as a script file. You can generate the create scripts for all objects for a specific schema, specific object types, or specific objects.

To generate a DDL statement:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.

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3. Click **Generate DDL**.

   The Generate DDL page appears.

4. Click **Create Script**.

   The Generate DDL Wizard appears.

5. Select a database schema and click **Next**.

6. Define the object type:

   a. Output - Specify an output format. Select either **Display Inline** or **Save As Script File**.

   b. **Check All** - Select this option to include all object types for which to generate DDL.

   c. **Object Type** - Select the object types for which to generate DDL.

   d. To select object names for the selected object types, click **Next** and follow the on-screen instructions.

7. Click **Generate DDL**.

See Also

- *Oracle AI Database SQL Language Reference* for information about DDL statements
- Data Dictionary and Dynamic Performance Views in *Oracle AI Database Concepts* for information about the data dictionary

5.7 Managing User Interface Defaults (UI Defaults)

Managing User Interface Defaults (UI Defaults) enables you to assign default UI properties, create default wizards, modify the table UI defaults, add new attributes, and export the UI defaults.

- About UI Defaults
  Learn about UI Defaults
- Creating UI Defaults for a Table
  If no defaults have been created for a table, use the Table Dictionary Create Defaults wizard to automatically generate defaults based on the database table and column definitions. After the initial defaults are created, you can modify the individual default values.
- Modifying Table UI Defaults
  Learn how to modify existing table UI defaults.
- Creating UI Attributes
  Use the Attribute Dictionary to define and add new attributes.
- Modifying UI Attributes
  Modify existing UI attributes on the Grid Edit page or by selecting a specific column.
- Exporting and Importing UI Defaults
  Export UI defaults in the same way you export any related application file.

5.7.1 About UI Defaults

Learn about UI Defaults

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UI Defaults enable AI interactions to understand the contents of your tables. You can also use UI Defaults to populate initial labels for forms and reports, providing consistency across multiple pages in an application or multiple applications.

When you create an application using the **Use Create App Wiaard** option, you can specify in Advanced Setting if you want to use UI Defaults. When you create a form or report using a wizard, the wizard uses this information to create default values for region and item properties. Utilizing UI defaults can save valuable development time and has the added benefit of providing consistency across multiple pages in an application. UI Defaults are divided into two categories:

- **Table Dictionary** - Specific to tables and columns within a selected schema. These defaults will be used over any defined within the Attribute Dictionary.
- **Attribute Dictionary** - Contains a set of attributes about a column that are used in creating forms and reports. The definitions are matched by column name and a particular definition can be shared amongst several columns by using synonyms.

When you use UI Defaults during creation of pages and regions, the Table Dictionary takes priority over the Attribute Dictionary. If a table and column combination exists, that is used rather than an attribute definition of the same name. This can be useful, for example, when you want to have a specific label or Help text for the `CREATED_BY` column in the `emp` table but then use more generic defaults for `CREATED_BY` in another table.

5.7.2 Creating UI Defaults for a Table

If no defaults have been created for a table, use the Table Dictionary Create Defaults wizard to automatically generate defaults based on the database table and column definitions. After the initial defaults are created, you can modify the individual default values.

To create the initial UI defaults for tables:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **UI Defaults**.

   The Dashboard page for UI Defaults appears.
4. Click **Table Dictionary**.

   The Table Dictionary page displays a report of all objects in your workspace that includes a Defaults Exist column indicating whether defaults have been created for each object.
5. Click the object name for which you want to create defaults.

   The Create Table Dictionary Defaults page appears.
6. Click **Create Defaults**.

   The Table Dictionary page displays a report showing that defaults exist for the object you selected.

> **Note**
>
> Synchronizing defaults with the database data dictionary creates table-based defaults for any tables in the current schema that do not have defaults yet and updates those of tables that do to match the database definition.

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> **See Also**
>
> Modifying Table UI Defaults

5.7.3 Modifying Table UI Defaults

Learn how to modify existing table UI defaults.

To modify existing table defaults:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **UI Defaults**.

   The Dashboard page for UI Defaults appears.
4. Click **Table Dictionary**.

   The Table Dictionary page displays a report of all objects in your workspace. The Defaults Exist column indicates whether defaults have been created for an object.
5. Click the object name you want to modify.

   The Table and Column Properties page displays a report of column defaults.
6. Click the column name you want to modify.

   The Column Defaults page displays.
7. Make modifications and click **Apply Changes**.

   See field-level help for a description of the individual settings on this page.

> **Tip**
>
> A column can be removed from the Table Dictionary, thus allowing the Attribute Dictionary defaults to be used during the creation process. For example, when you have auditing columns where you may want the exact same labels and help across every instance of `CREATED_BY` and `CREATED_ON`, regardless of which table they come from, you could remove the column defaults from each table for those columns.

5.7.4 Creating UI Attributes

Use the Attribute Dictionary to define and add new attributes.

To create an attribute:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **UI Defaults**.

   The Dashboard page for UI Defaults appears.
4. Click **Attribute Dictionary**.

   The Attribute Dictionary page displays a report of all attributes in your workspace.

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5. Click **Create**.

   The Column Details page appears.

6. Enter attribute specifications and click **Create**.

   See field-level help for a description of the individual settings on this page.

5.7.5 Modifying UI Attributes

Modify existing UI attributes on the Grid Edit page or by selecting a specific column.

To modify an existing attribute:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **UI Defaults**.

   The Dashboard page for UI Defaults appears.

   The current schema displays to the right of the breadcrumb menu.

4. Click **Attribute Dictionary**.

   The Attribute Dictionary page displays a report of all attributes in your workspace.

5. To edit select attributes for all displayed columns:
   a. Click **Grid Edit**.
   b. Edit the appropriate attributes and click **Apply Changes**.
6. To edit a specific column, click the edit icon for the attribute you want to modify.

   The Column Details page displays.

   > **Tip**
   >
   > If you select to edit a synonym, identified by having the `Synonym of` column populated, you are taken to the definition for the base column, because the base column and all synonyms share one definition. To delete the synonym, select the synonym within the Synonyms region. Deleting the base column deletes the column and all synonyms.

7. Make modifications and click **Apply Changes**.

   See field-level help for a description of the individual settings on this page.

5.7.6 Exporting and Importing UI Defaults

Export UI defaults in the same way you export any related application file.

To export UI defaults from one development instance to another:

1. Export the UI defaults using the Export User Interface Defaults utility.
2. Import the exported file into the target Oracle APEX instance.
3. Install the exported file from Export Repository.

When you export UI defaults, all UI defaults for the selected schema are exported to a single script. The file contains an API call to create table hints by making calls to the application

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PL/SQL API. You can use this file to import UI defaults to another database and Oracle APEX instance.

> **See Also**
>
> In *Oracle APEX App Builder User's Guide*
>
> - Exporting User Interface Defaults
> - Importing User Interface Defaults
> - Installing Export Files

5.8 Comparing Schemas

You can run a report that compares database objects in two schemas, displaying differences between them. You can compare all objects in the schemas or limit your report to specific objects.

To compare two schemas, both must be available to your workspace.

Examples:

- Compare `DEMO_ objects` by searching for that naming convention. The report indicates if the object exists in each of the two schemas.
- Analyze the object details in the two schemas to determine why one implementation is different. For example, the report might show that an index in one schema has an additional column or a column with a different data type.

To compare schemas:

1. On the Workspace home page, click **SQL Workshop**.
2. Click **Utilities**.
3. Click **Schema Comparison**.
4. On the Schema Comparison page, make the appropriate selections to run the comparison:
   a. **Schema 1 and Schema 2** - Select the schemas to compare.
   b. **Compare** - Restrict the report to show one object type or select **All** to show all database objects.
   c. **Search** - Enter a case insensitive query for the object name.
   d. **Rows** - To change the number of rows that appear in the report, make a selection from the Display list.
   e. **Compare** - Click **Go** to find the results matching your selections.
   f. **Show Differences Only or Show Details** - Select the type of information you want to review.
   g. Click **Compare**.

5.9 Navigating to Data Dictionary Cache

Quickly navigate to Data Dictionary Cache in Administration Services.

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> **See Also**
>
> Accessing the Data Dictionary Cache Report from Workspace Administration in *Oracle APEX Administration Guide*

5.10 Managing Methods on Tables

The Managing Methods on Tables utility enables you to create an application programming interface, or package, based on a specified table.

To create a package:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **Methods on Tables**.

   The Create Table API page appears.
4. Enter a Package name. To have the final package name match the case entered in the Package Name field, click **Preserve Case** and click **Next**.
5. Select the table(s) for which you want to generate the PL/SQL package-based application program interface (API) and click **Next**.
6. A confirmation page appears, which displays the subprogram(s) and their description. You have the option to show or download the specification or body. To confirm, click **Create Package**.

5.11 Using the Recycle Bin

You can use the Recycle Bin to view and restore dropped database objects.

Required: You **must** enable Flashback Drop in the database to use the Recycle Bin in SQL Workshop.

When you drop a table, the space associated with the table is not immediately removed. The Oracle AI Database renames the table and places it and any associated objects in the Recycle Bin. You can recover objects in the Recycle Bin at a later time.

- Managing Objects in the Recycle Bin
  Once you select an object and view the Object Details page, you can choose to purge the object or restore the object by clicking the appropriate button.
- Emptying the Recycle Bin Without Viewing the Objects
  You can empty the Recycle Bin without viewing the objects by using Purge Recycle Bin option.

5.11.1 Managing Objects in the Recycle Bin

Once you select an object and view the Object Details page, you can choose to purge the object or restore the object by clicking the appropriate button.

You can view objects in the Recycle Bin on the Dropped Objects page.

To view objects in the Recycle Bin:

1. On the Workspace home page, click the **SQL Workshop**.

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2. Click **Utilities**.
3. Click **Recycle Bin.**
4. Click **Dropped Objects**.

   The Dropped Objects page appears.
5. To filter the report, select an object type, enter the object name in the Original Name field, and click **Go**.
6. To view object details, click the object name.

   The Object Details page appears.
7. To restore the current object, click **Restore Object**.
8. To permanently delete the current object, click **Purge Object**.

5.11.2 Emptying the Recycle Bin Without Viewing the Objects

You can empty the Recycle Bin without viewing the objects by using Purge Recycle Bin option.

To empty the Recycle Bin without viewing the objects:

1. On the Workspace home page, click **SQL Workshop**.
2. Click **Utilities**.
3. Click **Recycle Bin**.
4. Click **Purge Recycle Bin**.

   The Purge Recycle Bin page appears.
5. Confirm your request by clicking **Purge Recycle Bin** again.

5.12 Viewing Object Reports

SQL Workshop Utilities includes a variety of object reports to help you better manage the objects in your database.

- Viewing Table Reports
  Use the Table reports to view specific details about the tables within your database.
- Viewing PL/SQL Reports
  Use the PL/SQL reports to view program unit arguments or unit line counts and also to search PL/SQL source code.
- Viewing Exception Reports
  Use the Exception Reports to view unindexed foreign keys and tables without primary keys, indexes, or triggers.
- Viewing Security Reports
  Use the Security reports to view object or column privileges granted on database objects owned by other schemas.
- Viewing All Object Reports
  Use the All Object reports to view objects for the selected schema.

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5.12.1 Viewing Table Reports

Use the Table reports to view specific details about the tables within your database.

To view the Table reports:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **Object Reports**.

   The Object Reports page appears.
4. Under Table Reports, select a report to view:
   - **Table Columns**
   - **Table Comments**
   - **Table Constraints**
   - **Table Statistics**
   - **Table Storage Sizes**
5. To filter a report, enter search criteria in the field provided and click **Go**.
6. To view reports for a different schema, select another schema from the Schema list.

> **See Also**
>
> Customizing an Interactive Report Using the Actions Menuin *Oracle APEX End User's Guide*

5.12.2 Viewing PL/SQL Reports

Use the PL/SQL reports to view program unit arguments or unit line counts and also to search PL/SQL source code.

- Viewing Package Input and Output Parameters
  Use the Program Unit Arguments report to view package input and output parameters.
- Viewing the Number of Lines of Code for an Object
  Use the Unit Line Counts report to view the number of lines of code for each object.
- Searching PL/SQL Source Code
  Use the Search PL/SQL Source code page to search the text within your PL/SQL code.

> **See Also**
>
> Customizing an Interactive Report Using the Actions Menu in *Oracle APEX End User's Guide*

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5.12.2.1 Viewing Package Input and Output Parameters

Use the Program Unit Arguments report to view package input and output parameters.

To view the PL/SQL Unit Arguments report:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **Object Reports**.

   The Object Reports page appears.
4. Under PL/SQL Reports, click **Program Unit Arguments**.
5. To filter a report, enter search criteria in the field provided and click **Go**.
6. To view reports for a different schema, select another schema from the Schema list.

5.12.2.2 Viewing the Number of Lines of Code for an Object

Use the Unit Line Counts report to view the number of lines of code for each object.

Use this report to identify larger PL/SQL program units.

To view the Unit Line Counts report:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **Object Reports**.

   The Object Reports page appears.
4. Under PL/SQL Reports, click **Unit Line Counts**.

   The PL/SQL Unit Line Counts report appears.
5. To view reports for a different schema, select another schema from the Schema list.

5.12.2.3 Searching PL/SQL Source Code

Use the Search PL/SQL Source code page to search the text within your PL/SQL code.

Use this report to find references to tables or functions you might be thinking of deleting. You can also use this page to locate code when you can only recall a code snippet.

To search for PL/SQL source code:

1. On the Workspace home page, click the **Utilities** icon.
2. Click **Object Reports**.

   The Object Reports page appears.
3. Under PL/SQL Reports, click **Search PL/SQL Source Code**.
4. To filter the report:
   a. In From Line and To Line, enter the range of lines you want to search.
   b. Click **Set**.
   c. To filter the report, enter an object name and click **Go**.

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5. To view reports for a different schema, select another schema from the Schema list.

5.12.3 Viewing Exception Reports

Use the Exception Reports to view unindexed foreign keys and tables without primary keys, indexes, or triggers.

To view Exception reports:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **Object Reports**.

   The Object Reports page appears.
4. In the Exception Reports section, click the report you want to view.
   - **Tables without Primary Keys**
   - **Tables without Indexes**
   - **Unindexed Foreign Keys**
   - **Tables without Triggers**
5. To filter the report, enter a table name and click **Go**.
6. To view reports for a different schema, select another schema from the Schema list.

> **See Also**
>
> Customizing an Interactive Report Using the Actions Menu in *Oracle APEX End User's Guide*

5.12.4 Viewing Security Reports

Use the Security reports to view object or column privileges granted on database objects owned by other schemas.

You can also use these reports to view database role and system privileges.

To view the Security reports:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **Object Reports**.

   The Object Reports page appears.
4. Under Security Reports, click the report you want to view:
   - **Object Grants** - View the privileges for an existing schema and also understand what privileges have been granted from the selected schema to other schemas.
   - **Column Privileges** - View the privileges for columns within your schema and also understand what privileges have been granted from the selected schema to other schemas.

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- **Role Privileges** - View the database roles that have been granted to a selected schema. Roles are collections of various privileges.
- **System Privileges** - View the database privileges that have been granted to a selected schema.

5. To filter a report, enter search criteria in the field provided and click **Go**.
6. To view reports for a different schema, select another schema from the Schema list.

> **See Also**
>
> Customizing an Interactive Report Using the Actions Menu in *Oracle APEX End User's Guide*

5.12.5 Viewing All Object Reports

Use the All Object reports to view objects for the selected schema.

To view the All Object reports:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **Object Reports**.

   The Object Reports page appears.
4. Under All Object Reports, select a report to view:
   - **All Objects** - List all objects in the current schema. Displays creation date and when the last DDL (data definition language) was performed.
   - **Invalid Objects** - View all invalid objects in the database by object type.
   - **Object Creation Calendar** - View all objects in a calendar format based on the date each database object was created.
   - **Object Counts by Type** - View the number of database objects by type for the selected schema.
   - **Data Dictionary** - View the data dictionary for this database.

     An Oracle data dictionary is a set of tables and views used as a read-only reference about the database. For example, a data dictionary stores information about both the logical and physical structure of the database.

     A data dictionary also stores information about valid Oracle database users, integrity constraints for tables in the database, and the amount of space allocated for a schema object and the amount being used.
5. To filter a report, enter search criteria in the field provided and click **Go**.
6. To view reports for a different schema, select another schema from the Schema list.

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See Also

- Customizing an Interactive Report Using the Actions Menu in *Oracle APEX End User's Guide*
- Data Dictionary and Dynamic Performance Views in *Oracle AI Database Concepts*for information about the data dictionary

5.13 Creating a Data Model Using AI

Create a data model using the Generative AI Service already configured on the workspace.

To create a data model using AI, you must have a Generative AI Service configured and enable the **Used by App Builder** setting. If an AI Service is not available, the Create Data Model Using AI option is hidden. To learn more, see Managing Generative AI Services in *Oracle APEX App Builder User's Guide*.

To create a data model using AI:

1. On the Workspace home page, click **SQL Workshop**.
2. Click **Utilities**.
3. Click **Create Data Model Using AI**.

   Tip

   You can also access **Create Data Model Using AI** directly from the Tasks list on the SQL Workshop home page.

4. Select the SQL Format:
   - **Oracle SQL**
   - **Quick SQL**

   Tip

   APEX saves this choice as a user preference.

5. Request the database objects:
   - Select from the sample prompts to begin.
   - Enter your own request using natural language.

   The APEX Assistant begins building a SQL script based on the information you provide.

To complete the SQL script:

6. For **Oracle SQL** format, click **Create SQL Script**.

   APEX generates the script and brings you to the Script Editor page.

7. For **Quick SQL** format, click **Review Quick SQL**.

   APEX generates the Quick SQL code and brings you to the Quick SQL page.

To save, edit, and run the script:

8. In Script Name, enter a name for the script. Script name extensions are optional.

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9. Optional: Edit the script.
10. Click **Run** to run the script.

> **See Also**
>
> - Using the Script Editor

5.14 Viewing Database Details

If you have an account that has been granted a database administrator role, you can view details about your database on the About Database page.

To access details about your database:

1. On the Workspace home page, click **SQL Workshop**.
2. Click **Utilities**.
3. Click **About Database**.
4. If prompted, enter the appropriate administrator user name and password and click **Login**.

   The About Database page appears.

   > **Tip**
   >
   > See About Database Monitor Access Requirements to learn more about the requirements for accessing this page.

5. To view additional information about installed options, currently used features, or National Language Support:
   - Select one of the following options:
     - **Version**
     - **Settings**
     - **Options**
     - **National Language Support**
     - **CGI Environment**
     - **Parameters**
   - Click **Go**.

5.15 Monitoring the Database

The reports available on the Database Monitor page provide a database-wide view of the database sessions, system statistics, SQL statements, and longer operations.

You can use these reports to identify poorly performing SQL and to better understand the workload of the database.

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> **Tip**
>
> To access any of the icons on the Database Monitor page, you must have a database account that has been granted a database administrator (DBA) role.

- About Database Monitor Access Requirements
  Ensure that your account has the database administrator (DBA) role, Database Monitoring is enabled in the instance, and your user name is uppercase at sign-in.
- Accessing Session Page Reports
  A session is the connection of a user to an Oracle database instance.
- System Statistics
  Displays the System Statistics page statistics.
- Viewing System Statistics
  Learn how to view the System Statistics page.
- About Top SQL Page
  The top SQL statements represent the SQL statements that are executed most often, that use more system resources than other SQL statements, or that use system resources more frequently than other SQL statements.
- Viewing Top SQL Page
  Use the Top SQL page to identify poorly performing SQL.
- About Long Operations Page
  The Long Operations page displays the status of various operations that run for longer than 6 seconds (in absolute time).
- Viewing the Long Operations Page
  Learn how to view the Long Operations page.

5.15.1 About Database Monitor Access Requirements

Ensure that your account has the database administrator (DBA) role, Database Monitoring is enabled in the instance, and your user name is uppercase at sign-in.

To access the Database Monitor page, you meet the following requirements:

- Your database account that has been granted a database administrator (DBA) role.
- Database Monitoring is enabled for the instance. Your intance administrator can enable this from Instance Administration or use `APEX_INSTANCE_ADMIN.SET_PARAMETER` to set the `ALLOW_DB_MONITOR` parameter value.

When all requirements are met, sign in using the database account with DBA role with an UPPERCASE user name.

> **See Also**
>
> - Configuring Database Monitoring in *Oracle APEX Administration Guide*
> - SET_PARAMETER Procedure in *Oracle APEX App Builder User's Guide*

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5.15.2 Accessing Session Page Reports

A session is the connection of a user to an Oracle database instance.

A session lasts from the time the user connects until the time the user disconnects or exits the database application.

- Accessing Reports on the Session Page
  You must have database administrator privileges to access the Sessions page.
- Creating Sessions Reports
  The Sessions Report displays information about the current sessions in the database.
- Controlling the Number of Rows for Locks Reports
  The Locks report displays a report of sessions which have locks that are blocking other session(s).
- Creating Waits Reports
  The Waits report displays the wait events for each session.
- Creating I/O Reports
  The I/0 report displays details about the I/O for each session.
- Creating SQL Reports
  The SQL report displays details about the current or last SQL statement executed for each session.
- Creating Open Cursors Report
  The Open Cursors report displays details about the number of open cursors for each session.

5.15.2.1 Accessing Reports on the Session Page

You must have database administrator privileges to access the Sessions page.

A session is the connection of a user to an Oracle database instance. A session lasts from the time the user connects until the time the user disconnects or exits the database application.

To access reports on the Sessions page:

1. On the Workspace home page, click **SQL Workshop**.
2. Click **Utilities**.
3. Click **Database Monitor**.
4. Click **Sessions**.
5. If prompted, enter the appropriate database administrator user name and password and click **Login**.

   The Sessions page appears.
6. To view a report, select one of the following tabs at the top of the page:
   - **Sessions**
   - **Locks**
   - **Waits**
   - **I/O**
   - **SQL**

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- **Open Cursors**

5.15.2.2 Creating Sessions Reports

The Sessions Report displays information about the current sessions in the database.

Use the controls at the top of page to narrow the view:

- **Search**. Enter search criteria and click **Go**. For search details, click the Search label.
- **Status**. Select a status and click **Go**.
- **Show**. Select how many columns to display and click **Go**.
- **Rows**. Select the number of rows to appear in the report and click **Go**.

To view session details, click the Session ID (SID). The Session Details page appears. To remove the current session, navigate to the Session Details page and click **Kill Session**.

5.15.2.3 Controlling the Number of Rows for Locks Reports

The Locks report displays a report of sessions which have locks that are blocking other session(s).

To control the number of rows that appear, make a selection from the Rows list and click **Go**.

5.15.2.4 Creating Waits Reports

The Waits report displays the wait events for each session.

Use the controls at the top of page to narrow the view:

- **Search**. Enter search criteria and click **Go**. For search details, click the Search label.
- **Status**. Select a status and click **Go**.
- **Show**. Select how many columns to display and click **Go**.
- **Rows**. Select the number of rows to appear in the report and click **Go**.

To view session details, click the Session ID (SID). The Session Details page appears. To remove the current session, click **Kill Session**.

5.15.2.5 Creating I/O Reports

The I/0 report displays details about the I/O for each session.

Use the controls at the top of page to narrow the view:

- **Search**. Enter search criteria and click **Go**. For search details, click the Search label.
- **Rows**. Select the number of rows to appear in the report and click **Go**.

To view session details, click the Session ID (SID). The Session Details page appears. To remove the current session, click **Kill Session**.

5.15.2.6 Creating SQL Reports

The SQL report displays details about the current or last SQL statement executed for each session.

Use the controls at the top of page to narrow the view:

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- **Search**. Enter search criteria and click **Go**. For search details, click the Search label.
- **Status**. Select a status and click **Go**.
- **Show**. Select how many columns to display and click **Go**.
- **Rows**. Select the number of rows to appear in the report and click **Go**.

To view session details, click the Session ID (SID). The Session Details page appears. To remove the current session, click **Kill Session**.

5.15.2.7 Creating Open Cursors Report

The Open Cursors report displays details about the number of open cursors for each session.

Use the controls at the top of page to narrow the view:

- **Search**. Enter search criteria and click **Go**. For search details, click the Search label.
- **Status**. Select a status and click **Go**.
- **Rows**. Select the number of rows to appear in the report and click **Go**.

To view details about a specific open cursor count, click the numeric link under the Open Cursor Count column.

To view session details, click the Session ID (SID). The Session Details page appears. To remove the current session, click **Kill Session**.

5.15.3 System Statistics

Displays the System Statistics page statistics.

The System Statistics page displays statistics for:

- **Physical I/O**. A physical I/O is an I/O that requires disk access. This report displays disk access statistics for physical reads and writes.
- **Logical I/O**. A logical I/O is an I/O that is satisfied in memory or disk. Displays the sum of buffer reads which might be consistent gets or current mode gets. Redo is the buffer in the SGA that contains information about changes.
- **Memory Statistics**. Displays memory consumption of the database.
- **Time Statistics**. Shows various times consumed by the database.
- **SQL Cursor Statistics**. Displays statistics about the cursors in the Oracle database.
- **Transaction Statistics**. Shows the number of transactions performed.

5.15.4 Viewing System Statistics

Learn how to view the System Statistics page.

To view the System Statistics page:

1. On the Workspace home page, click **SQL Workshop**.
2. Click **Utilities**.
3. Click **Database Monitor**.
4. Click **System Statistics**.
5. If prompted, enter the appropriate administrator user name and password and click **Login**.

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The System Statistics page appears.

Additional controls on the System Statistics page include:

- **Refresh Report** - Refreshes the System Statistics report.
- **Save Statistics** - Saves the current report.
- **Show delta between current and saved values** - Click this check box to display actual statistic values, or display deltas between a saved value and the current value.

> **See Also**
>
> *Oracle AI Database Performance Tuning Guide*

5.15.5 About Top SQL Page

The top SQL statements represent the SQL statements that are executed most often, that use more system resources than other SQL statements, or that use system resources more frequently than other SQL statements.

Use the Top SQL page to identify poorly performing SQL.

5.15.6 Viewing Top SQL Page

Use the Top SQL page to identify poorly performing SQL.

To view the Top SQL page:

1. On the Workspace home page, click the **SQL Workshop.**
2. Click **Utilities**.
3. Click **Database Monitor**.
4. Click **Top SQL**.
5. If prompted, enter the appropriate administrator user name and password and click **Login**.

   The Top SQL page appears. Use the search fields and lists and the top of the page and click **Go** to narrow the display. For details on each field or list, click the label.
6. To access the SQL Plan page, click the **View** icon.

   The SQL Plan page appears, containing the following sections:

   - **Query Plan** - Contains a color coded explain plan. Note that unindexed columns display in red.
   - **SQL Text** - Displays the full text of the SQL statement.
   - **Indexes** - Displays all indexes on the table in the query. There is a checkmark when that index is used in the query.
   - **Table Columns** - Shows all columns on all tables or views in the query.

5.15.7 About Long Operations Page

The Long Operations page displays the status of various operations that run for longer than 6 seconds (in absolute time).

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These operations currently include many backup and recovery functions, statistics gathering, and query execution, and more operations are added for every Oracle release.

5.15.8 Viewing the Long Operations Page

Learn how to view the Long Operations page.

To view the Long Operations page:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **Database Monitor.**
4. Click **Long Operations**.
5. If prompted, enter the appropriate administrator user name and password and click **Login**.

> **See Also**
>
> V_SESSION_LONGOPS in *Oracle AI Database Reference*

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6

Using SQL Scripts

Use SQL scripts to create, edit, view, run, and delete script files.

- About SQL Scripts
  A SQL script is a set of SQL commands saved as a file in SQL Scripts.
- Accessing SQL Scripts
  Learn how to access SQL Scripts.
- About the SQL Scripts Page
  The SQL Scripts page displays an interactive report of all SQL scripts created by the current user.
- About the Tasks List
  A Tasks list displays on the right side of the SQL Scripts page.
- Creating a SQL Script
  Learn about different ways of creating a SQL script.
- Using the Script Editor
  You use the Script Editor to add content to a new script, to edit existing scripts, and to run and delete scripts in the script repository.
- Creating an Application from a Script
  Launch the Create Application Wizard loaded with pages based on the tables used by the script.
- Deleting a SQL Script
  You can delete scripts from the Script Repository by deleting selected scripts from the SQL Scripts page, or deleting the current script in the Script Editor.
- Copying a SQL Script
  You can copy a script in the Script Repository by saving it with a new name.
- Executing a SQL Script
  You can execute scripts stored in the Script Repository. You can submit a script for execution either from the Script Editor or from the SQL Scripts page.
- Viewing SQL Script Results
  You use the Manage Script Results page to view and delete script results.
- Exporting and Importing SQL Scripts
  Move scripts from your current Script Repository by exporting them and then importing SQL Script Export into a Script Repository in a different workspace.
- Viewing Script and Result Quotas
  You can view the script limits in the current workspace on the Script Quotas page.

6.1 About SQL Scripts

A SQL script is a set of SQL commands saved as a file in SQL Scripts.

A SQL script can contain one or more SQL statements or PL/SQL blocks. You can use SQL scripts to create, edit, view, run, and delete database objects.

When using SQL Scripts, remember the following:

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- SQLcl commands in a SQL script are ignored at runtime.
- There is no interaction between SQL Commands and SQL scripts.
- You can cut and paste a SQL command from the SQL Script editor to run it in SQL Commands.
- SQL scripts does not support bind variables.

See Also

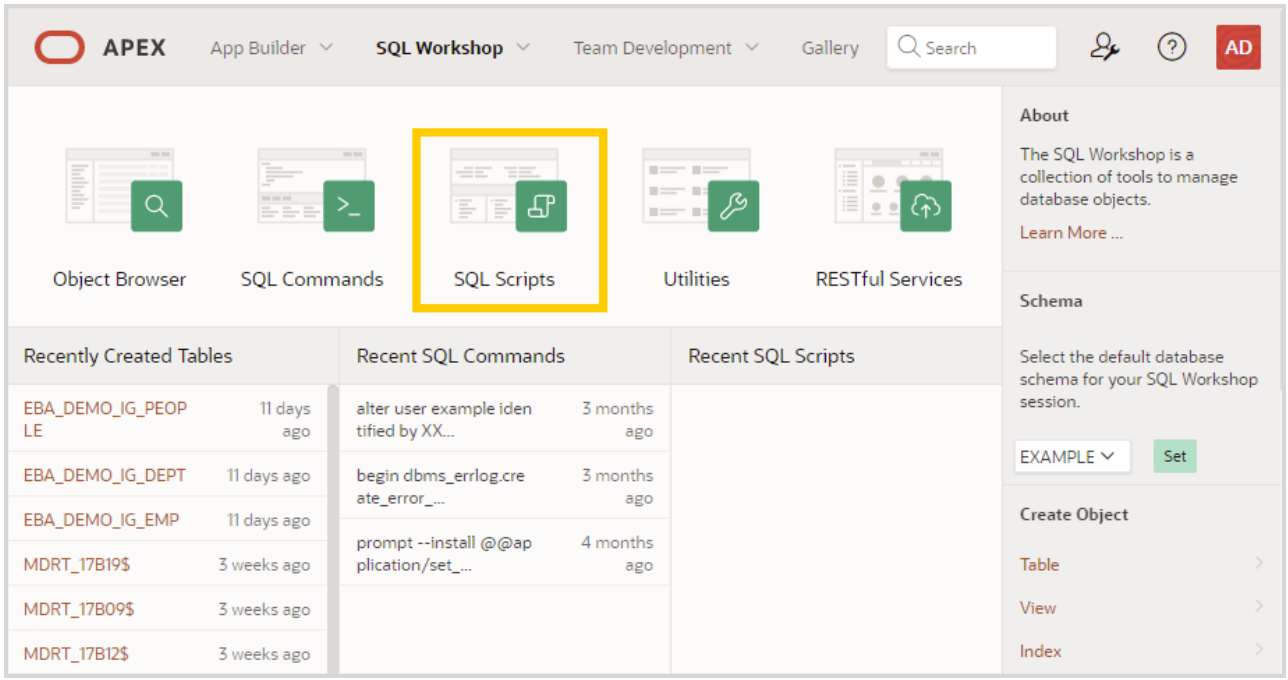
- Using SQL Scripts
- Using SQL Commands
- About Long Operations Page

6.2 Accessing SQL Scripts

Learn how to access SQL Scripts.

To access SQL Scripts:

- On the Workspace home page, click **SQL Workshop** and then **SQL Scripts**.



The SQL Scripts page appears.

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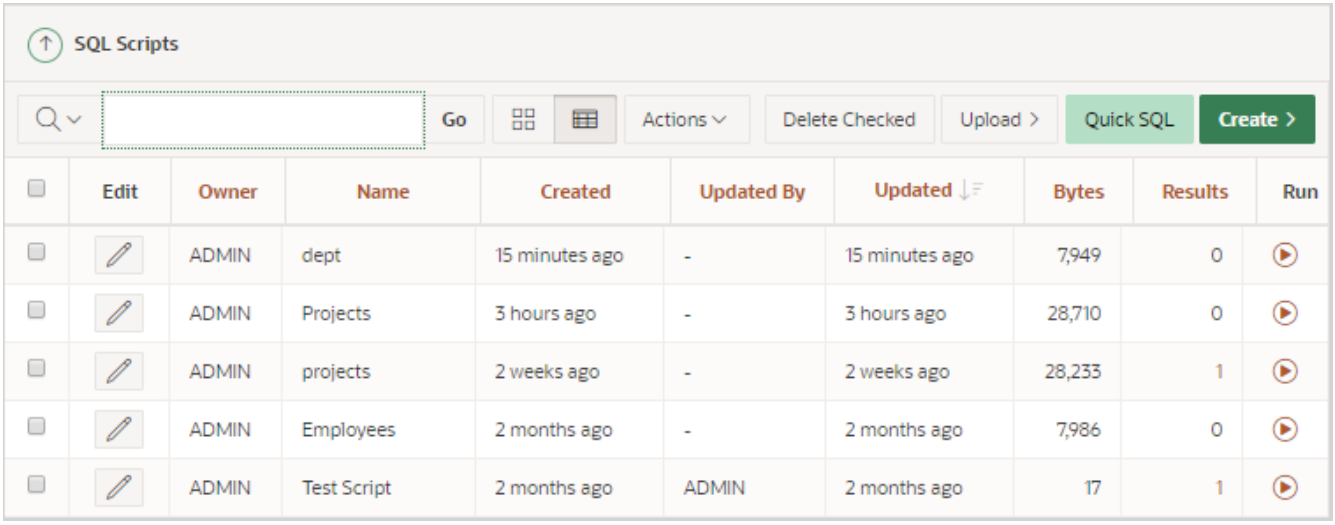
> **Note**
>
> If the instance administrator has disabled RESTful Services for this APEX instance, RESTful Services are not available for this instance and the RESTful Services icon does not display.

> **See Also**
>
> - Configuring SQL Workshop in *Oracle APEX Administration Guide*
> - About the SQL Scripts Page
> - Using SQL Commands
> - About Long Operations Page

6.3 About the SQL Scripts Page

The SQL Scripts page displays an interactive report of all SQL scripts created by the current user.

If you are a workspace administrator, this page displays all SQL scripts created by workspace users. You can alter the layout of report data by choosing the columns you are interested in, applying filters, highlighting, and sorting. You can also define breaks, aggregations, different charts, group bys, and add your own computations.



A search bar displays at the top of every interactive report and includes the following features:

- **Select Columns to Search** - This button resembles a magnifying glass. Click **Select Columns to Search** to narrow your search to specific columns. To search all columns, select **All Columns**.
- **View Icons** - Displays each script as an icon identified by the script name.

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- **View Report** - Displays each script as a line in a report. Each line includes a check box to enable the selection of scripts for deletion, an edit icon to enable the script to be loaded into the script editor, the script name, the script owner, when the script was last updated and by who, the size in bytes, the number of times the script has been run linked to the run results, and an icon to enable the script to be run.

  Reports view offers the following additional controls:

  – **Delete Checked** - In Reports view, select the check box associated with the script you want to delete and click **Delete Checked**.

  – **Sort** - In Reports view, click a column heading to sort the listed scripts by that column.
- **Upload** - Click **Upload** to upload a script from your local file system into SQL Scripts.
- **Create** - Click **Create** to create a script in the Script Editor.

See Also

- Deleting a SQL Script
- Uploading a SQL Script
- Creating a SQL Script
- Selecting a Schema
- Customizing Interactive Reports in a Running Application in *Oracle APEX App Builder User's Guide*

6.4 About the Tasks List

A Tasks list displays on the right side of the SQL Scripts page.

The Task list contains the following links:

- **Manage Results** - enables you to view, search, and display results.
- **Show Quotas** - displays the Script Quotas page. The Script Quotas page shows the maximum size of a single result, the maximum size of all results, the quota used and the quota free. It also shows the maximum size of a SQL Script.
- **Export** - enables you to export multiple scripts from the current SQL Script Repository for import into SQL Scripts in a different workspace. The scripts you select to export are encoded in a single export script written to your local file system. The export script is named *workspace_name*_script.sql by default.
- **Import** - enables you to import a script exported by this workspace, or a different workspace. **Import** only imports scripts encoded in an export script created using **Export**. The export script to import must be accessible on your local file system.

See Also

- Viewing SQL Script Results
- Exporting and Importing SQL Scripts
- Accessing SQL Scripts

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6.5 Creating a SQL Script

Learn about different ways of creating a SQL script.

You can create a script in the Script Repository by:

- Creating a SQL Script in the Script Editor
  Learn how to create SQL script in the Script Editor.
- Uploading a SQL Script
  Learn how to upload a SQL script from your local file system.

6.5.1 Creating a SQL Script in the Script Editor

Learn how to create SQL script in the Script Editor.

To create an SQL script in the Script Editor:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Scripts**.

   The SQL Scripts page appears.
2. Click the **Create** button.

   The Script Editor appears.
3. In Script Name, enter a name for the script. Script name extensions are optional.
4. Enter the SQL statements, PL/SQL blocks you want to include in your script.

   > **Note**
   >
   > SQLcl commands are ignored at runtime.
5. Click **Create**.

   The SQL Scripts page appears listing your newly saved script.

6.5.2 Uploading a SQL Script

Learn how to upload a SQL script from your local file system.

To upload a script from your local file system:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Scripts**.

   The SQL Scripts page appears.
2. Click the **Upload** button.

   The Upload Script dialog appears.
3. For Upload Script:
   a. File - Browse to locate the script you want to upload.
   b. Script Name - Optionally enter a new name in the Script Name field. This name displays in the Script Repository.
   c. File Character Set - Select the character set in which the script is encoded.
   d. Click **Upload**.

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The SQL Scripts page appears listing your newly uploaded script.

Tip

The script is parsed during runtime. When parsed, ignored statements such as SQLcl commands are listed. Any invalid SQL is identified only in results. If a script of the same name exists, you are prompted to rename it.

See Also

Creating a SQL Script in the Script Editor

6.6 Using the Script Editor

You use the Script Editor to add content to a new script, to edit existing scripts, and to run and delete scripts in the script repository.

- Editing an Existing Script
  Learn how to edit an existing SQL script.
- Script Editor Controls
  Controls and buttons available within the Script Editor.

6.6.1 Editing an Existing Script

Learn how to edit an existing SQL script.

To edit a SQL script:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Scripts**.

   The SQL Scripts page appears.
2. You can load a script into the editor as follows:
   - In Icons view, click the script icon.
   - In Report view, click the **Edit** icon.

   The Script Editor appears.
3. Edit the script.

   Note that new lines are automatically indented to the previous line start column. Other features of the Script Editor include:
   - **Undo** - Use to undo the last edit.
   - **Redo** - Use to reapply the last undone edit.
   - **Find** - Click the **Find** icon (which resembles a magnifying glass) to perform a basic search.
   - **Replace** - Click the **Replace** icon (which resembles a two-sided arrow) to replace existing code.

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- **Cut, Copy, and Paste** - Use standard edit controls to cut, copy and paste content in the Script Editor.
- **Auto Complete** - Click the **Auto Complete** icon to complete the command.

4. Click **Apply Changes** to save your script.

   The SQL Scripts page appears.

You can test your script during editing by running the script to reveal errors.

See Also

- Executing a SQL Script
- Viewing SQL Script Results

6.6.2 Script Editor Controls

Controls and buttons available within the Script Editor.

The following table describes the buttons and controls available within the Script Editor

Button	Descriptions
Cancel	Cancel the editing session and exit the Script Editor without saving changes made since the last save.
Download	Saves a copy of the current script to your local file system. Enter a name for the script on your local file system and a directory path.
Delete	Removes the current script from the Script Repository.
Save	Saves the currently script. Save is disabled if you edit the Script Name. Instead use **Apply Changes**.
Create App	Launches the Create App Wizard based on the table. Only works with scripts that add tables to the schema. **Tip**: You must run the script that adds tables to the schema first.
Run	Submits the script for execution.
Undo (Ctrl+Z)	Removes, or undoes, the most recent line edit made in the Script Editor.
Redo (Ctrl+Shift+Z)	Repeats the most recent line edit made in the Script Editor.
Find (Ctrl+F)	Click the **Find** icon (which resembles a magnifying glass) to perform a basic search.
Auto Complete (Ctrl+Space)	Click the **Auto Complete** icon (which resembles upper case letter A) view possible auto complete suggestions.
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 (F1)	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+,)

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Button	Descriptions
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.

See Also

- Deleting a SQL Script
- Executing a SQL Script

6.7 Creating an Application from a Script

Launch the Create Application Wizard loaded with pages based on the tables used by the script.

Required

The tables specified in the script must exist in your workspace to use the Create App button. Run the script or load the tables first.

Procedure

To create an application based on the script:

1. In SQL Workshop, click **SQL Scripts**.
2. If necessary, upload the script.
3. Click the **Edit** icon (**pencil**) for the script.
4. Do one of the following:
   - Click **Create App**.
   - Run the script and click **Create App**.
5. Click **Create Application** on the confirmation dialog.

The Create Application Wizard launches in App Builder loaded with the tables used in the script.
Complete the wizard to create your application.

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> **See Also**
>
> Running the Create Application Wizard in *Oracle APEX App Builder User's Guide*

6.8 Deleting a SQL Script

You can delete scripts from the Script Repository by deleting selected scripts from the SQL Scripts page, or deleting the current script in the Script Editor.

- Deleting Scripts from the SQL Scripts Page
  Learn how to delete scripts from the SQL Scripts page.
- Deleting a Script in the Script Editor
  Learn how to delete a script in the Script Editor.

6.8.1 Deleting Scripts from the SQL Scripts Page

Learn how to delete scripts from the SQL Scripts page.

To delete scripts from the SQL Scripts page:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Scripts**.

   The SQL Scripts page appears.
2. Click the **View Report** icon.

   Reports view appears.
3. Select the scripts to be deleted.

   To select individual scripts, click the check box to the left of the script name. To select all scripts visible in the current page, click the check box in the column heading.
4. Click **Delete Checked** to permanently remove the selected scripts from the Script Repository.
5. When prompted to confirm the delete action, click **OK**.

6.8.2 Deleting a Script in the Script Editor

Learn how to delete a script in the Script Editor.

To delete a script in the Script Editor:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Scripts**.

   The SQL Scripts page appears.
2. Open the script you want to delete in the Script Editor.
3. Click **Delete** to permanently remove the script from the Script Repository.
4. When prompted to confirm the delete action, click **OK**.

6.9 Copying a SQL Script

You can copy a script in the Script Repository by saving it with a new name.

To copy a script:

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1. On the Workspace home page, click **SQL Workshop** and then **SQL Scripts**.

   The SQL Scripts page appears.
2. Open the script into the Script Editor.
3. In Script Name, enter a new script name.
4. Click **Apply Changes**.

   The SQL Scripts page appears listing the new script.

6.10 Executing a SQL Script

You can execute scripts stored in the Script Repository. You can submit a script for execution either from the Script Editor or from the SQL Scripts page.

When you submit a script for execution, the Run Script page appears. It displays the script name, when it was created and by whom, when it was last updated and by whom, the number of statements it contains, and its size in bytes. It also lists unknown statements such as SQLcl commands that are ignored during execution.

If a script does not contain any runnable statements, the Run control does not display.

- Executing a SQL Script in the Script Editor
  Learn how to execute a script in the Script Editor.
- Executing a SQL Script from the SQL Scripts Page
  Learn how to execute a script from the SQL Scripts page.

> **See Also**
>
> About Long Operations Page

6.10.1 Executing a SQL Script in the Script Editor

Learn how to execute a script in the Script Editor.

To execute a script in the Script Editor:

1. Open the script you want to execute in the Script Editor.
2. Click **Run** in the Script Editor.

   The Run Script page appears. This page displays information about the script and lists statements in error preventing execution, or statements such as SQLcl commands that are ignored when the script is executed.

   Available options on the Run Script page include:

   - **Cancel** - returns you to the SQL Scripts page without executing the script.
   - **Run Now** - to submit the script for execution.
3. Click **Run Now** to submit the script for execution.

   The Manage Script Results page appears listing script results.
4. To view script results, click **View Results**.

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> **See Also**
>
> - Using the Script Editor
> - Viewing SQL Script Results

6.10.2 Executing a SQL Script from the SQL Scripts Page

Learn how to execute a script from the SQL Scripts page.

To execute a script from the SQL Scripts page:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Scripts**.

   The SQL Scripts page appears.
2. Click the **View Report** icon.

   Reports view appears.
3. In the far right column, click the **Run** icon for the script you want to execute.

   > **Tip**
   >
   > If the script does not contain any runnable statements, an error icon displays.

   The Run Script page appears. This page displays information about the script and lists statements in error preventing execution, or statements such as SQL*Plus commands that are ignored when the script is executed.

   Available options on the Run Script page include:

   - **Cancel** - returns you to the SQL Scripts page without executing the script.
   - **Run Now** - to submit the script for execution.
4. Click **Run Now** to submit the script for execution.

   The Manage Script Results page appears listing available results for the script.
5. Click the **View Results** icon in the far right column.

> **See Also**
>
> Viewing SQL Script Results

6.11 Viewing SQL Script Results

You use the Manage Script Results page to view and delete script results.

To view script results:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Scripts**.

   The SQL Scripts page appears.

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2. On the Tasks list, click **Manage Results**.

   The Manage Script Results page appears, listing available results for the script.

3. Click the **View Results** icon in the far right column.

   The Results page appears.

   The Results page displays the script name and status (Complete, Canceled, Executing or Submitted), and lists the statements executed.

To launch the Create Application Wizard based on the script:

4. Click **Create App**.

To view the detailed results for a previously run script:

5. On the Results page, select a View option and click **Go**:
   - **Detail** - Displays the Results in a report.
   - **Summary** - Displays a Summary page. From the Rows list, select the number of Rows to display. Select a column heading to sort the listed values by that column.
6. Click **Edit Script** to load the script into the Script Editor.

> **See Also**
>
> Using the Script Editor

6.12 Exporting and Importing SQL Scripts

Move scripts from your current Script Repository by exporting them and then importing SQL Script Export into a Script Repository in a different workspace.

- Exporting SQL Scripts
  Move scripts from your current Script Repository by exporting them.
- Importing Scripts
  Import a Script Export into the Script Repository.

6.12.1 Exporting SQL Scripts

Move scripts from your current Script Repository by exporting them.

By default, the Export SQL Scripts page lists all scripts in the Script Repository created by the current user. Export SQL Scripts features two regions: **Scripts** and **Scripts to Export**. Use **Scripts** to select the scripts to export. Then, review **Scripts to Export** to finalize the scripts to export and choose a name for the Script Export.

To export script files:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Scripts**.

   The SQL Scripts page appears.

2. On the Tasks list, click **Export**.

   The Export SQL Scripts page appears.

3. Under Scripts:

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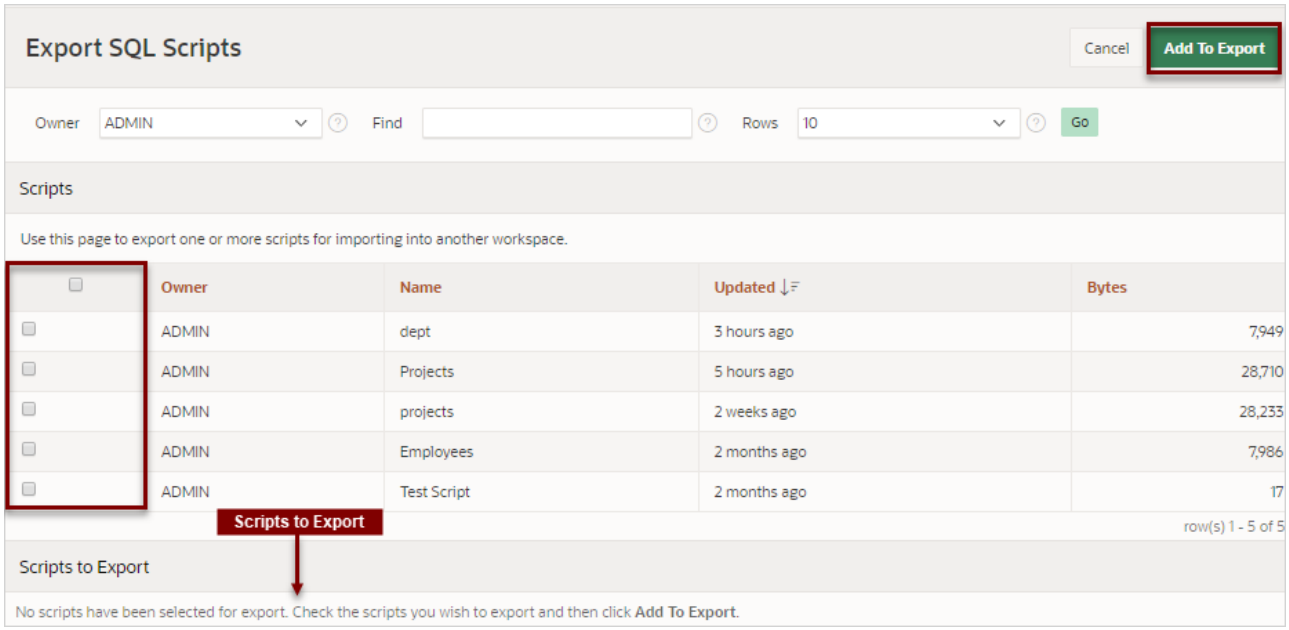
a. Select the scripts you want to export. To select all displayed scripts, click the column head check box.

b. Click **Add to Export**.



The selected scripts display under **Scripts to Export**.

4. Under **Scripts to Export**:

   a. **File Name** - Enter a name for the export script. The default script name is *workspace_name*_script.sql.

   b. To remove a script, deselect it and click **Remove Checked**.

   c. Click **Export All**.

5. Import the Script Export.

6.12.2 Importing Scripts

Import a Script Export into the Script Repository.

To import scripts:

1. Sign in to the target workspace.
2. On the Workspace home page, click **SQL Workshop** and then **SQL Scripts**.

   The SQL Scripts page appears.
3. On the Tasks list, click **Import**.

   The Export SQL Scripts page appears.
4. On Import Scripts:

   a. **Import file** - Browse to the Script Export you want to import.

   b. **File Character Set** - Indicate the character set encoding of the file to be imported.

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c. Click **Next**.

The Import Scripts page appears. The Action column indicates whether the imported script is new, or whether it replaces an existing script of the same name.

5. Click **Import Script(s)** to import the listed scripts into the current Script Repository.

The SQL Scripts page appears listing the imported scripts.

6.13 Viewing Script and Result Quotas

You can view the script limits in the current workspace on the Script Quotas page.

To view the Script Quotas page:

1. On the Workspace home page, click **SQL Workshop** and then **SQL Scripts**.

The SQL Scripts page appears.

2. On the Tasks list, click **Show Quotas**.

The Script Quotas page appears and displays the following limits:

- Result Quota in Bytes:
  - **Maximum Script Result Size** - The maximum size in bytes of a single script result. This size is set by an Oracle APEX instance administrator and cannot be changed from within the workspace.
  - **Quota for All Script Results** - The maximum size in bytes of all results in this workspace. This size is set by an Oracle APEX instance administrator and cannot be changed from within the workspace.
  - **Used** - The number of bytes currently used in this workspace.
  - **Free** - The number of bytes currently free in this workspace.
  - **Quota** - A usage bar illustrating the percentage of quota currently used.
- Script Quota in Bytes:
  - **Maximum Script Size** - The maximum size in bytes of a single script. The size is set by the Oracle APEX instance administrator and cannot be changed within the Workspace.

3. Click **Cancel** to return to the SQL Scripts page.

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7

Enabling Data Exchange with RESTful Services

RESTful Services enable the declarative specification of RESTful services used to access the database.

> **Note**
>
> The ability to define REST APIs using RESTful Services in SQL Workshop is deprecated with Oracle APEX 26.1 and will be removed in a future release of APEX. The declarative specification of REST APIs remains supported in SQL Developer Web.

RESTful Services enable the creation of a set of standards-based APIs on top of database objects available for a workspace. Without connecting directly to the underlying data source, these APIs enable external systems to interact securely with the data by querying, inserting, updating, or deleting.

The definitions of RESTful services created within Oracle APEX are stored in the Oracle REST Data Services (ORDS) repository, and are referred to as ORDS-based REST Services.

> **Note**
>
> Prior to release 18.1, the definitions of RESTful services created within APEX were stored within the metadata tables of the core APEX schema. They were referred to as APEX-based REST Services. APEX-based REST Services were desupported in APEX release 22.1.
>
> ORDS release 21.4.2 and later includes migration scripts that enable you to upgrade any remaining APEX-based REST Services to ORDS-based Services. To learn more, see Migration of Oracle APEX Restful Service Modules in *Oracle REST Data Services Release Notes*.

This section introduces you to the concepts of RESTful services and describes how to create, edit, and delete RESTful Services using APEX.

> **Note**
>
> Your workspace administrator controls whether RESTful services are enabled. If disabled, the RESTful Services icon does not display.

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- About Oracle RESTful Services in Oracle APEX
  This section introduces RESTful Services as implemented by Oracle REST Data Services (ORDS) and provides clarification on the terminology used within APEX and other Oracle tools to reference the different components that make up a RESTful Service.
- Enabling REST Objects
  Enable REST objects using the AutoREST feature of ORDS.
- Enabling Authorization for REST-enabled Objects
  Restrict access for REST-enabled objects on the RESTful Services page. Use the resulting Authorization Role information to configure user roles in ORDS.
- How to Access RESTful Services
  Access RESTful Services from SQL Workshop.
- How to Create the ORDS Based RESTful Services Module Example
  Learn how to create the ORDS Based RESTful Services module example.
- Managing RESTful Service Modules
  Learn how to install sample RESTful service module, You can create ,edit, and delete an ORDS RESTful service module.
- Managing Resource Templates
  Resource templates are a means of grouping URIs and associating them with a particular RESTful Service Module.
- Managing Resource Handlers
  A resource handler is a query or an anonymous PL/SQL block responsible for handling a particular HTTP method.
- Accessing SQL Developer Web Directly from APEX
  Access SQL Developer Web from the SQL Workshop menu.

> **See Also**
>
> Enabling RESTful Services and Defining a Path Prefix for a Workspace in *Oracle APEX Administration Guide*

7.1 About Oracle RESTful Services in Oracle APEX

This section introduces RESTful Services as implemented by Oracle REST Data Services (ORDS) and provides clarification on the terminology used within APEX and other Oracle tools to reference the different components that make up a RESTful Service.

You use Resource Modules, Resource Templates, and Resource Handlers, to configure RESTful Services as implemented by Oracle REST Data Services (ORDS).

- RESTful Service Configuration Requirements
  Configuration requirements for exposing RESTful Services to external systems.
- REST and RESTful Services
  Representational State Transfer (REST) is a way of providing interoperability between computer systems over the Internet. You can define the RESTful services to enable the querying and manipulation of data without the need for direct access to the underlying data store.
- Resource Modules
  A Resource Module is a container that groups a set of related RESTful Services together.

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- Resource Templates
  A Resource Template defines an individual service that can be called. Resource Templates are contained in Resource Modules.
- Resource Handlers
  Each Resource Handler implements one (and only one) HTTP operation. It is important to understand how Resource Handler implementations are mapped to traditional Create, Read, Update, Delete (CRUD) operations.
- Example RESTful Service
  Use Resource Modules, Resource Templates, and Resource Handlers, to configure RESTful Services as implemented by Oracle REST Data Services (ORDS).
- RESTful Services Terminology
  Terminology used in Oracle APEX and other Oracle tools to reference the different components that make up a RESTful Service.

7.1.1 RESTful Service Configuration Requirements

Configuration requirements for exposing RESTful Services to external systems.

You must meet the following requirements for the RESTful Service utility to be available and function:

- Your Oracle APEX configuration includes Oracle REST Data Services (ORDS) 20.x or later.
- An administrator has enabled RESTful Services either at the workspace or instance-level as described in Controlling RESTful Services for a Workspace and Enabling RESTful Services for an Instance in *Oracle APEX Administration Guide*

Support for Existing RESTful Services from Earlier Releases

Prior to APEX release 18.1, the metadata for APEX-based RESTful Services were defined in the core APEX metadata repository. APEX-based REST Services were desupported in APEX release 22.1. ORDS release 21.4.2 and later includes migration scripts that enable you to upgrade any remaining APEX-based REST Services to ORDS-based Services. To learn more, see Migration of Oracle APEX Restful Service Modules in *Oracle REST Data Services Release Notes*.

> **See Also**
>
> Downloading, Configuring and Installing Oracle REST Data Services in *Oracle REST Data Services Installation and Configuration Guide*

7.1.2 REST and RESTful Services

Representational State Transfer (REST) is a way of providing interoperability between computer systems over the Internet. You can define the RESTful services to enable the querying and manipulation of data without the need for direct access to the underlying data store.

A service is described as RESTful when it conforms to the tenets of REST. Although a full discussion of REST is outside the scope of this document, a RESTful Service has the following characteristics:

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- A RESTful Service is modeled as a set of resources. Those resources are identified by URLs and accessed over the `http` or `https` web protocols.
- A small set of operations are used to manipulate resources (such as `PUT`, `POST`, `GET`, `DELETE`).
- RESTful Services are stateless. They maintain no connection between the client and serving computer systems, and no client context is stored between requests.
- Requests to a RESTful Service always elicit a response. This response is in the form of XML, JSON, HTML, or some other defined format.
- Responses provide details of some sort of alteration to the underlying data, error messages, and hypertext links to other related resources depending upon the operation.

REST resources use a stateless protocol with standard operations, so you can create reusable, underlying components that can be managed and updated without affecting the system, even while REST is running.

While consuming RESTful Services uses the standard HTTP operations, processing the data returned through a RESTful service is different.

7.1.3 Resource Modules

A Resource Module is a container that groups a set of related RESTful Services together.

A Resource Module not only provides a way to identify the group uniquely, but also defines the unique Base Path used on a URL to access the set of services defined within the module.

In most cases, you must configure a Resource Module and a child Resource Template for each RESTful Service that you want your application to provide. You must also define a Resource Handler for each method associated with the same Resource Template. For example, to provide a method to return data and another to store data, you must define a Resource Handler for each operation.

Example 7-1 Resource Module

A Resource Module that enables you to access information about employees is named `oracle.example.hr` and the base path value for the service is `/hr/` .

7.1.4 Resource Templates

A Resource Template defines an individual service that can be called. Resource Templates are contained in Resource Modules.

Each Resource Template defines a URI Pattern where it can be reached and implements at least one Resource Handler. A Resource Template may only implement one of each type of Resource Handler (GET, POST, PUT, DELETE) but can be configured not to implement all of them.

7.1.5 Resource Handlers

Each Resource Handler implements one (and only one) HTTP operation. It is important to understand how Resource Handler implementations are mapped to traditional Create, Read, Update, Delete (CRUD) operations.

`GET`
Retrieves a representation of a resource, equivalent to a SQL SELECT statement.

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POST
Creates a new resource or adds a resource to a collection, equivalent to a SQL INSERT statement.

PUT
Updates the values an existing resource, equivalent to a SQL UPDATE statement.

DELETE
Deletes an existing resource, equivalent to a SQL DELETE statement.

7.1.6 Example RESTful Service

Use Resource Modules, Resource Templates, and Resource Handlers, to configure RESTful Services as implemented by Oracle REST Data Services (ORDS).

Example 7-2 Complete Resource Template

```
http://example.com/ords/anyco/hr/employees/7978
```

Where:

```
http://example_URL/ords_alias/schema_alias/base_path/module_base_path/
URI_template/:bind_variable
```

A functionally complete Resource Template implements the ability to retrieve a specific employee's details by passing in the employee id. The Resource Template's URI Pattern is `employees/:id`. A Resource Handler is implemented using the GET operation and the following logic:

```
select empno, ename, dept from emp where empno = :id
```

When calling the RESTful Service, access the service using the server path, base path and URI Template and providing a static value for the employee id as:

```
http://example.com/ords/anyco/hr/employees/7978
```

Server Path
`http://example.com/`

ORDS Alias
`/ords/`

Schema Alias
`/anyco/`

Base Path
`/hr/`

URI Template
`employees/7978`

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When this particular URL is called using an HTTP GET, the service returns the result of the SQL Statement listed above. The format in which the data is returned depends upon the full definition of the Resource Handler.

> **Note**
>
> A Resource Template is considered functionally incomplete if it does not implement at least one Resource Handler.

> **See Also**
>
> - How to Create the ORDS Based RESTful Services Module Example
> - Implementing Web Services in *Oracle APEX App Builder User's Guide*

7.1.7 RESTful Services Terminology

Terminology used in Oracle APEX and other Oracle tools to reference the different components that make up a RESTful Service.

Base Path
A case sensitive base path that is used to access a RESTful Service. This base path for the module is appended to the server path and the Schema Alias for the underlying Oracle schema. The base path must be unique within the schema.

HTTP Operation
HyperText Transport Protocol (HTTP) defines standard methods that can be performed on resources: GET, POST, PUT, and DELETE.

Resource Handler
Provides the logic required to service a specific HTTP operation for a specific resource template.

Resource Module
A container that is used to group related RESTful Services together.

Resource Template
An individual RESTful Service that is able to service requests for some set of Universal Resource Identifiers (URIs). The URI Pattern of the Resource Template defines the set of URIs.

RESTful Service
An HTTP web service that conforms to the tenets of the RESTful architectural style.

Schema Alias
When enabling an Oracle schema for use with RESTful services, an alias is required. The case sensitive Schema Alias is used to form the URL and appended to the server path prior to the Base Path and URI pattern.

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URI pattern
A case sensitive path used to access the specific resource and can be either a Route Pattern or a URI Template. The URI Pattern for the resource is appended to the server path and Resource Module Base Path. The URI Pattern may also include a bind variable appended after a forward slash. This allows a value to be passed to the service as part of the URI. The bind variable syntax prefixes the variable name with a colon (:).

- Route Pattern - a pattern that focuses on decomposing the path portion of a URI into its component parts. For example, a pattern of `/:object/:id?` will match `/emp/101` (matches a request for the item in the `emp` resource with id of `101`) and also match `/emp/` (matches a request for the `emp` resource, because the `:id` parameter is annotated with the `?` modifier, which indicates that the id parameter is optional).
- URI Template - a simple grammar that defines the specific patterns of URIs that a given resource template can handle. For example, the pattern `employees/:id` matches any URI whose path begins with `employees/`, such as `employees/2560`.

7.2 Enabling REST Objects

Enable REST objects using the AutoREST feature of ORDS.

> **Tip**
>
> While the AutoREST feature of ORDS is the most straight forward way to create RESTful Services based on database objects, it does have some drawbacks and limitations. To learn more about AutoREST, see Automatic Enabling of Schema Objects for REST Access (AutoREST) in the *Oracle REST Data Services Developer's Guide*

Required

To perform this procedure, your enviroment must meet the following requirements:

- Your schema must be registered in ORDS.

  To register your schema, see Registering Schema with ORDS.
- The REST objects you wish to enable must exist and comply with AutoREST.

To REST Enable an object:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **Enabled Objects** in the RESTful Data Services tree.
3. Click **Create AutoREST Object**.
4. In the AutoREST Enable Object dialog:
   a. Object Type - Select the type of database object you wish to AutoREST enable.
   b. Object - Select the object you wish to AutoREST enable.
   c. Object Alias - Enter the alias to be used for the selected object. This alias replaces the object name in the AutoREST URL. The default is the object name. For security reasons, it is always good practice to provide an alias that is different to the underlying object name.

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d. Authorization Required - Indicates whether external users trying to access the AutoREST enabled object are required to be assigned the related role.

   If **Authorization Required** is set to **Yes**, **Authorization Role** displays the role name. If you enable authorization for the object, you can use the resulting Authorization Role information to configure user roles in ORDS.

> **Note**
>
> Disabling the Authorization Required setting renders the object publicly accessible. Enabling this setting requires further configuration of user roles to grant access to users.

e. Full URL - Displays the full URL. To copy the URL, click **Copy to Clipboard**.

f. Click **Create**.

Optional

Once the object is REST Enabled, you can access the data through the supplied URI. The URI is formatted in JSON.

5. To view the plain text contents of the RESTful URI using a browser:

   a. Click **Enabled Objects** in the RESTful Data Services tree.

   b. Under **Parsing Object**, click the object name.

   c. Copy the RESTful URI.

> **Tip**
>
> You can click the Copy to Clipboard icon ( ) to quickly copy the RESTful URI.

   d. Open a new browser tab, paste the copied URI into the URL field, and press Enter.

   The browser displays a JSON document exposing the table data for the table you selected.

> **See Also**
>
> - Registering Schema with ORDS
> - Enabling Authorization for REST-enabled Objects
> - Automatic Enabling of Schema Objects for REST Access (AutoREST) in the *Oracle REST Data Services Developer's Guide*

7.3 Enabling Authorization for REST-enabled Objects

Restrict access for REST-enabled objects on the RESTful Services page. Use the resulting Authorization Role information to configure user roles in ORDS.

When authorization is disabled for REST-enabled objects, they are fully exposed to normal internet traffic and publicly accessible. After you enable authorization for the object on the

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RESTful Services page, you must use the resulting Authorization Role to configure your authorized user roles in ORDS.

To enable authorization on a REST-enabled object:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **Enabled Objects** in the RESTful Data Services tree.
3. Under **Parsing Object**, click the object name.
4. For Authorization Required, click **Yes**.

   A new Authorization Role field appears showing the ORDS created role associated with the AutoREST-enabled object. If you enable authorization for the object, you can use the resulting Authorization Role information to configure user roles in ORDS.
5. Click **Apply Changes**.

7.4 How to Access RESTful Services

Access RESTful Services from SQL Workshop.

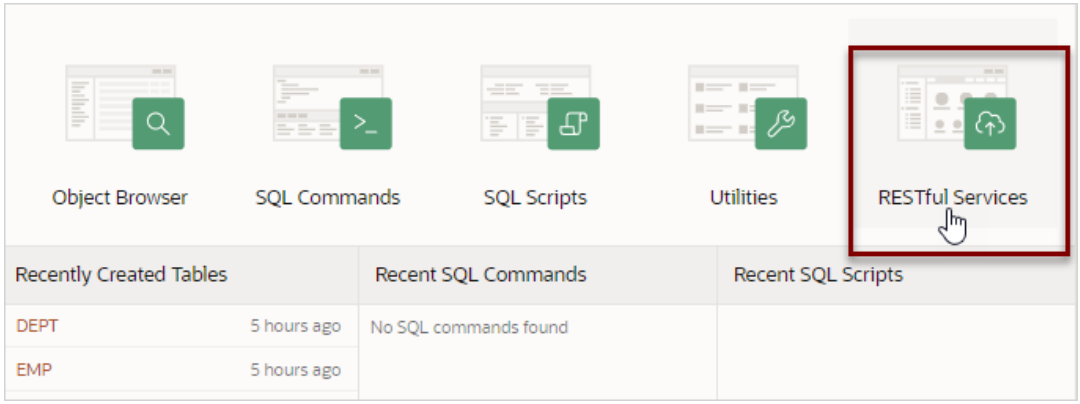
- Accessing RESTful Services
  Access RESTful Services from the Workspace home page by clicking SQL Workshop and then RESTful Services.
- Registering Schema with ORDS
  If you are accessing ORDS Restful Services in a new workspace, you must register the schema with ORDS RESTful Data Services.
- About ORDS RESTful Services Dashboard
  Learn about ORDS RESTful Services dashboard.

7.4.1 Accessing RESTful Services

Access RESTful Services from the Workspace home page by clicking SQL Workshop and then RESTful Services.

To access RESTful Services:

1. On the Workspace home page, click **SQL Workshop**.
2. Click **RESTful Services**.



The RESTful Services home page appears.

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> **See Also**
>
> Creating an ORDS RESTful Service Module

7.4.2 Registering Schema with ORDS

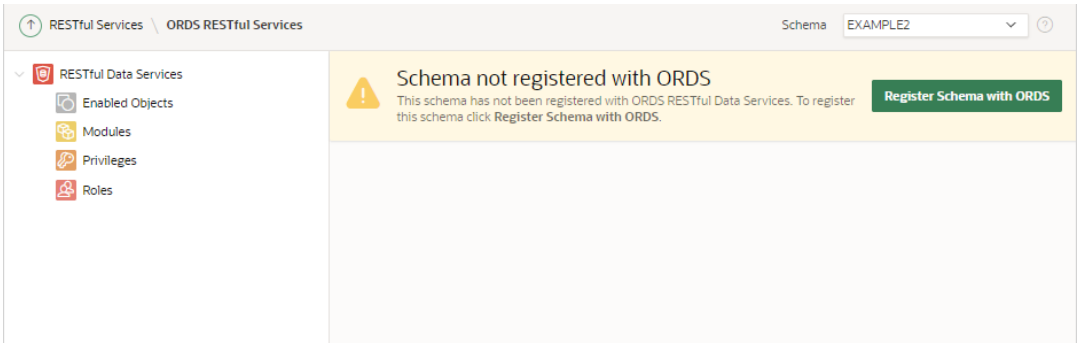
If you are accessing ORDS Restful Services in a new workspace, you must register the schema with ORDS RESTful Data Services.

To register a schema with ORDS RESTful Data Services:

1. On the Workspace home page, click **SQL Workshop**.
2. Click **RESTful Services**.

   The RESTful Services home page appears.
3. Click **ORDS Based RESTful Services**.

   ORDS RESTful Services page appears. If your schema is not registered with ORDS RESTful Data Services, the following message appears: "Schema not registered with ORDS"



4. Click **Register Schema with ORDS**.

   ORDS Schema Attributes dialog appears.

> **Note**
>
> ORDS enabling a schema that is assigned to more than one workspace as the default schema causes issues with workspace related static files.

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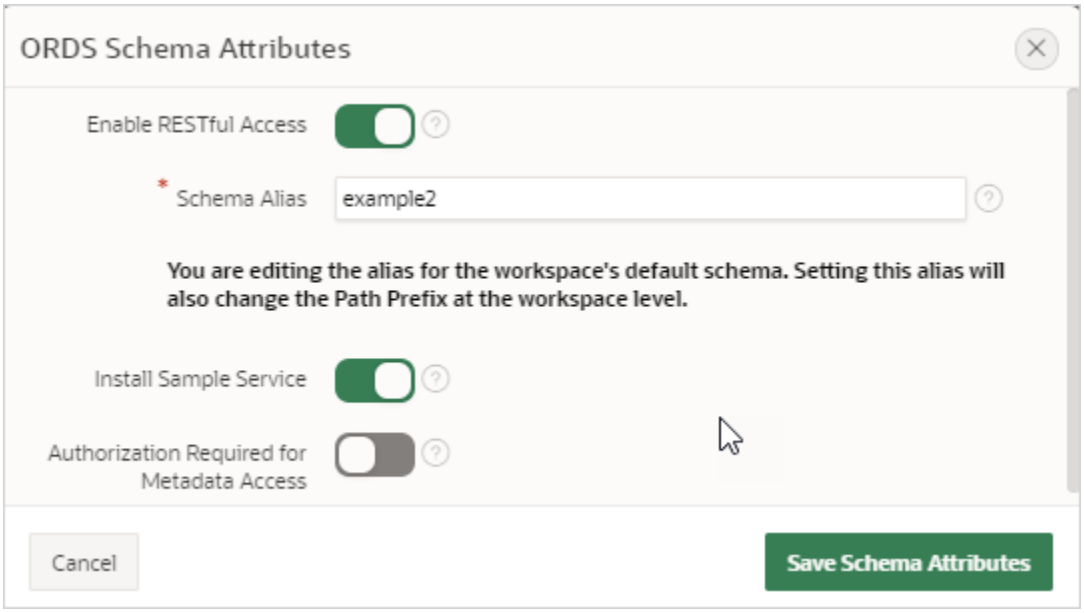

5. Enter the attribute details:
   a. **Enable RESTful Access** - Select **On** to enable or **Off** to disable access to any REST services defined in the schema.
   b. **Schema Alias** - Enter the name of the schema alias to be used in the formation of the URL referencing any RESTful service within the schema.
   c. **Install Sample Service** - Select **On** or **Off**. Selecting **On** installs sample `oracle.example.hr` RESTful service.
   d. **Authorization Required for Metadata Access** - Select **On** or **Off**. Selecting **On** requires Oracle REST Data Services user authorization before allowing access to the ORDS metadata catalog of the schema.
6. Click **Save Schema Attributes**.

   ORDS RESTful page appears with a message Schema enabled for use with ORDS RESTful Services and sample RESTful Service successfully installed.

7.4.3 About ORDS RESTful Services Dashboard

Learn about ORDS RESTful Services dashboard.

Upon registering the schema with ORDS, the ORDS RESTful Services dashboard page appears displaying the ORDS version.

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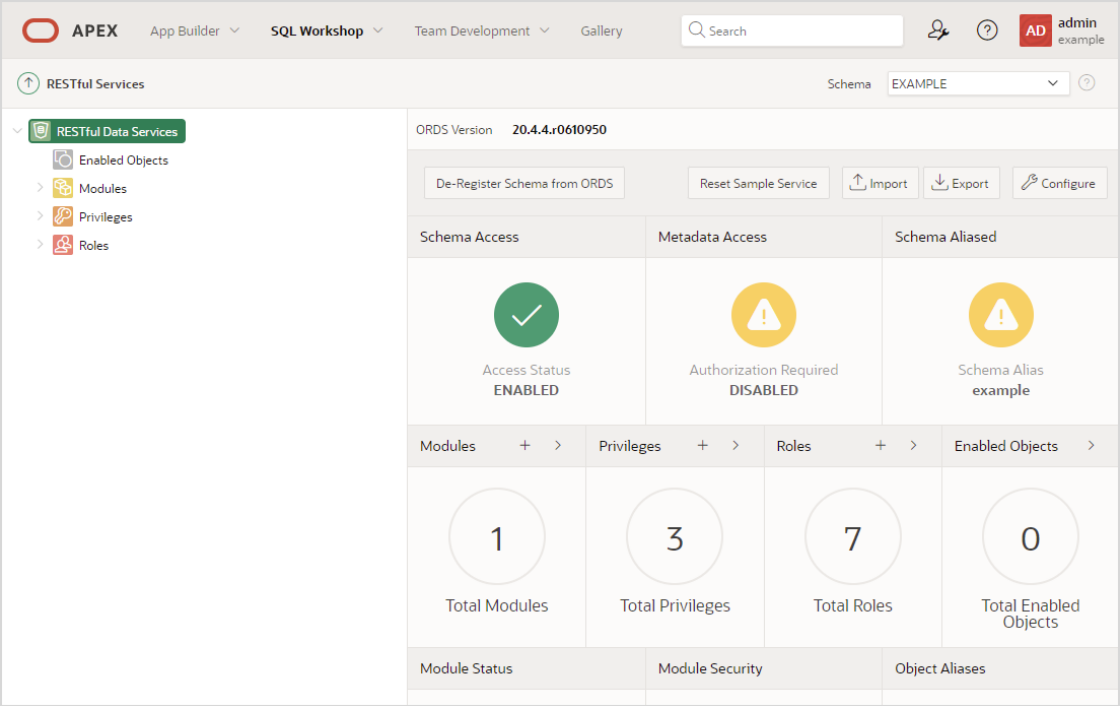

The following table displays the information available in the ORDS RESTful Services Dashboard:

Name	Description
ORDS Version	Version of ORDS.
De- Register Schema from ORDS	Click to de-register schema.
Reset Sample Service	Click to reset the installed sample service. Note: The **Reset Sample Service Verification** dialog displays to warn the user that the service will be completely deleted and re-created.
Import	Click to import ORDS based RESTful service definitions from a SQL script generated by SQL Developer or Oracle APEX.
Export	Click to export ORDS based RESTful Service metadata to SQL script file format. Note: If you are running ORDS 18.3 or later , dipalys the **Include Enable Schema** and **Include Privilages** fields. **Include Enable Schema** - (Default: Enabled) This dictates whether the resulting export script contains `ORDS.ENABLE_SCHEMA` statement **Include Privileges** - (Default: Enabled) This dictates whether the resulting export script contains the privilege definitions associated with the chosen module(s). (includes protected module, roles, and resource patterns)
Configure	Click to configure ORDS schema attributes. Note: ORDS Enabling a schema that is assigned to more than one workspace as the default schema causes issues with workspace related static files.

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Name	Description
Schema Access	Displays whether access to the RESTful services defined within the schema is enabled or disabled.
Metadata Access	Displays whether Oracle REST Data Services should require user authorization before allowing access to the ORDS metadata catalog of this schema.
Schema Aliased	Displays alias name for the current schema.
Modules	Displays total number of modules defined within the schema. Click to view list of defined modules.
Privileges	Displays total number of privileges defined. Click to view list of defined privileges.
Roles	Displays total number of roles associated. Click to view the associated roles.
Enabled Objects	Displays the total number of REST enabled database objects in the schema. Click to view list of REST enabled objects.
Module Status	Displays the status of published and unpublished modules.
Module Security	Displays the status of protected and unprotected modules.
Object Aliases	Displays the status of Aliased and Unaliased objects.

7.5 How to Create the ORDS Based RESTful Services Module Example

Learn how to create the ORDS Based RESTful Services module example.

Oracle APEX workspace by default has an example RESTful Service Module, `oracle.example.hr`. You can install the sample service while registering the schema with ORDS.

- About the Example RESTful Service Module (oracle.example.hr)
  In ORDS Based RESTful Services, you can choose to install the sample service `oracle.example.hr`, when registering schema with ORDS.
- Returning the Result Set Based on a PL/SQL Block (empsecformat/:empname)
  You can add and test your own resource template that uses a PL/SQL block to format results.
- Returning the Result Set in JSON Format with Pagination Set (employees/)
  You can add and test your own resource template that retrieves data in JSON format and demonstrates pagination.
- Retrieving Data Based on a Parameter (employees/:id)
  You can add and test your own resource template that retrieves employee data based on a parameter.
- Returning the Result Set in CSV Format (empinfo/)
  You can build and test your own example RESTful Service Module that retrieves data in CSV format.
- Returning the Result Set as a Feed (employeesfeed/)
  You can add and test your own resource template that displays return data as a feed.

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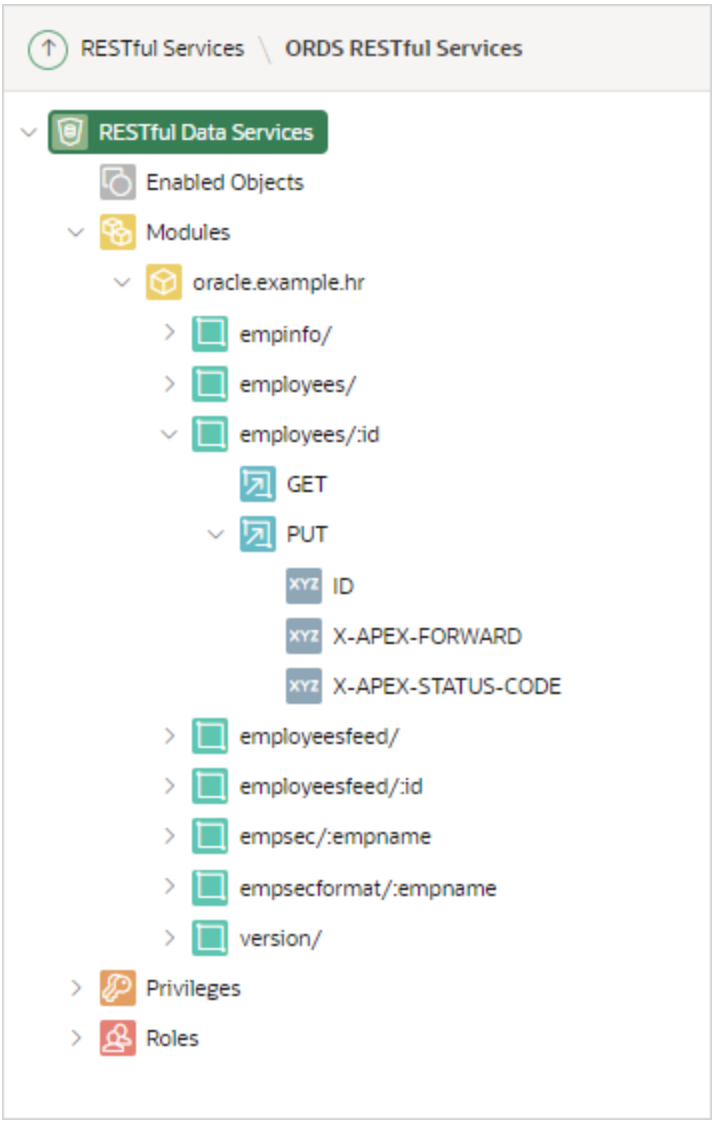
7.5.1 About the Example RESTful Service Module (oracle.example.hr)

In ORDS Based RESTful Services, you can choose to install the sample service `oracle.example.hr`, when registering schema with ORDS.

This module provides example resource templates and resource handlers that implement several different methods to retrieve and display employee information from the `emp` table. To access the `oracle.example.hr` module, see Accessing RESTful Services.

The `oracle.example.hr` module consists of several resource templates. Each resource template demonstrates a different way of retrieving information and formatting the returned results.



The following results are expected for each `oracle.example.hr` resource template when the respective GET resource handler is invoked:

- `empsec/:empname` - Employee information for a specified employee name, `empname`, is returned and displayed in JSON.

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- `empsecformat/:empname` - Employee information for a specified employee name, `empname`, is returned and formatted based on the execution of a PL/SQL block.
- `employees/` - Employee information from the employees `emp` table is displayed in JSON format with Pagination Size set to 7. A first, previous and next link is provided to page through the results.
- `version/`- Returns the version of the RESTful service module.
- `employees/:id` - Employee information from the employees `emp` table for a specified `id` is returned.
- `empinfo/` - Employee information from the employees `emp` table is returned in CSV format.
- `employeesfeed/` - Employee information from the employees `emp` table is returned as a JSON Feed.
- `employeesfeed/:id` - Employee information from the employees `emp` table for a specified `id` is displayed in JSON format.

The following result is expected for the `employees/:id` resource template when the PUT resource handler is invoked:

- `employees/:id` - Employee information from the employees `emp` table for a specified id is updated.

> **See Also**
>
> Accessing RESTful Services

7.5.2 Returning the Result Set Based on a PL/SQL Block (`empsecformat/:empname`)

You can add and test your own resource template that uses a PL/SQL block to format results.

The `oracle.example.hr` module includes the `empsecformat/:empname` resource template to demonstrate a RESTful Service that returns the results of an SQL Query formatted by a PL/SQL block.

To add and test your own resource template that uses a PL/SQL block to format results:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful services page appears.
3. Click the RESTful Service Module you want to add the resource template to.

   The Module Definition page appears.
4. Under Resource Templates block on the left panel, click **Create Template**.

   The ORDS Template Definition page appears.
5. For URI Template, enter `empsecformat/:empname`.
6. Click **Create Template**.
7. Under the `empsecformat/:empname` resource template, click **Create Handler**.

   The ORDS Handler Definition page appears.

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8. Make the following selections and entries:
   - **Method** - Select **GET**.
   - **Source Type** - Select **PL/SQL**.
   - **Source** - enter the following:

```
DECLARE
  prevdeptno     number;
  total_rows     number;
  deptloc        varchar2(20);
  deptname       varchar2(20);
  CURSOR         getemps is select * from emp
                             start with ename = :empname
                            connect by prior empno = mgr
                             order siblings by deptno, ename;
BEGIN
  sys.htp.htmlopen;
  sys.htp.headopen;
  sys.htp.title('Hierarchical Department Report for Employee '||:empname);
  sys.htp.headclose;
  sys.htp.bodyopen;

  for emprecs in getemps
  loop

      if l_employee.deptno != prevdeptno or prevdeptno is null then
          select dname, loc
           into deptname, deptloc
           from dept
          where deptno = l_employee.deptno;

         if prevdeptno is not null then
             sys.htp.print('</ul>');
         end if;
        sys.htp.print('Department ' || apex_escape.html(deptname) || ' located
in ' || apex_escape.html(deptloc) || '<p/>');
         sys.htp.print('<ul>');
      end if;

      sys.htp.print('<li>' || apex_escape.html(l_employee.ename) || ', '  ||
apex_escape.html(l_employee.empno) || ', ' ||
                        apex_escape.html(l_employee.job) || ', ' ||
apex_escape.html(l_employee.sal) || '</li>');

      prevdeptno := l_employee.deptno;
      total_rows := getemps%ROWCOUNT;

   end loop;
   if total_rows > 0 then
       sys.htp.print('</ul>');
   end if;
   sys.htp.bodyclose;
   sys.htp.htmlclose;
END;
```

9. Click **Create Handler**.

   The GET resource handler appears under the `empsecformat/:empname` resource template on the left panel.

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7.5.3 Returning the Result Set in JSON Format with Pagination Set (employees/)

You can add and test your own resource template that retrieves data in JSON format and demonstrates pagination.

The oracle.example.hr module includes the employees/ resource template to demonstrate a RESTful Service that returns data in JSON format. This example is returning the Result Set in JSON Format with Pagination Set Using Pagination Bind Variables. The Pagination bind variables are :row_offset and :row_count.

For other example resource templates that return results in JSON format see the empsec/{empname} resource template for the oracle.example.hr Service Module.

To add and test your own resource template that retrieves data in JSON format and demonstrates pagination:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful services page appears.
3. Click the RESTful Service Module you want to add the resource template to.

   The Module Definition page appears.
4. Under Resource Templates block on the left panel, click **Create Template**.

   The ORDS Template Definition page appear.
5. For URI Template, enter employees/.
6. Click **Create Template**.

   The employees/ resource template displays on the left panel.
7. Under the employees/ resource template, click **Create Handler**.

   The ORDS Handler Definition page appear.
8. Make the following selections and entries:
   - **Method** - Select **GET**.
   - **Source Type** - Select **Query**.
   - **Format** - Select **JSON**.
   - **Source** - Enter the following:

     ```
     select empno "$uri", rn, empno, ename, job, hiredate, mgr, sal, comm,
     deptno
       from (
            select emp.*
                 , row_number() over (order by empno) rn
              from emp
            ) tmp
     ```
9. Click **Create Handler**.

   The GET Handler appears under the employees/ resource template on the left panel.

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7.5.4 Retrieving Data Based on a Parameter (`employees/:id`)

You can add and test your own resource template that retrieves employee data based on a parameter.

The `oracle.example.hr` module includes the `employees/:id` resource template to demonstrate a RESTful Service that returns one row of data in JSON format based on the specified `id`.

For other example resource templates that return results based on a specified parameter see the `employeesfeed/:id`, `empsec/:empname` and `empsecformat/:empname` resource templates for the `oracle.example.hr` Service Module.

To add and test your own resource template that retrieves employee data based on a parameter:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful services page appear.
3. Click the RESTful Service Module you want to add the resource template to.

   The Module Definition page appears.
4. Under Resource Templates block on the left panel, click **Create Template**.

   The ORDS Template Definition page appear.
5. For URI Template, enter `employees/:id`.
6. Click **Create Template**.

   The `employees/:id` resource template displays on the left panel.
7. Under the `employees/:id` resource template, click **Create Handler**.

   The ORDS Handler Definition page appear.
8. Make the following selections and entries:
   - **Method** - select **GET**.
   - **Source Type** - select **Query One Row**. Executes a SQL Query returning one row of data into a JSON representation. This option is only available when the HTTP method GET has been selected
   - Pagination Size - Leave blank. In this case, there's no need to set pagination since only one record is retrieved.
   - **Source** - enter the following:

     ```
     select * from emp  where empno = :id
     ```
9. Click **Create Handler**.

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7.5.5 Returning the Result Set in CSV Format (empinfo/)

You can build and test your own example RESTful Service Module that retrieves data in CSV format.

The oracle.example.hr module includes the empinfo/ resource template to demonstrate a RESTful Service that returns data in CSV format. In this example, all the employee data from the emp table is returned by using a SQL Query.

To build and test your own example RESTful Service Module that retrieves data in CSV format:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click ORDS Based RESTful services.

   The ORDS RESTful services page appear.
3. Click the RESTful Service Module you want to add the resource template to.

   The Module Definition page appears.
4. Under Resource Templates block on the left panel, Click **Create Template**.

   The ORDS Template Definition page appear.
5. For URI Template, enter empinfo/.
6. Click **Create Template**.

   The empinfo/ resource template displays on the left panel.
7. Under the empinfo/ resource template, click **Create Handler**.
8. Make the following selections and entries:
   - **Method** - select **GET**.
   - **Source Type** - Select **Query**. Executes a SQL Query and transforms the result set into either a JavaScript Object Notation (JSON) or CSV representation, depending on the format selected. This option is only available when the HTTP method GET has been selected
   - **Format** - Select **CSV**.
   - **Source** - Enter the following:

     ```
     select * from emp
     ```
9. Click **Create Handler**.

7.5.6 Returning the Result Set as a Feed (employeesfeed/)

You can add and test your own resource template that displays return data as a feed.

The oracle.example.hr module includes the employeesfeed/ resource template to demonstrate a RESTful Service that returns empno and ename values from the emp table and displays them as a feed.

A feed resource handler executes a SQL query and transforms the results into a JSON Feed representation. Each item in the feed contains a summary of a resource and a hyperlink to a full representation of the resource. The first column in each row in the result set must be a unique identifier for the row and is used to form a hyperlink of the form: path/to/feed/{id}, with

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the value of the first column being used as the value for {id}. The other columns in the row are assumed to summarize the resource and are included in the feed. A separate resource template for the full representation of the resource should also be defined.

To add and test your own resource template that displays return data as a feed:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click ORDS Based RESTful services.

   The ORDS RESTful services page appear.
3. Click the RESTful Service Module you want to add the resource template to.

   The Module Definition page appears.
4. Under Resource Templates block on the left panel, click **Create Template**.

   The ORDS Template Definition page appear.
5. For URI Template, enter `employeesfeed/`.
6. Click **Create Template**.
7. Under the `employeesfeed/` resource template, click **Create Handler**.

   The ORDS Handler Definition page appear.
8. Make the following selections and entries:
   - **Method** - select **GET**.
   - **Source Type** - select **Feed**.
   - **Pagination Size** - enter 25.
   - **Source** - enter the following:

     ```
     select empno, ename from emp  order by deptno, ename
     ```
9. Click **Create Handler**.

7.6 Managing RESTful Service Modules

Learn how to install sample RESTful service module, You can create ,edit, and delete an ORDS RESTful service module.

A RESTful Service Module is a grouping of common templates, known as resource templates, under a common Uniform Resource Identifier (URI) prefix.

The specification of a URI prefix is optional. If defined for the RESTful Service Module, it is prepended to all resource templates. A priority value is used to choose between resource templates when their patterns both match a single request URI. In such cases, the resource template with the highest priority value is chosen.

- Installing a Sample RESTful Service Module with Schema ORDS not Enabled
  Learn how to create a Sample RESTful Service Module with Schema ORDS not Enabled.
- Installing a Sample RESTful Service Module with Schema ORDS Enabled
  Learn how to create a Sample RESTful Service Module with Schema ORDS Enabled.
- Creating an ORDS RESTful Service Module
  Learn how to create an ORDS RESTful Service Module.

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- Editing an ORDS RESTful Service Module
  An ORDS RESTful Service Module can have associated resource templates and resource handlers. During the edit process for a particular RESTful Service Module, you can make changes to any of the associated resource templates and resource handlers.
- Deleting an ORDS RESTful Service Module
  Deleting an ORDS RESTful service module removes the module along with all resource templates and resource handlers associated with this module.
- Managing an ORDS RESTful Service Privileges
  Privileges to access RESTful Service Modules can be restricted in APEX.
- Assigning Privileges to an ORDS RESTful Service Modules
  Learn how to assign privileges to an ORDS RESTful Service Modules.
- Creating an ORDS RESTful Service Privilege
  You can create an ORDS RESTful Service Privilege to restrict access to specified users for one or more RESTful Service Modules.
- Editing an RESTful Service Privilege
  You can modify an ORDS RESTful Service Privilege. Changes to the specified Protected Modules will be reflected in the Required Privilege setting on the RESTful Service Module page for affected modules.
- Deleting an ORDS RESTful Service Privilege
  You can remove an ORDS RESTful Service Privilege. After deleting the privilege, any RESTful Service Modules that were protected by this privilege will be unprotected until reassigned another privilege.
- Exporting an ORDS RESTful Service Module
  An ORDS RESTful Service Module metadata can be exported to a file in SQL script format. The exported file can be imported on the same instance or another compatible Oracle APEX instance.
- Importing an ORDS RESTful Service Module
  An ORDS RESTful Service Module metadata that has been exported to a file in SQL script format can be imported. The imported module must have been exported on the same instance or another compatible Oracle APEX instance.
- Generating a Swagger Document
  Learn how to generate a Swagger document.

7.6.1 Installing a Sample RESTful Service Module with Schema ORDS not Enabled

Learn how to create a Sample RESTful Service Module with Schema ORDS not Enabled.

> **Note**
>
> You can install a sample RESTful service only when you create new workspace.

To create a Sample RESTful Service Module:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

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The ORDS RESTful Services page appear.

3. Click **Register Schema with ORDS**.

   The ORDS Schema Attributes page appears.

> **Note**
>
> ORDS enabling a schema that is assigned to more than one workspace as the default schema causes issues with workspace related static files. Oracle recommends that you do not ORDS enable schemas shared amongst multiple workpaces until you are running ORDS 18.3 or higher.

4. Enter the attribute details:
   a. **Enable RESTful Access** - Select **On** to enable or **Off** to disable access to any REST services defined in the schema.
   b. **Schema Alias** - Enter the name of the schema alias to be used in the formation of the URL referencing any RESTful service within the schema.
   c. **Install Sample Service** - Select **On**. Selecting **On** installs sample `oracle.example.hr` RESTful service.
   d. **Authorization Required for Metadata Access** - Select **On**. Selecting **On** requires Oracle REST Data Services user authorization before allowing access to the ORDS metadata catalog of the schema.
5. Click **Save Schema Attributes**.

   The ORDS RESTful page appears. Sample RESTful Services appears under Modules.

7.6.2 Installing a Sample RESTful Service Module with Schema ORDS Enabled

Learn how to create a Sample RESTful Service Module with Schema ORDS Enabled.

> **Note**
>
> You can install a sample RESTful service only when you create new workspace.

To create a Sample RESTful Service Module:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful Services page appear.
3. Click **Install Sample Service** on the right pane.

   The Sample service is installed and appears under RESTful Services Modules.

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> **Note**
>
> Click **Reset Sample Service** button to reset the sample service. **Reset Sample Service Verification** dialog appears warning the user that the service will be completely deleted and re-created.

7.6.3 Creating an ORDS RESTful Service Module

Learn how to create an ORDS RESTful Service Module.

To create an ORDS RESTful Service Module:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful Services page appears.
3. Click **Modules** under RESTful Data Services tree.
4. Click **Create Module** on the right pane.

   The ORDS Module Definition page appears.
5. Specify the following RESTful Service Module settings:
   - **Module Name** - Enter the name of the RESTful Service Module.
   - **Base Path** - Enter module base path.
   - **Is Published** - Select **On** to make this service available for use, otherwise select **Off**.
   - **Pagination Size** - Specify the size of the pagination window. For database queries, this is the number of rows to return.
   - **Origins Allowed**(optional) - Specify a comma-separated list of origins that are permitted to access the resource template.
   - **Comments**(optional) - Enter comments.
6. Click **Create Module**.

   The ORDS Module Definition page appears.

7.6.4 Editing an ORDS RESTful Service Module

An ORDS RESTful Service Module can have associated resource templates and resource handlers. During the edit process for a particular RESTful Service Module, you can make changes to any of the associated resource templates and resource handlers.

To edit an ORDS RESTful Service Module:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click the name of the module you want to edit.

   The ORDS Module Definition page appears.

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> **Note**
>
> Use the RESTful Service tree on the left pane to view, edit and create resource templates and resource handlers.

3. To edit RESTful Service Module settings, make changes to the fields on the right pane under ORDS Module Definition page.
   - To edit a resource template:
     a. Select the resource template you want to edit on the RESTful Service tree on the left panel. The resource template options appear on the right panel.
     b. Make your changes.
     c. Click **Apply Changes**.
   - To edit a resource handler:
     a. Select the resource handler you want to edit on the RESTful Service tree on the left panel. The resource handler options appear on the right panel.
     b. Make your changes.
     c. Click **Apply Changes**.
4. Click **Apply Changes**.

> **See Also**
>
> - Creating an ORDS RESTful Service Module
> - Adding a Resource Template
> - Adding a Resource Handler

7.6.5 Deleting an ORDS RESTful Service Module

Deleting an ORDS RESTful service module removes the module along with all resource templates and resource handlers associated with this module.

To delete an ORDS RESTful Service Module:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click the name of the module you want to delete.

   The ORDS Module Definition page appears.
3. Click **Delete**.
4. Click **OK** to confirm.

   The RESTful Services home page appears.

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7.6.6 Managing an ORDS RESTful Service Privileges

Privileges to access RESTful Service Modules can be restricted in APEX.

To protect an ORDS RESTful Service Modules by assigning privileges:

1. Create a RESTful Service Privilege.
2. Specify which RESTful Service Modules are protected by this privilege.

> **See Also**
>
> - Managing Users in a Workspace in *Oracle APEX Administration Guide*
> - Creating an ORDS RESTful Service Privilege
> - Assigning Privileges to an ORDS RESTful Service Modules
> - Editing an RESTful Service Privilege
> - Deleting an ORDS RESTful Service Privilege

7.6.7 Assigning Privileges to an ORDS RESTful Service Modules

Learn how to assign privileges to an ORDS RESTful Service Modules.

You can assign privileges to an ORDS RESTful Service Modules during the creation or editing of an ORDS RESTful Service Privilege, you can specify the module or modules protected by this privilege.

> **Note**
>
> After a RESTful Service Privilege is deleted, all RESTful Service Modules protected by that privilege are unprotected.

> **See Also**
>
> - Creating an ORDS RESTful Service Module
> - Editing an ORDS RESTful Service Module
> - Creating an ORDS RESTful Service Privilege
> - Editing an RESTful Service Privilege
> - Deleting an ORDS RESTful Service Privilege

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7.6.8 Creating an ORDS RESTful Service Privilege

You can create an ORDS RESTful Service Privilege to restrict access to specified users for one or more RESTful Service Modules.

A RESTful Service Privilege can include users belonging to one or more user groups. RESTful Service Modules protected by this privilege display the privilege name for Required Privilege on the RESTful Service Module page.

To create an ORDS RESTful Service Privilege:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful Services page appears.
3. Under RESTful Data Services tree on the left pane, click **Privileges**.
4. Click **Create Privilege** on the right pane.

   The ORDS Privileges Definition page appears.
5. Specify the following in the ORDS Privileges Definition page:
   - **Name**- Enter the name of the RESTful Service Privilege.
   - **Title**- Enter the name of the RESTful Service Privilege title.
   - **Description**- Enter the description of the RESTful Service Privilege.
   - **Comments**- Enter comments.
   - **Roles**- Select roles assigned to the privilege.
   - **Protected Modules**- Use the arrows to select the modules this privilege is assigned to.
   - **Protected Resources**- Adding a list of protection patterns to the Interactive Grid.
6. Click **Create Privilege**.

7.6.9 Editing an RESTful Service Privilege

You can modify an ORDS RESTful Service Privilege. Changes to the specified Protected Modules will be reflected in the Required Privilege setting on the RESTful Service Module page for affected modules.

To edit a ORDS RESTful Service Privilege:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful Services page appears.
3. Under RESTful Data Services tree on the left pane, click **Privileges**.

   The ORDS Privileges Definition page appears.
4. Make modifications.

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5. Click **Apply Changes**.

7.6.10 Deleting an ORDS RESTful Service Privilege

You can remove an ORDS RESTful Service Privilege. After deleting the privilege, any RESTful Service Modules that were protected by this privilege will be unprotected until reassigned another privilege.

To delete an ORDS RESTful Service Privilege:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful Services page appears.
3. Under RESTful Data Services tree on the left pane, click **Privileges**.

   The ORDS Privileges Definition page appears.
4. Click **Delete**.

7.6.11 Exporting an ORDS RESTful Service Module

An ORDS RESTful Service Module metadata can be exported to a file in SQL script format. The exported file can be imported on the same instance or another compatible Oracle APEX instance.

To export an ORDS RESTful Service module:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful services page appear.
3. Click **Export** on the right pane.

   The Export ORDS RESTful Services page appears.
4. For RESTful Service, perform one of the following:
   - To export one module, select the module name.
   - To export all modules, select **All Services**.
5. Click **Export**.

   The Opening dialog appears.
6. Select export options.
7. Click **OK**.

> **See Also**
>
> Importing an ORDS RESTful Service Module

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7.6.12 Importing an ORDS RESTful Service Module

An ORDS RESTful Service Module metadata that has been exported to a file in SQL script format can be imported. The imported module must have been exported on the same instance or another compatible Oracle APEX instance.

> **Note**
>
> If the imported module contains a ORDS RESTful Service name that exists in this workspace, the existing ORDS RESTful Service is deleted and replaced with the definition from the imported module.

To import an ORDS RESTful Service module:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful services page appears.
3. Click **Import** on the right pane.

   The Import ORDS RESTful Services page appears.
4. For Import File, browse to and select the import file.
5. For File Character Set, select the character set used by the import file.
6. Click **Import**.

   The ORDS RESTful Services page appears with the imported data.

> **Warning**
>
> An error message appears that the file is of the wrong type, when you export an APEX Based RESTful Services and try to import it into the Import ORDS RESTful Services page.

> **See Also**
>
> Exporting an ORDS RESTful Service Module

7.6.13 Generating a Swagger Document

Learn how to generate a Swagger document.

Generate a swagger document by setting up the URL at the Oracle APEX instance level. This allows you to define the URL for a Swagger server. Oracle APEX sends generated swagger document to the server for rendering when the URL is setup at the instance level. Oracle APEX just displays the JSON generated for Swagger when the URL is not specified.

To generate a Swagger a document:

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1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful services page appears.
3. Select the module for which you want to generate Swagger document.
4. Click **Generate Swagger Doc** on the left pane.
   - If a Swagger UI URL is defined at the instance level, then Oracle APEX calls the URL and pass the ORDS Swagger Doc URL to it. Opens in a new browser tab and the swagger documentation appears .
   - If the Swagger UI is not defined, Oracle APEX simply calls ORDS to produce the Swagger documentation JSON file and present that in a new tab.

7.7 Managing Resource Templates

Resource templates are a means of grouping URIs and associating them with a particular RESTful Service Module.

Resource templates can have one or more resource handlers. Only one resource handler per HTTP method is permitted. For example, a resource template can have only one GET method, only one DELETE method and so on.

- Adding a Resource Template
  Learn how to add a resource template to a ORDS RESTful Service Module.
- Editing a Resource Template
  Learn how to edit a resource template.
- Deleting a Resource Template
  Deleting a resource template removes the template along with all resource handlers associated with this template.

7.7.1 Adding a Resource Template

Learn how to add a resource template to a ORDS RESTful Service Module.

To add a resource template to a ORDS RESTful Service Module:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful services page appears.
3. Click the ORDS RESTful Service module you want to ad the resource template to.

   The Module Definition Page appears.
4. Under Resource Templates block on the left panel, click **Create Template**.

   The ORDS Template Definition page appears.
5. Fill in the appropriate fields and select the appropriate options. Mandatory fields are marked with a red asterisk (*). To learn more about a specific option, see the field-level help.
6. Specify the following:

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- **URI Template** - Enter the URI template to identify your Uniform Resource Identifiers. A URI template is simple syntax for describing URIs, for example:

  ```
  example/:id
  ```

- **Priority** - Specify the template's evaluation order. Higher numbers are evaluated first.
- **HTTP Entity Tag** - Specify the type of Entity Tag to use to uniquely identify the resource version

7. Click **Create Template**.

7.7.2 Editing a Resource Template

Learn how to edit a resource template.

To edit a resource template:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click ORDS RESTful Service template you want to edit.

   The ORDS Template Definition page appears.

   The ORDS RESTful services page appears.
3. Make the changes you want.
4. Click **Apply Changes**.

> **See Also**
>
> Adding a Resource Template

7.7.3 Deleting a Resource Template

Deleting a resource template removes the template along with all resource handlers associated with this template.

To delete a resource template:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful services page appears.
3. Click ORDS RESTful Service template you want to delete.

   The ORDS Template Definition page appears.
4. Click **Delete**.
5. Click **OK** to confirm.
6. Click **Apply Changes**.

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7.8 Managing Resource Handlers

A resource handler is a query or an anonymous PL/SQL block responsible for handling a particular HTTP method.

Multiple resource handlers can be defined for a resource template, however only one resource handler can be defined for a HTTP method.

Parameters to a resource handler can be manually defined to bind HTTP headers to the resource handler, or to cast a URI template parameter to a specific data type. Parameters declared in the URI template are implicitly passed to the resource handler. For example, a resource handler might need to know the value of the HTTP Accept-Language header in order to localize the generated representation.

- Adding a Resource Handler
  Learn how to add a resource handler to a resource template.
- Editing a Resource Handler
  Learn how to edit a resource handler.
- Deleting a Resource Handler
  Learn how to delete a resource handler.

7.8.1 Adding a Resource Handler

Learn how to add a resource handler to a resource template.

To add a resource handler to a resource template:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful services page appears.
3. Click the ORDS RESTful Service template you want to add the resource template to.

   The ORDS Template Definition page appears.
4. Under Resource Handlers on the right pane, click **Create Handler**.

   The ORDS Handler Definition page appears.
5. Fill in the appropriate fields and select the appropriate options. Mandatory fields are marked with a red asterisk (*). To learn more about a specific option, see the field-level help.
6. Under Resource Handler, specify the following:
   - **Method** - Specify the HTTP method to be used for the resource handler. See field-level help.
   - **Source Type** - Identify the strategy type used to generate the resource. See field-level help.
   - **Format** - Select the format to utilize for the result set.
   - **Pagination Size** - Identify the size of the pagination window. For database queries, this is the number of rows to return.
7. Under Source, enter the SQL query or PL/SQL block responsible for handling the selected HTTP method.

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8. Click **Create Handler**.

7.8.2 Editing a Resource Handler

Learn how to edit a resource handler.

To edit a resource handler:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful services page appears.
3. Click the ORDS RESTful Service Handler you want to edit.

   The ORDS Handler Definition page appears.
4. Make the changes you want.
5. Click **Apply Changes**.

> **See Also**
>
> Adding a Resource Handler

7.8.3 Deleting a Resource Handler

Learn how to delete a resource handler.

To delete a resource handler:

1. On the Workspace home page, click **SQL Workshop** and then **RESTful Services**.

   The RESTful Services home page appears.
2. Click **ORDS Based RESTful Services**.

   The ORDS RESTful services page appears.
3. Click the ORDS RESTful Service Handler you want to delete.

   The ORDS Handler Definition page appears.
4. Make the changes you want.
5. Click **Delete**.
6. Click **OK** to confirm.
7. Click **Apply Changes**.

7.9 Accessing SQL Developer Web Directly from APEX

Access SQL Developer Web from the SQL Workshop menu.

SQL Developer Web (also known as Database Actions) provides a web-based interface that enables you to execute queries and scripts, create database objects, load data, build data models, and monitor database performance.

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Users with Developer rights and access to SQL Workshop can open a SQL Developer Web session for any database schema associated with the current workspace directly from APEX using the SQL Developer Web option on the SQL Workshop menu in the menu bar.

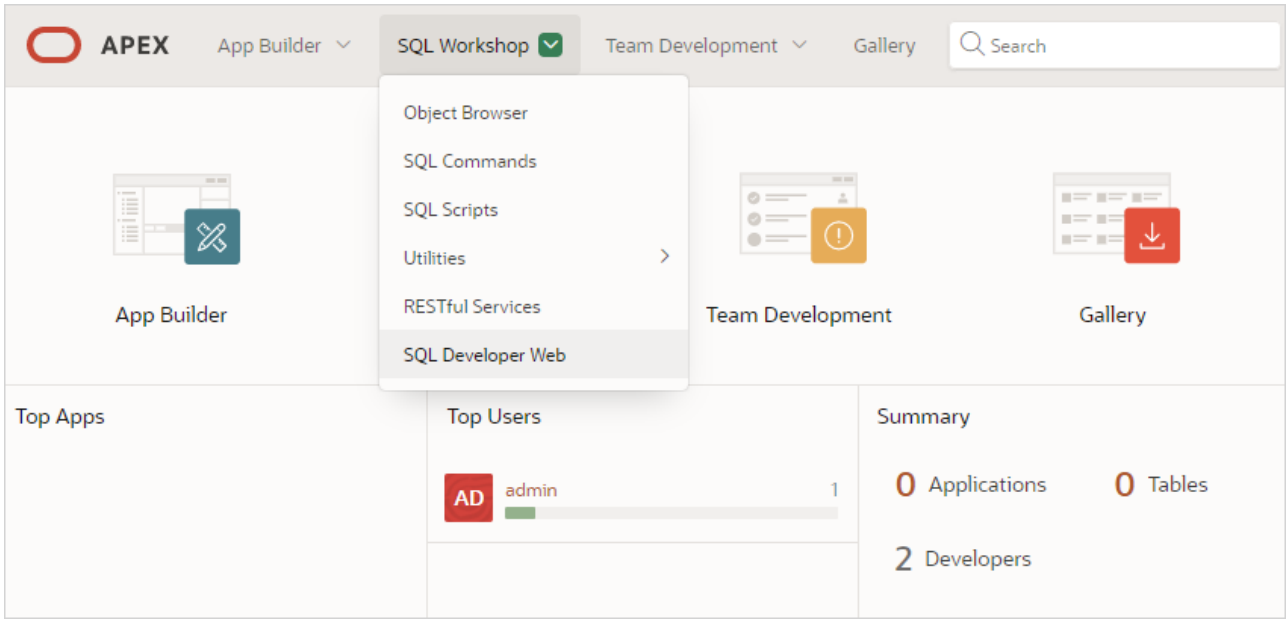
Requirements for enabling the SQL Developer Web menu option include:

- Oracle REST Data Services release 23.1.0, running in HTTPS mode.
- An instance administrator must select the **Enable SQL Developer Web** attribute in Administration Services.

To open a SQL Developer Web session from APEX:

1. Select the Enable SQL Developer Web attribute in Administration Services:
   a. Sign in to APEX Administration Services.
   b. Click **Manage Instance**.
   c. Under Instance Settings, click **Feature Configuration**.
   d. Locate the **SQL Workshop** section and select **Enable SQL Developer Web**.
   e. Sign out of Administration Services.
2. Sign in to your APEX workspace.
3. Click the **SQL Workshop** menu.

   Note the SQL Workshop menu now includes a SQL Developer Web menu option.



4. Clicking the **SQL Developer Web** menu results in two behaviors:
   - If there is only one schema associated with the current workspace and that schema already is REST-enabled, a new browser tab with a SQL Developer Web session displays.
   - If there are multiple schemas associated with the current workspace, a dialog displays showing the schemas and indicates if they are REST-enabled.

     Selecting a schema that is not currently REST-enabled, displays the RESTful Services page and prompts you to register the schema as described in Registering Schema with ORDS. Once the schema is registered, a new browser tab with a SQL Developer Web session displays.

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Note

Opening a new browser tab with SQL Developer Web invalidates and ends any other open SQL Developer Web sessions for the that browser.

See Also

- Configuring SQL Workshop in *Oracle APEX Administration Guide*
- About Database Actions in *Using Oracle AI Database Actions*

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