Oracle® Application Express

SQL Workshop Guide

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Preface

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

- Audience
- Documentation Accessibility
- Related Documents
- Conventions

Audience

Oracle Application Express SQL Workshop Guide is intended for application developers who are building database-centric Web applications using Oracle Application Express. The guide describes how to use Oracle Application Express 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 Application Express is running.

> **See Also:**
>
> *Oracle Application Express App Builder User's Guide*

Documentation Accessibility

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

Access to Oracle Support

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

Related Documents

For more information, see these Oracle resources:

- *Oracle Application Express Release Notes*
- *Oracle Application Express Installation Guide*
- *Oracle Application Express App Builder User's Guide*
- *Oracle Application Express API Reference*
- *Oracle Application Express Administration Guide*
- *Oracle Application Express Application Migration Guide*
- *Oracle Application Express End User's Guide*
- *Oracle Database Concepts*
- *Oracle Database Development Guide*
- *Oracle Database Administrator's Guide*
- *Oracle Database SQL Language Reference*
- *SQL*Plus User's Guide and Reference*
- *Oracle Database PL/SQL Language Reference*

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
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.

1

Changes in Release 20.2 for *Oracle Application Express SQL Workshop Guide*

All content in *Oracle Application Express SQL Workshop Guide* has been updated to reflect release 20.2 functionality and user interface changes.

New Features and Updates

The following are features and updates in Oracle Application Express release 20.2:

- **Quick SQL Models**

  Reuse Quick SQL shorthand syntax by saving a model.

  See Managing Quick SQL Models and Scripts and Loading a Saved Quick SQL Model.

- **New Code Editor**

  SQL Scripts and SQL Commands include a new code editor resulting in a greatly improved code editing experience. The improved editor includes enhanced code completion, syntax highlighting and vastly improved accessibility.

  See Script Editor Controls and About the SQL Commands Home Page.

Deprecated and Desupported Features

See "Deprecated Features" and "Desupported Features" *Oracle Application Express Release Notes*.

2

Getting Started with SQL Workshop

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

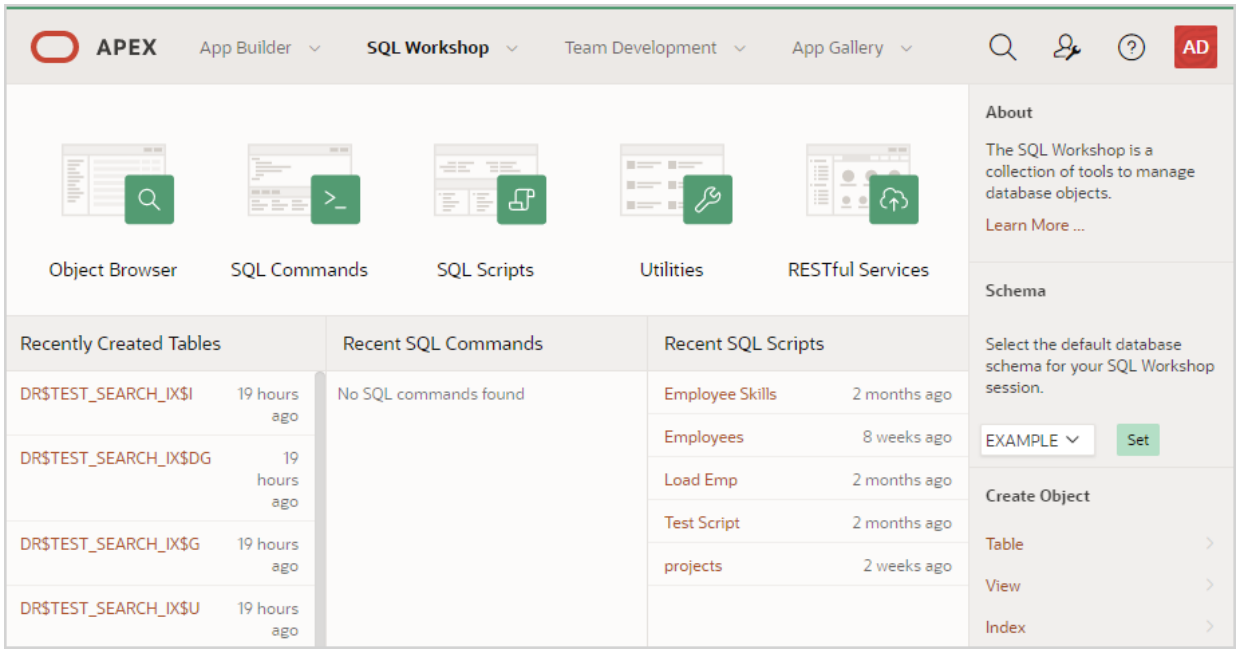
Object Browser enables you to use a tree control to view object properties and create new objects. The SQL Commands tool enables you to enter ad-hoc SQL. Query Builder enables you to create join queries using drag and drop. SQL Scripts enables you to store and run scripts. The Data Workshop enables you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

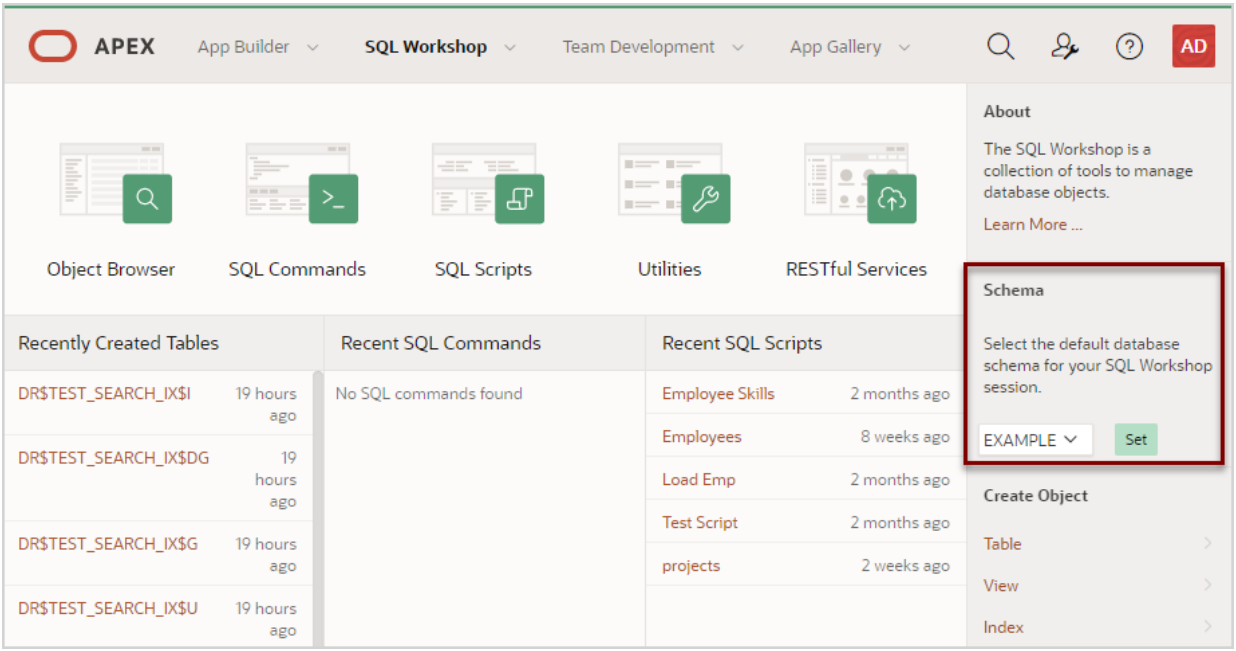
- SQL Commands.
- SQL Scripts.
- Utilities.
- RESTful Services.

> **See Also:**
>
> - " Managing Database Objects with Object Browser "
> - " Using SQL Commands "
> - " Using SQL Scripts "
> - " Using Oracle Application Express 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.



3

Managing Database Objects with Object Browser

Object Browser enables developers to browse, create, and edit objects in a database.

Oracle Application Express 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.
- Managing Object Browser
  Use Object Browser to review the database objects in your workspace.
- Managing Tables
  You can create, browse, edit, or drop tables as well as view different table reports.
- Managing Views
  A view is a logical representation of another table or combination of tables. You can create, browse, edit, download, compile, drop a view and view reports.
- Managing Indexes
  An index is an optional structure associated with tables and clusters. You can create, browse, drop an index and view reports.
- Managing Sequences
  A sequence generates a serial list of unique numbers for numeric columns of a database table. You can create, browse, drop, alter a sequence and view a report.
- Managing Types
  A type is a user-specified object or collection definition. You can create, browse, drop a type and view a report.
- Managing Packages
  A package is a database object that groups logically related PL/SQL types, items, functions and procedures. You can create, view, edit, compile, drop, download a package, and view a report.
- Managing Procedures
  A procedure is a subprogram that performs a specific action. You can 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, browse, edit, compile, download, drop functions and view report.
- Managing Triggers
  A database trigger is a stored subprogram associated with a database table, view, or event. You can create, browse, edit, compile, download, drop, disable or enable a trigger and view report.

- Managing Database Links
  A database link is a schema object in one database that enables you to access objects in another database. You can create, browse, drop a database link and view report.
- Managing Materialized Views
  A materialized view provides indirect access to table data by storing the results of a query in a separate schema object. You can create, browse, drop a materialized view and view report.
- Managing Synonyms
  A synonym is an alias for a schema object. You can create, view and drop a synonym.
- Managing SODA Collections
  Simple Oracle Document Access (SODA) is a set of NoSQL-style APIs that let you create and store collections of documents in Oracle Database, retrieve them, and query them, without needing to know Structured Query Language (SQL) or how the documents are stored in the database.

See Also:

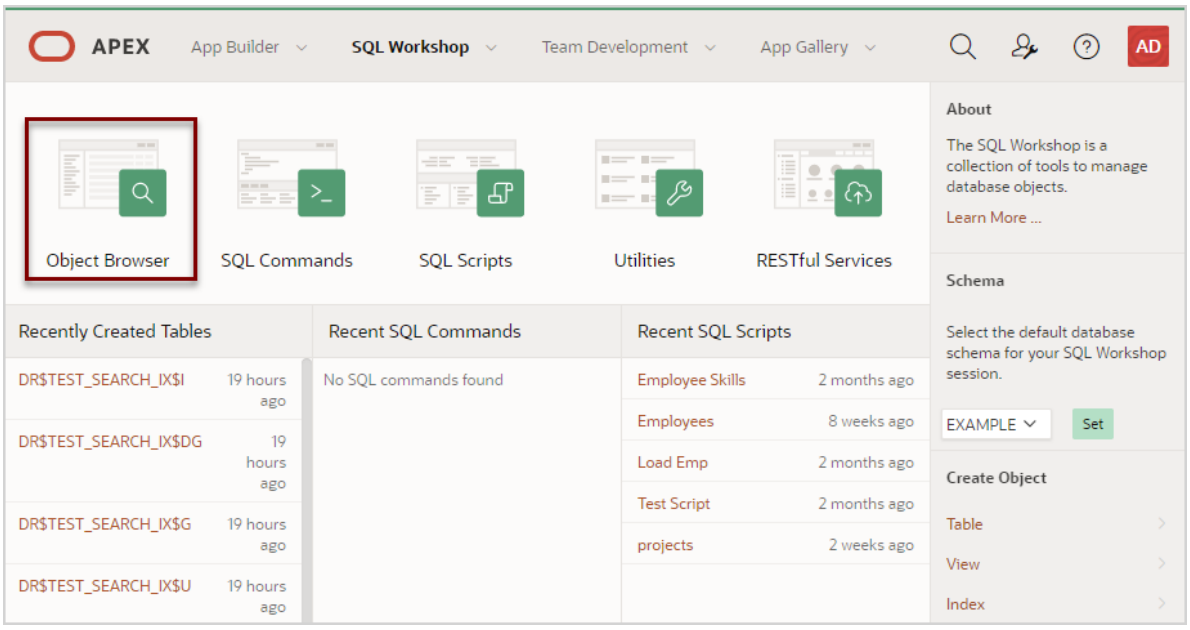
- *Oracle Database SQL Language Reference*
- *Oracle Application Express API Reference* for details of the views defined

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**.



Note:

If the instance administrator has disabled RESTful Services for this Application Express instance, RESTful Services are not available for this instance and the RESTful Services icon does not display.

See Also:

"Configuring SQL Workshop" in *Oracle Application Express Administration Guide*

3.2 Managing Object Browser

Use Object Browser to review the database objects in your workspace.

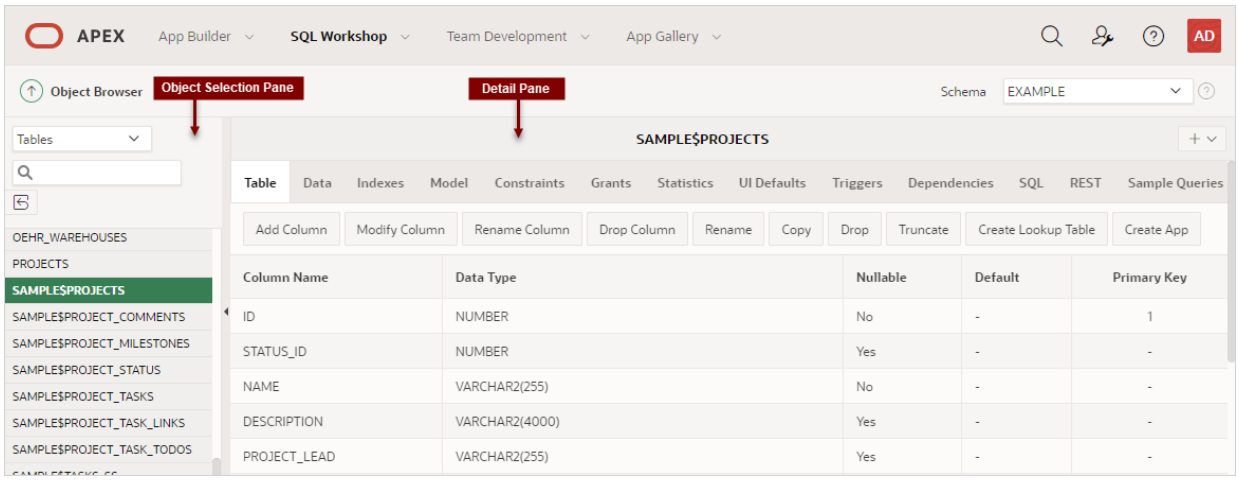
- About Object Browser
  The Object Browser page is divided into two panes: Object Selection pane and Detail pane.
- Filtering by Object Type in Object Browser
  Choose the type of database objects to view in Object Browser from the Object Type list.
- Searching for Database Objects in Object Browser
  Search for database objects in Object Browser with the Search Field.
- Selecting Database Objects in Object Browser
  Select a database object from the Object list to view or modify its details.

- Hiding the Object Selection Pane
  You can hide the Object Selection pane by selecting the Collapse control which displays on the right side of the Object Selection pane.
- Creating Database Objects
  You can create database objects using the Create Database Object Wizard.

3.2.1 About Object Browser

The Object Browser page is divided into two panes: Object Selection pane and Detail pane.

- The **Object Selection pane** displays on the left side of the Object Browser page and lists database objects of a selected type within the current schema. You can further narrow the results by filtering on the object name.
- The **Detail pane** displays to the right of the page and displays detailed information about the selected object. To view object details, select an object in the Object Selection pane. Click the tabs at the top of the Detail pane to view additional details about the current object. To edit an object, click the appropriate button.



3.2.2 Filtering by Object Type in Object Browser

Choose the type of database objects to view in Object Browser from the Object Type list.

The Object Selection pane displays on the left side of the Object Browser page and lists database objects by type with the current schema. You can filter the view by selecting an object type or entering a case insensitive search term.

3.2.3 Searching for Database Objects in Object Browser

Search for database objects in Object Browser with the Search Field.

To search for a database object in the Object Selection pane:

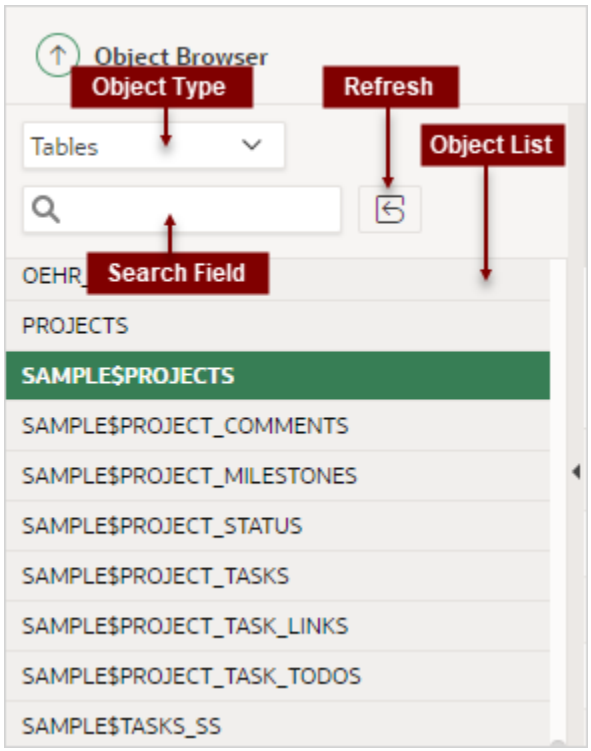
1. On the Workspace home page, click **SQL Workshop** and then **Object Browser**.

   Object Browser appears.

2. Select the type of object to display (Tables is selected by default).

> **Note:**
>
> You cannot search across all database object types.

3. In the Search Field, enter a case insensitive search term.



The list of objects that appears depends upon the available objects in the current schema.

> **Note:**
>
> Any object with an adjacent red bar is invalid.

4. (Optional) To view all objects, leave the search field blank.

Once you locate the database object you want to view, simply select it. The selected object displays in the Detail pane. If no object is selected, the Detail pane is blank.

3.2.4 Selecting Database Objects in Object Browser

Select a database object from the Object list to view or modify its details.

1. To select a database object in Object Browser:

1. Open Object Browser.
2. In the Object Selection pane (left), select an object from the Object List.

   The list of objects that appears depends upon the available objects in the current schema.

> **Note:**
>
> Any object with an adjacent red bar is invalid.

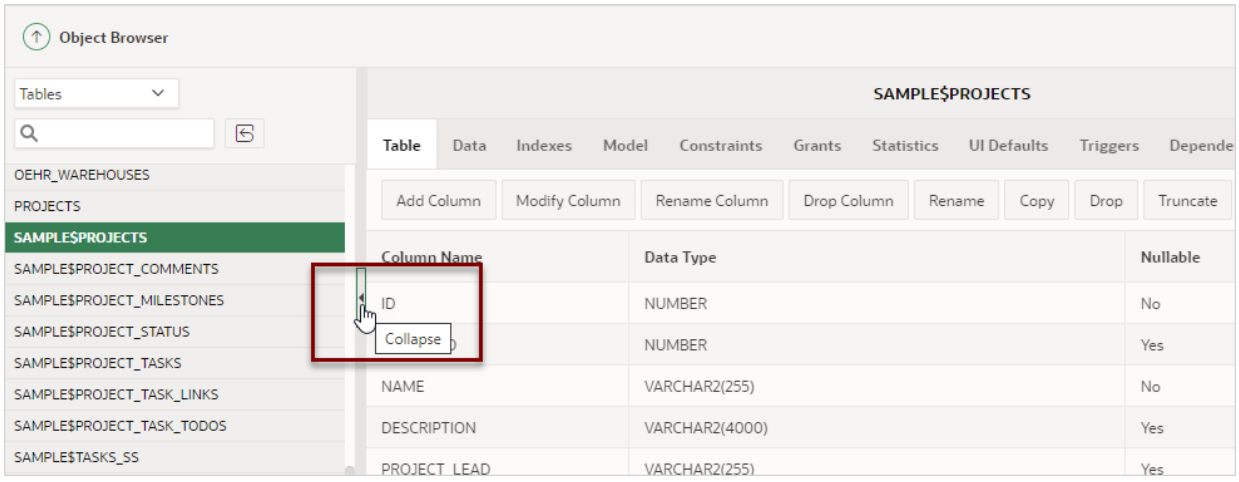
The selected object displays in the Detail pane. If no object is selected, the Detail pane is blank.

The actions you can take for the selected object depend on the object. For example, if you select a table, you can modify the columns, edit the rows, view a sample SQL query, and more with the tabs in the Detail pane.

3.2.5 Hiding the Object Selection Pane

You can hide the Object Selection pane by selecting the Collapse control which displays on the right side of the Object Selection pane.

If the Object Selection pane appears, selecting this control hides it. Similarly, if the Object Selection pane is hidden, selecting this control causes the pane to reappear.



3.2.6 Creating Database Objects

You can create database objects using the Create Database Object Wizard.

Once you select an object, a set of tabs and buttons appears at the top of the Detail pane. Use the tabs to view different aspects of the current items (for example, the indexes of the table). Use the buttons to modify the current object.

To create an object:

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

Object Browser appears.

2. Click the **Create** icon which displays as a plus (+) sign in the upper right corner of the Detail pane.
3. From the list of object types, select the type of object you want to create.
4. Follow the on-screen instructions.

3.3 Managing Tables

You can create, browse, edit, or drop tables as well as view different table reports.

A table is a unit of data storage in an Oracle database, containing rows and columns. When you view a table in Object Browser, a table description appears that describes each column in the table.

- Creating a Table
  Create a table using Object Browser.
- Browsing a Table
  Learn how to view different reports about a table.
- Reports Available for Tables
  Learn about alternative views available when viewing a table in Object Browser.
- Editing a Table
  Click the appropriate buttons on a table in Object Browser to edit a table.
- Dropping a Table
  Drop a table using Object Browser.
- Creating an Application from a Table
  Use the Create App button to quickly enter the Create Application Wizard based on the current table.
- Analyzing Statistics of a Table
  Use the Statistics tab to examine various metrics of a table.
- Viewing Sample Queries for a Table
  View the Sample Queries tab to review a set of example queries (such as sample table queries and sample column queries for tables with foreign keys) derived from the table contents.

See Also:

- *Oracle Database Administrator's Guide* for information on managing tables
- *Oracle Database Concepts* for conceptual information on tables types
- *Oracle Database SQL Language Reference* for the syntax required to create and alter tables

3.3.1 Creating a Table

Create a table using Object Browser.

To create a table:

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

   Object Browser appears.

2. Click the **Create** icon.
3. From the list of object types, select **Table**.
4. Enter a table name.

   Table names must conform to Oracle naming conventions.

5. To have the final table name match the case entered in the Table Name field, click **Preserve Case**.
6. Enter column details:
   a. Column Name - Enter the column name.
   b. Type - Select the column type.
   c. Precision - The precision is 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 - The function of the scale setting depends on the column 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 - To specify a column must always have a value, select the **Not Null** check box.
   f. If running Oracle Database 12*c* - Select an identity option for NUMBER and FLOAT columns. Options include:
      - **Always** - The Oracle Database always uses the sequence generator to assign a value to the column. If you attempt to explicitly assign a value to the column using INSERT or UPDATE, then an error is returned.
      - **Default** - The Oracle Database uses the sequence generator to assign a value to the column by default, but you can also explicitly assign a specified value to the column.
      - **Default on Null** - The Oracle Database uses the sequence generator to assign a value to the column when a subsequent INSERT statement attempts to assign a value that evaluates to NULL.
   g. Move - Click the **Up** and **Down** arrows in the Move column to change the order of previously entered columns.
   h. Add Column - Click Add Column to add additional columns.

i. Click **Next**.

Next, define the primary key for this table (optional). A primary key is a single field or combination of fields that uniquely identifies a record.

7. For Primary Key, select the appropriate option and click **Next**:

   a. Select an option:

      - **No Primary Key** - No primary key is created.
      - **Populate from a new sequence** - Creates a primary key and creates a trigger and a sequence. The sequence is used in the trigger to populate the selected primary key column. The primary key can only be a single column.
      - **Populated from an existing sequence** - Creates a primary key and creates a trigger. The selected sequence is used in the trigger to populate the selected primary key column. The primary key can only be a single column.
      - **Not populated** - Defines a primary key but does not have the value automatically populated with a sequence within a trigger. You can also select this option to define a composite primary key (that is, a primary key made up of multiple columns).
      - If running Oracle Database 12*c* - **Populate By Identity Column** - Creates a primary key and a sequence. The sequence is used to populate the selected primary key column.

   b. Click **Next**.

   Next, add foreign keys (optional). A foreign key establishes a relationship between a column (or columns) in one table and a primary or unique key in another table.

8. Add Foreign Key:

   a. Name - Enter a name of the foreign key constraint that you are defining.

   b. Select the appropriate option:

      - **Disallow Delete** - Blocks the delete of rows from the referenced table when there are dependent rows in this table.
      - **Cascade Delete** - Deletes the dependent rows from this table when the corresponding parent table row is deleted.
      - **Set to Null on Delete** - Sets the foreign key column values in this table to null when the corresponding parent table row is deleted.

   c. Select Key Column(s) - Select the columns that are part of the foreign key, then click the **Add** icon to move them to Key Column(s).

   d. References Table - Select the table which is referenced by this foreign key. Then, select the columns referenced by this foreign key. Once selected, click the **Add** icon to move the selected columns to Referenced Column(s).

   e. Click **Add**.

   f. Click **Next**.

   Next, add a constraint (optional). You can create multiple constraints, but you must add each constraint separately.

9. To add a constraint:

   a. Specify the type of constraint (Check or Unique).

A **check constraint** is a validation check on one or more columns within the table. No records can be inserted or updated in a table which violates an enabled check constraint. A **unique constraint** designates a column or a combination of columns as a unique key. To satisfy a unique constraint, no two rows in the table can have the same values for the specified columns.A **check constraint** is a validation check on one or more columns within the table. No records can be inserted or updated in a table which violates an enabled check constraint. A **unique constraint** designates a column or a combination of columns as a unique key. To satisfy a unique constraint, no two rows in the table can have the same values for the specified columns.

b. Enter the constraint in the field provided. For unique constraints, select the column(s) that are to be unique. For check constraints, enter the expression that should be checked such as `flag in ('Y','N')`.

c. Click **Add**.

10. Click **Next**.

    A confirmation page appears.

11. Click **Create**.

> **See Also:**
>
> - "Using the Table Finder" in *Oracle Application Express App Builder User's Guide*
> - "Overview of Tables" in *Oracle Database Concepts* for information about tables

3.3.2 Browsing a Table

Learn how to view different reports about a table.

When you view a table in Object Browser, the table description appears. While viewing this description, you can add a column, modify a column, rename a column, drop a column, rename the table, copy the table, drop the table, truncate the table, or create a lookup table based upon a column in the current table. Additionally, you have access to other reports that offer related information including the table data, indexes, data model, constraints, grants, statistics, user interface defaults, triggers, dependencies, and SQL to create the selected table.

To view a table description:

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

   Object Browser appears.

2. From the Object list, ensure **Tables** is selected.
3. From the Object Selection pane, select a table.

   The table description appears.

4. Click the tabs at the top of the page to view different reports about the table.

> **See Also:**
>
> "Reports Available for Tables"

3.3.3 Reports Available for Tables

Learn about alternative views available when viewing a table in Object Browser.

Table 3-1 describes all available reports for tables.

Table 3-1 Available Reports for Tables

View	Description
Table	Displays details of the first 57 columns including the column name, data type, nullable status, default value, and primary key. While viewing table details you can add, modify, delete, or rename a column. Additionally, you can drop, rename, copy, or truncate the table only if the referencing table has no records and create a lookup table. To export the data as a comma-delimited file (.csv) file, click the **Download** link. To print the data in a portable document format (.pdf) file, click the **Print** link. Please note, this option must have a Report Server configured at the instance level. See "Configuring Report Printing" in *Oracle Application Express Administration Guide*.
Data	Displays a report of the data in the current table. Actions you can perform include: • **Query** - Enables you to sort by column. To restrict specific rows, enter a condition in the Column Condition field. Use the percent sign (%) for wildcards. From Order by, select the columns you want to review and click **Query**. • **Count Rows** - Displays a report of the number of rows in the current table. • **Insert Row** - Enables you to insert a row into the table. • **Download** - Exports all data in the table to a spreadsheet. Click the **Download** link at the bottom of the page to export all data in the selected table. • **Edit** - Click the **Edit** icon to edit a row.
Indexes	Displays indexes associated with this table. Actions you can perform include **Create** and **Drop**.
Model	Displays a graphical representation of the selected table along with all related tables. Related tables are those that reference the current table in a foreign key and those tables referenced by foreign keys within the current table. You can position the cursor over an underlined table name to view the relationship between that table and the current table. Click an underlined table name to view the model of the related table.
Constraints	Displays a list of constraints for the current table. Actions you can perform include **Create**, **Drop**, **Enable**, and **Disable**.

Table 3-1 (Cont.) Available Reports for Tables

View	Description
Grants	Displays a list of grants on the current table, including the grantee, the privilege, and grant options. Actions you can perform in this view include **Grant** and **Revoke**.
Statistics	Displays collected statistics about the current table, including the number of rows and blocks, the average row length, sample size, when the data was last analyzed, and the compression status (enabled or disabled). Click **Analyze** to access the Analyze Table Wizard.
UI Defaults	Displays user interface defaults for forms and reports. User interface defaults enable developers to assign default user interface properties to a table, column, or view within a specified schema. Click **Edit** to edit defined user interface defaults. Click **Create Defaults** to initialize user interface defaults for tables that do not currently have user interface defaults defined.
Triggers	Displays a list of triggers associated with the current table. Actions you can perform include **Create**, **Drop**, **Enable**, and **Disable**. To view trigger details, click the trigger name.
Dependencies	Displays report showing objects referenced by this table, objects this table references, and synonyms for this table.
SQL	Displays the SQL necessary to re-create this table, including keys, indexes, triggers and table definition.

See Also:

- "Editing a Table"
- "Managing Indexes"
- "Managing User Interface Defaults"
- "Managing Triggers"

3.3.4 Editing a Table

Click the appropriate buttons on a table in Object Browser to edit a table.

While viewing a table description, you can edit it by clicking the buttons above the table description.

To edit a table:

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

   Object Browser appears.
2. From the Object list, ensure **Tables** is selected.

3. From the Object Selection pane, select a table.

   The table description appears.

4. Click the appropriate button described in Table 3-2.

Table 3-2 Edit Table Buttons

Button	Description
Add Column	Adds a column to the table. Enter a column name and select a type. Depending upon the column type, specify whether the column requires a value, the column length, precision, and scale.
Modify Column	Modifies the selected column. For Oracle Database 11*g* Release 2 (11.2.0.4) and later, a Data Redaction region may be shown if the current schema selected has been granted execute on `DBMS_REDACT`.
Rename Column	Renames the selected column.
Drop Column	Drops the selected column.
Rename	Renames the selected table.
Copy	Copies the selected table.
Drop	Drops the selected table.
Truncate	Removes all rows from the selected table. Truncating a table can be more efficient than dropping and re-creating a table. Dropping and re-creating a table may invalidate dependent objects, requiring you to regrant object privileges or re-create indexes, integrity constraints, and triggers.
Create Lookup Table	Creates a lookup table based on the column you select. That column becomes a foreign key to the lookup table.

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

3.3.5 Dropping a Table

Drop a table using Object Browser.

To drop a table:

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

   Object Browser appears.

2. From the Object list, ensure **Tables** is selected.
3. From the Object Selection pane, select a table.

   The table description appears.

4. Click **Drop**.
5. To confirm, click **Finish**.

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

3.3.6 Creating an Application from a Table

Use the Create App button to quickly enter the Create Application Wizard based on the current table.

1. To create an application from a table in Object Browser:
1. Select a table in Object Browser.
2. Click **Create App**.
3. On the confirmation page, click **Create App**.

The Create Application Wizard appears loaded with the data from the selected table.

> **Note:**
>
> If an error displays and you've made DDL or DML changes (such as modifications to the table structure or column names), refresh the Data Dictionary Cache. See "Refreshing the Data Dictionary Cache" in *Oracle Application Express Administration Guide*.

> **See Also:**
>
> Using the Create Application Wizard in the *Oracle Application Express App Builder User's Guide*

3.3.7 Analyzing Statistics of a Table

Use the Statistics tab to examine various metrics of a table.

1. To view the statistics of a selected table:
1. Select a table in Object Browser.
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.
2. To refresh the displayed statistics:
3. Click one of the following buttons:
   - Click **Analyze** to use the traditional analysis algorithm.

- Click **Gather Table Statistics** to use a modern method of analysis.

4. Proceed through the dialog screens as prompted.

The Statistics tab redisplays in Object Browser.

3.3.8 Viewing Sample Queries for a Table

View the Sample Queries tab to review a set of example queries (such as sample table queries and sample column queries for tables with foreign keys) derived from the table contents.

1. To view the table query examples:

1. Select a table in Object Browser.
2. Click the **Sample Queries** tab.

   The Sample Queries page loads with a Table Query and Column Queries.

Each query has a Run button that you can click to run.

3.4 Managing Views

A view is a logical representation of another table or combination of tables. You can create, browse, edit, download, compile, drop a view and view reports.

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` clause, subquery, or collection expression 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. To allow users to see only five of these columns or only specific rows, a view is created as follows:

```
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.
- Browsing a View
  Select a view from the Object Selection pane and view different reports about the view.
- Reports for Views
  Alternative views available when browsing a view in Object Browser.
- Editing a View Manually
  When you edit a view you can edit the code manually, perform a search and replace, and compile the view.
- Using Find and Replace
  Select a view from the Object Selection pane and click Find or Replace.

- Downloading a View
  Select a view from the Object Selection pane and download a view by clicking Download Source.
- Compiling a View
  Click the Save & Compile button to save changes to the view.
- Dropping a View
  Select a view from the Object Selection pane, select the View or Code tab, and click Drop.

> **See Also:**
>
> *Oracle Database Administrator's Guide*

3.4.1 Creating a View

Create a view using Object Browser.

To create a view:

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

   Object Browser appears.
2. Click the **Create** icon.
3. From the list of object types, select **View**.
4. Define the view:
   - View Name - Enter a name for the View.
   - Query - Enter a query to define the view.

   > **Tip:**
   >
   > To access Query Builder or SQL Commands, click the appropriate button at the bottom of the page. The selected tool displays in a pop-up window. Once you create the appropriate SQL, click **Return** to automatically close the popup window and return to the wizard with the SQL.
5. Click **Next**.

   A confirmation page appears, which displays the SQL used to create the view.
6. Click **Create View**.

> **See Also:**
>
> - "Using Query Builder"
> - " Using SQL Commands "

3.4.2 Browsing a View

Select a view from the Object Selection pane and view different reports about the view.

When you access a view in Object Browser, the Detail pane displays a report listing the columns in that view.

To browse a view:

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

   Object Browser appears.
2. From the Object list, select **Views**.
3. From the Object Selection pane, select a view.

   The view definition appears displaying the appropriate columns.
4. Click the tabs at the top of the page to view different reports about the view.

> **See Also:**
>
> "Reports for Views"

3.4.3 Reports for Views

Alternative views available when browsing a view in Object Browser.

Table 3-3 describes all available reports for views.

Table 3-3 Available Reports for Views

View	Description
View	(Default) Displays the columns in the current view. Actions you can perform include: • Compile • Drop
Code	Displays the code editor.
Data	Displays a report of the data in the columns in the view. Actions you can perform include: • **Query** - Enables you to sort by column. To restrict specific rows, enter a condition in the Column Condition field. Use the percent sign (%) for wildcards. From Order by, select the columns you want to review and click **Query**. • **Count Rows** - Enables you to count rows in the table. • **Insert Row** - Enables you to insert a row into the table.
Grants	Displays a list of grants associated with the columns in the view. Grant details include grantee, privilege, and grant options. Actions you can perform include **Grant** and **Revoke**.

Table 3-3 (Cont.) Available Reports for Views

View	Description
UI Defaults	Displays user interface defaults for forms and reports. User interface defaults enable developers to assign default user interface properties to a table, column, or view within a specified schema. Click **Edit** to edit existing user interface defaults. Click **Create Defaults** to initialize user interface defaults for views that do not currently have user interface defaults defined.
Dependencies	Displays a report showing objects referenced by this view, objects this view references, and synonyms for this view.
SQL	Displays the SQL necessary to re-create this view.

See Also:

- "Editing a View Manually"
- "Compiling a View"
- "Dropping a View"
- "Managing User Interface Defaults"

3.4.4 Editing a View Manually

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

You can save the view as a file or drop it.

To edit a view manually:

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

   Object Browser appears.
2. From the Object list, select **Views**.
3. From the Object Selection pane, select a view.
4. Select the **Code** tab.

   The code editor appears.

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

See Also:

"Compiling a View."

3.4.5 Using Find and Replace

Select a view from the Object Selection pane and click Find or Replace.

To use Find and Replace:

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

   Object Browser appears.
2. From the Object list, select **Views**.
3. From the Object Selection pane, select a view.
4. To perform a basic search, click the **Find** icon (which resembles a magnifying glass).
5. To replace existing code, click the **Replace** icon (which resembles a two-sided arrow).

3.4.6 Downloading a View

Select a view from the Object Selection pane and download a view by clicking Download Source.

To save the current view as a file:

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

   Object Browser appears.
2. From the Object list, select **Views**.
3. From the Object Selection pane, select a view.
4. Select the **Code** tab.

   The code editor appears.
5. Click **Download Source**.

3.4.7 Compiling a View

Click the Save & Compile button to save changes to the view.

There is no save function since this is just a view of the object within the database.

To re-create the current view:

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

   Object Browser appears.
2. From the Object list, select **Views**.
3. From the Object Selection pane, select a view.
4. Select the **Code** tab.

   The code editor appears.
5. Click **Save & Compile**.

3.4.8 Dropping a View

Select a view from the Object Selection pane, select the View or Code tab, and click Drop.

To drop a view:

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

   Object Browser appears.
2. From the Object list, select **Views**.
3. From the Object Selection pane, select a view.
4. Select the **View** tab or the **Code** tab.
5. Click **Drop**.
6. To confirm, click **Finish**.

3.5 Managing Indexes

An index is an optional structure associated with tables and clusters. You can create, browse, drop an index and view reports.

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

When you view an index in Object Browser, the Detail pane displays a report containing the index name, index type, table owner, table name, table type, uniqueness, compression, prefix length, tablespace name, status, last analyzed and a listing of the indexed columns.

- Creating an Index
  Create an index using Object Browser.
- Browsing an Index
  Select an index from the Object Selection pane and view different reports about the an index.
- Reports for Indexes
  Alternative views available when browsing an index in Object Browser.
- Dropping an Index
  Select an index from the Object Selection pane and click Drop.

3.5.1 Creating an Index

Create an index using Object Browser.

To create an index:

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

   Object Browser appears.
2. Click the **Create** icon.
3. From the list of object types, select **Index**.

4. Select a table and select the type of index you want to create. Available index types include:
   - **Normal** - Indexes one or more scalar typed object attributes of a table
   - **Text** - Creates a text index (Oracle Text)
5. Click **Next**.
6. Create the index definition. Specify an index name, select one or more columns to be indexed, and click **Next**.

   A confirmation page appears, which displays the SQL used to create the index.
7. To confirm, click **Create Index**.

3.5.2 Browsing an Index

Select an index from the Object Selection pane and view different reports about the an index.

To browse an index:

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

   Object Browser appears.
2. From the Object list, select **Indexes**.
3. From the Object Selection pane, select an index.

   The index appears displaying the index name, index type, table owner, table name, table type, uniqueness, compression, prefix length, tablespace name, status, last analyzed and a listing of the indexed columns.
4. Click the tabs at the top of the page to view different reports about the index.

3.5.3 Reports for Indexes

Alternative views available when browsing an index in Object Browser.

Table 3-4 describes all available reports for indexes.

Table 3-4 Available Reports for Indexes

View	Description
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. Actions you can perform while viewing Object Details include: • Disable - Disables the current index • Drop - Drops the current index • Rebuild - Rebuilds the current index
Statistics	Displays collected statistics about the current view, including the number of rows, sample size, when the data was last analyzed, and the compression status (enabled or disabled). Click **Analyze** to refresh the displayed statistics.
SQL	Displays the SQL necessary to re-create this index.

3.5.4 Dropping an Index

Select an index from the Object Selection pane and click Drop.

To drop an index:

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

   Object Browser appears.
2. From the Object list, select **Indexes**.
3. From the Object Selection pane, select an index.
4. Under Object Details, click **Drop**.
5. To confirm, click **Finish**.

3.6 Managing Sequences

A sequence generates a serial list of unique numbers for numeric columns of a database table. You can create, browse, drop, alter a sequence and view a report.

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 Selection pane and view different reports about the sequence.
- Reports for Sequences
  Alternative views available when browsing a sequence in Object Browser.
- Dropping a Sequence
  Select a sequence from the Object Selection pane and click Drop.
- Altering a Sequence
  Select a sequence from the Object Selection pane and click Alter.

3.6.1 Creating a Sequence

Create a sequence using Object Browser.

To create a sequence:

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

   Object Browser appears.
2. Click the **Create** icon.
3. From the list of object types, select **Sequence**.
4. For Define:
   a. **Sequence Name** - Enter the name of the sequence.
   b. **Preserve Case** - To have the final sequence name match the case entered in the Sequence Name field, click **Preserve Case**.

c. **Start With** - Enter the number of the first sequence. The first reference to `sequence_name.nextval` returns this number.

d. **Minimum Value** - Enter the minimum value this sequence can return.

e. **Maximum Value** - Enter the maximum value this sequence can return.

f. **Increment By** - Each call to `sequence_name.nextval` returns a value greater than the last, until the maximum value is reached. Enter the value used to increment to the next sequence number.

g. **Cycle** - Select this option to restart the sequence number to the minimum value when the maximum value is reached. Note that this is not recommended if using the sequence for primary key creation.

h. **Number to Cache** - For faster access, specify how many sequence values are stored in memory.

i. **Order** - Specify ORDER to guarantee that sequence numbers are generated in order of request. This option is necessary if using Real Application Clusters (Oracle RAC).

5. Click **Next**.

   A confirmation page appears, which displays the SQL used to create the sequence.

6. Click **Create Sequence**.

3.6.2 Browsing a Sequence

Select a sequence from the Object Selection pane and view different reports about the sequence.

To browse a sequence:

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

   Object Browser appears.

2. From the Object list, select **Sequences**.

3. From the Object Selection pane, select a sequence.

   The Object Details view appears.

4. Click the tabs at the top of the page to view different reports about the sequence.

3.6.3 Reports for Sequences

Alternative views available when browsing a sequence in Object Browser.

Table 3-5 describes all available reports for sequences.

Table 3-5 Available Reports for Sequences

View	Description
Object Details	Displays details about the current sequence. You can perform **Alter** and **Drop** in this view.

Table 3-5 (Cont.) Available Reports for Sequences

View	Description
Grants	Displays a list of grants associated with the sequence. Grant details include grantee, privilege, and grant options. You can perform **Grant** and **Revoke** in this view.
Dependencies	Displays a list of objects that use (or depend) upon this sequence.
SQL	Displays the SQL necessary to re-create this sequence.

3.6.4 Dropping a Sequence

Select a sequence from the Object Selection pane and click Drop.

To drop a sequence:

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

   Object Browser appears.
2. From the Object list, select **Sequences**.
3. From the Object Selection pane, select a sequence.

   The Object Details view appears.
4. Click **Drop**.

3.6.5 Altering a Sequence

Select a sequence from the Object Selection pane and click Alter.

To alter a sequence

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

   Object Browser appears.
2. From the Object list, select **Sequences**.
3. From the Object Selection pane, select a sequence.

   The Object Details view appears.
4. Click **Alter**.

3.7 Managing Types

A type is a user-specified object or collection definition. You can create, browse, drop a type and view a report.

Oracle Application Express 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.
- Browsing a Type
  Select a type from the Object Selection pane and view different reports for the type.
- Reports for Types
  Alternative views available when viewing a type in Object Browser.
- Dropping a Type
  Select a type from the Object Selection pane and click Drop.

> **See Also:**
>
> - "*Oracle Database Concepts*"
> - "*Oracle 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. On the Workspace home page, click **SQL Workshop** and then **Object Browser**.

   Object Browser appears.
2. Click the **Create** icon.
3. For Name:
   a. **Type Name** - Enter the name of the type to be created.
   b. **Preserve Case** - To have the type name match the case entered in the Type Name field, click **Preserve Case**.
   c. **Type to Create** - Specify the kind of type to create.
   d. Click **Next**.
4. Follow the on-screen instructions.

   A confirmation page appears, which displays the SQL used to create the type.
5. Click **Create Type**.

3.7.2 Browsing a Type

Select a type from the Object Selection pane and view different reports for the type.

To browse a collection type:

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

Object Browser appears.

2. From the Object list, select **Types**.
3. From the Object Selection pane, select a type.

   The Object Details view appears.
4. Click the tabs at the top of the page to view different reports for the type.

3.7.3 Reports for Types

Alternative views available when viewing a type in Object Browser.

Table 3-6 describes all available reports for types.

Table 3-6 Available Reports for Types

View	Description
Object Details	Displays details about the selected type. To drop a type, click **Drop**.
Synonyms	Displays a list of synonyms for the current type.
Grants	Displays a list of grants associated with the type. Grant details include grantee, privilege, and grant options. You can perform **Grant** and **Revoke** actions.
SQL	Displays the SQL necessary to re-create this type.

3.7.4 Dropping a Type

Select a type from the Object Selection pane and click Drop.

To drop a collection type:

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

   Object Browser appears.
2. From the Object list, select **Types**.
3. From the Object Selection pane, select a type.

   The Object Details view appears.
4. Click **Drop**.
5. To confirm, click **Finish**.

3.8 Managing Packages

A package is a database object that groups logically related PL/SQL types, items, functions and procedures. You can create, view, edit, compile, drop, download a package, and view a report.

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 a package using Object Browser. Select the type of package you want to create.
- Viewing a Package
  Select a package from the Object Selection pane and view different reports about the package.
- Reports for Packages
  Alternative views available when viewing a package in Object Browser.
- Editing a Package Manually
  Select a package from the Object Selection pane and click Find or Replace.
- Compiling a Package
  Save and Compile the view to save your changes.
- Downloading a Package
  Select a package from the Object Selection pane and download a package by clicking Download Source to save the current package as a file.
- Dropping a Package While Viewing Specification
  Select a package from the Object Selection pane and click Drop.
- Dropping a Package While Viewing the Body
  Select a package from the Object Selection pane, click Body tab, and click Drop.

> **See Also:**
>
> - "Using PL/SQL Packages " in *Oracle Database PL/SQL Language Reference* for additional information on PL/SQL packages.
> - "Using PL/SQL Subprograms" in *Oracle Database PL/SQL Language Reference* for information on PL/SQL subprograms

3.8.1 Creating a Package

Create a package using Object Browser. Select the type of package you want to create.

To create a package:

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

   Object Browser appears.
2. Click the **Create** icon.
3. From the list of object types, select **Package**.
4. For Create Package, select the type of package you want to create:
   - **Specification**
   - **Body**
   - **Package with methods on database table(s)**

     Packages usually have two parts: **Specification** and **Body**.
5. Click **Next**.

6. If you select **Specification**:
   a. Package Name - Enter a package name. To preserve the case of the name you enter, click **Preserve Case**.
   b. Click **Next**.

      The wizard creates a dummy package specification and displays it for editing.
   c. Edit the specification and click **Create Package Specification**.
7. If you select **Body**:
   a. Package - Select the package you want to create the body for and click **Next**.

      The wizard creates a package body with stubbed out calls identified in the specification and displays it for editing.
   b. Edit the package body and click **Create Package Body**.
8. If you select **Package with methods on database tables**:
   a. Package Name - Enter a package name. To preserve the case of the name you enter, click **Preserve Case**.
   b. Select up to ten tables and click **Next**.

      The wizard creates a specification and body with insert, update, delete, and GET APIs for the selected tables. Note that you have the option to show or download the specification or body.
   c. To confirm, click **Create Package**.

3.8.2 Viewing a Package

Select a package from the Object Selection pane and view different reports about the package.

When you access a package in Object Browser the specification appears.

To view a specification:

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

   Object Browser appears.
2. From the Object list, select **Packages**.
3. From the Object Selection pane, select a package.

   The Specification appears. You can also edit the code in this view.
4. Click the tabs at the top of the page to view different reports about the package.

3.8.3 Reports for Packages

Alternative views available when viewing a package in Object Browser.

Table 3-7 describes all available reports for packages.

Table 3-7 Available Reports for Packages

View	Description
Specification	Displays the package specification. This defines the interface to your application. Actions you can perform include: • Edit the code manually • **Save & Compile** • **Find** • **Replace** • **Auto Complete** • **Undo** • **Redo** • **Download Source** • **Drop**
Body	Displays the package body, if one exists, for the selected package. Actions you can perform include: • Edit the code manually • **Save & Compile** • **Find** • **Replace** • **Auto Complete** • **Undo** • **Redo** • **Download Source** • **Drop**
Dependencies	Displays objects that use (or depend on) on the current package and objects the package depends on.
Errors	Displays errors related to the current package.
Grants	Lists details of grants for the current package, including privilege, grantee, grantable, grantor, and object name.

3.8.4 Editing a Package Manually

Select a package from the Object Selection pane and click Find or Replace.

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

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

   Object Browser appears.
2. From the Object list, select **Packages**.
3. From the Object Selection pane, select a package.

   The Specification appears. You can edit the code in this view.
4. To perform a basic search, click the **Find** icon (which resembles a magnifying glass).
5. To replace existing code, click the **Replace** icon (which resembles a two-sided arrow).

3.8.5 Compiling a Package

Save and Compile the view to save your changes.

There is no save function because this is just a view of the object within the database.

To compile a package:

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

   Object Browser appears.
2. From the Object list, select **Packages**.
3. From the Object Selection pane, select a package.

   The Specification appears.
4. Click **Save & 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.

3.8.6 Downloading a Package

Select a package from the Object Selection pane and download a package by clicking Download Source to save the current package as a file.

To download a package:

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

   Object Browser appears.
2. From the Object list, select **Packages**.
3. From the Object Selection pane, select a package.

   The Specification appears.
4. Click **Download Source** to save the current package as a file.

3.8.7 Dropping a Package While Viewing Specification

Select a package from the Object Selection pane and click Drop.

To drop a package while viewing the Specification:

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

   Object Browser appears.
2. From the Object list, select **Packages**.
3. From the Object Selection pane, select a package.

   The Specification appears.
4. Click **Drop**.
5. To confirm, click **Finish**.

3.8.8 Dropping a Package While Viewing the Body

Select a package from the Object Selection pane, click Body tab, and click Drop.

To drop a package while viewing the Body:

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

   Object Browser appears.
2. From the Object list, select **Packages**.
3. From the Object Selection pane, select a package.

   The Specification appears.
4. Click the **Body** tab.
5. Click **Drop**.
6. To confirm, click **Finish**.

3.9 Managing Procedures

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

- Creating a Procedure
  Create procedure using Object Browser.
- Browsing a Procedure
  Select a procedure from the Object Selection pane and view different reports about the procedure.
- Reports for Procedures
  Alternative views available when viewing a procedure in Object Browser.
- Editing a Procedure
  When you edit a procedure you can edit the code manually or perform a search and replace.
- Compiling a Procedure
  If you edit and make changes to a view, you must compile to save your changes.
- Downloading a Procedure
  Select a procedure from the Object Selection pane and click Download Source to save the current procedure as a file.
- Dropping a Procedure
  Select a procedure from the Object Selection pane and click Drop.

> **See Also:**
>
> "*Oracle Database PL/SQL Language Reference*"

3.9.1 Creating a Procedure

Create procedure using Object Browser.

To create a procedure:

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

   Object Browser appears.
2. Click the **Create** icon.
3. From the list of object types, select **Procedure**.
4. For Name:
   a. **Procedure Name** - Enter the name of the procedure.

   > **Note:**
   >
   > Object names must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore.

   b. Specify whether to Include Arguments or Preserve Case.
   c. Click **Next**.
5. For Arguments, define the arguments by specifying the following information (optional):
   - **Argument Name**
   - **In/Out (the parameter mode)**
   - **Argument Type (datatype)**
   - **Default (value)**
   - **Move**

   To add additional arguments, click **Add Argument**.
6. Click **Next**.
7. For Define, enter PL/SQL block you want to use as the procedure body and click **Next**.

   A confirmation page appears.
8. Click **Create Procedure**.

3.9.2 Browsing a Procedure

Select a procedure from the Object Selection pane and view different reports about the procedure.

To browse a procedure:

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

   Object Browser appears.

2. From the Object list, select **Procedures**.
3. From the Object Selection pane, select a procedure.

   The Code view appears, displaying the source code for the procedure. You can edit the code in this view.
4. Click the tabs at the top of the page to view different reports about the procedure.

3.9.3 Reports for Procedures

Alternative views available when viewing a procedure in Object Browser.

Table 3-8 describes all available reports for procedures.

Table 3-8 Available Views for Procedures

View	Description
Code	(Default) Displays the source code for the procedure. You can edit the code in this view. Actions you can perform in this view include: • Edit the code manually • **Save & Compile** • **Download Source** • **Drop** • **Undo** • **Redo** • **Find** • **Replace** • **Auto Complete**
Dependencies	Displays objects that use (or depend) on the current procedure and objects the procedure depends on.
Errors	Lists errors related to the current procedure.
Grants	Lists details of grants for the current procedure, including privilege, grantee, grantable, grantor, and object name.

See Also:

- "Editing a Procedure"
- "Compiling a Procedure"
- "Downloading a Procedure"
- "Dropping a Procedure"

3.9.4 Editing a Procedure

When you edit a procedure you can edit the code manually or perform a search and replace.

- Editing a Procedure Manually
  Select a procedure from the Object Selection pane and click Find or Replace.

3.9.4.1 Editing a Procedure Manually

Select a procedure from the Object Selection pane and click Find or Replace.

To edit a procedure manually:

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

   Object Browser appears.
2. From the Object list, select **Procedures**.
3. From the Object Selection pane, select a procedure.

   The Code view appears. You can edit the code in this view.
4. To perform a basic search, click the **Find** icon (which resembles a magnifying glass).
5. To replace existing code, click the **Replace** icon (which resembles a two-sided arrow).

3.9.5 Compiling a Procedure

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

There is no save function because this is just a view of the object within the database.

To compile a procedure:

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

   Object Browser appears.
2. From the Object list, select **Procedures**.
3. From the Object Selection pane, select a procedure.
4. Click **Save & 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.

3.9.6 Downloading a Procedure

Select a procedure from the Object Selection pane and click Download Source to save the current procedure as a file.

To download a procedure:

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

   Object Browser appears.
2. From the Object list, select **Procedures**.
3. From the Object Selection pane, select a procedure.
4. Click **Download Source** to save the current procedure as a file.

3.9.7 Dropping a Procedure

Select a procedure from the Object Selection pane and click Drop.

To drop a procedure:

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

   Object Browser appears.
2. From the Object list, select **Procedures**.
3. From the Object Selection pane, select a procedure.
4. Click **Drop**.
5. To confirm, click **Finish**.

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, browse, edit, compile, download, drop functions and view report.

- Creating a Function
  Create a function using Object Browser.
- Browsing a Function
  Select a function from the Object Selection pane and view different reports about the function.
- Reports for Functions
  Alternative views available when browsing a function in Object Browser.
- Editing a Function Manually
  Select a function from the Object Selection pane and click Edit.
- Compiling a Function
  Select a function from the Object Selection pane click Save & Compile.
- Downloading a Function
  Select a function from the Object Selection pane click Download Source to save the current function as a file.
- Dropping a Function
  Select a function from the Object Selection pane and click Drop.

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

3.10.1 Creating a Function

Create a function using Object Browser.

To create a function:

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

   Object Browser appears.
2. Click the **Create** icon.
3. From the list of object types, select **Function**.
4. For Name:
   a. **Function Name** - Enter the name of the function.

      > **Note:**
      >
      > Object names must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore.

   b. **Return Data Type** - Select a data type.
   c. Specify whether to Include Arguments or Preserve Case.
   d. Click **Next**.
5. For Arguments, define the arguments by specifying the following information (optional):
   - **Argument Name**
   - **Argument Type (datatype)**
   - **Default (value)**
   - **Move**

   To add additional arguments, click **Add Argument**.
6. Click **Next**.
7. For Function Body, enter PL/SQL block you want to use and click **Next**.

   A confirmation page appears.
8. Click **Create Function**.

3.10.2 Browsing a Function

Select a function from the Object Selection pane and view different reports about the function.

To view a function in Object Browser:

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

   Object Browser appears.
2. From the Object list, select **Functions**.

3. From the Object Selection pane, select a function.

   The Code view appears. You can edit the code in this view.

4. Click the tabs at the top of the page to view different reports about the function.

> **See Also:**
>
> "Reports for Functions"

3.10.3 Reports for Functions

Alternative views available when browsing a function in Object Browser.

Table 3-9 describes all available reports for functions.

Table 3-9 Available Reports for Functions

View	Description
Code	(Default) Displays the source code for the function. You can edit the code in this view. Actions you can perform in this view include: • Edit the code manually • **Save & Compile** • **Find** • **Replace** • **Auto Complete** • **Undo** • **Redo** • **Download Source** • **Drop**
Dependencies	Displays objects that use (or depend) on the current function and objects the function depends on.
Errors	Displays errors related to the current function.
Grants	Lists details of grants for the current function, including privilege, grantee, grantable, grantor, and object name.

> **See Also:**
>
> - "Editing a Function Manually"
> - "Compiling a Function"
> - "Downloading a Function"
> - "Dropping a Function"

3.10.4 Editing a Function Manually

Select a function from the Object Selection pane and click Edit.

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

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

   Object Browser appears.
2. From the Object list, select **Functions**.
3. From the Object Selection pane, select a function.

   The Code view appears. You can edit the code in this view.
4. Click **Edit** to activate manual edit mode.
5. To perform a basic search, click the **Find** icon (which resembles a magnifying glass).
6. To replace existing code, click the **Replace** icon (which resembles a two-sided arrow).

3.10.5 Compiling a Function

Select a function from the Object Selection pane click Save & Compile.

If you edit and make changes to a function, you must compile to save your changes. There is no save function because this is just a view of the object within the database.

To compile a function in Object Browser:

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

   Object Browser appears.
2. From the Object list, select **Functions**.
3. From the Object Selection pane, select a function.

   The Code view appears.
4. Click **Save & Compile** to compile the current function.

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

3.10.6 Downloading a Function

Select a function from the Object Selection pane click Download Source to save the current function as a file.

To save a function to a file in Object Browser:

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

   Object Browser appears.
2. From the Object list, select **Functions**.
3. From the Object Selection pane, select a function.

The Code view appears.

4. Click **Download Source** to save the current function as a file.

3.10.7 Dropping a Function

Select a function from the Object Selection pane and click Drop.

To drop a function in Object Browser:

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

   Object Browser appears.

2. From the Object list, select **Functions**.
3. From the Object Selection pane, select a function.

   The Code view appears.

4. Click **Drop**.
5. To confirm, click **Finish**.

3.11 Managing Triggers

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

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 Triggers
  Create a trigger using Object Browser.
- Browsing a Trigger
  Select a trigger from the Object Selection pane and view different reports about the trigger.
- Reports for Triggers
  Alternative views available when viewing a trigger in Object Browser.
- Editing a Trigger Manually
  Select a trigger from the Object Selection pane and click Code.
- Compiling a Trigger
  Select a trigger from the Object Selection pane and click Save & Compile.
- Downloading a Trigger
  Select a trigger from the Object Selection pane and click Download Source to save the current trigger as a file.
- Dropping a Trigger
  Select a trigger from the Object Selection pane and click Drop.
- Disabling and Enabling a Trigger
  Select a trigger from the Object Selection pane and click Disable or Enable.

> **See Also:**
>
> - "*Oracle Database Concepts*"
> - "*Oracle Database Advanced Application Developer's Guide*"

3.11.1 Creating Triggers

Create a trigger using Object Browser.

To create a trigger in Object Browser:

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

   Object Browser appears.
2. Click the **Create** icon.
3. From the list of object types, select **Trigger**.
4. Select a table name and click **Next**.
5. Select the appropriate trigger attributes, enter the trigger body, and click **Next**.

   A confirmation page appears, which displays the SQL used to create the trigger.
6. Click **Create Trigger**.

3.11.2 Browsing a Trigger

Select a trigger from the Object Selection pane and view different reports about the trigger.

To browse a trigger in Object Browser:

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

   Object Browser appears.
2. From the Object list, select **Triggers**.
3. From the Object Selection pane, select a trigger.

   The Object Details view appears.
4. Click the tabs at the top of the page to view different reports about the trigger.

> **See Also:**
>
> "Reports for Triggers"

3.11.3 Reports for Triggers

Alternative views available when viewing a trigger in Object Browser.

Table 3-10 describes all available reports for triggers.

Table 3-10 Available Reports for Triggers

View	Description
Object Details	(Default) Lists of the details about the current trigger. Actions you can perform include: • **Compile** • **Download** • **Drop** • **Disable**
Code	Displays the source code for the trigger. You can edit the code in this view. Actions you can perform in this view include: • Edit the code manually • **Save & Compile** • **Find** • **Replace** • **Auto Complete** • **Undo** • **Redo** • **Download Source** • **Drop**
Errors	Displays errors related to the current trigger.
SQL	Displays the SQL necessary to re-create the trigger.

See Also:

- "Editing a Trigger Manually"
- "Compiling a Trigger"
- "Downloading a Trigger"
- "Dropping a Trigger"

3.11.4 Editing a Trigger Manually

Select a trigger from the Object Selection pane and click Code.

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

   Object Browser appears.
2. From the Object list, select **Triggers**.
3. From the Object Selection pane, select a trigger.

   The Object Details view appears.
4. Click Code tab.
5. You can edit the code in this view. Other edit controls include:
   - **Find**

- **Replace**
- **Auto Complete**

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

3.11.5 Compiling a Trigger

Select a trigger from the Object Selection pane and click Save & Compile.

If you edit and make changes to a function, you must compile to save your changes. There is no save function because this is just a view of the object within the database. Compiling re-creates the object in the database.

To compile a trigger in Object Browser:

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

   Object Browser appears.
2. From the Object list, select **Triggers**.
3. From the Object Selection pane, select a trigger.

   The Details view appears.
4. To compile the current trigger:
   - Under Object Details, click **Compile**.
   - Under Code, click **Save & Compile**.

   If the compilation fails, an error message displays above the code.

3.11.6 Downloading a Trigger

Select a trigger from the Object Selection pane and click Download Source to save the current trigger as a file.

To save the current trigger as a file:

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

   Object Browser appears.
2. From the Object list, select **Triggers**.
3. From the Object Selection pane, select a trigger.

   The Details view appears.
4. Click **Download Source** to save the current trigger as a file.
5. To download the current trigger:
   - Under Object Details, click **Download**.
   - Under Code, click **Download Source**.

   If the compilation fails, an error message displays above the code.

3.11.7 Dropping a Trigger

Select a trigger from the Object Selection pane and click Drop.

To drop a trigger in Object Browser:

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

   Object Browser appears.
2. From the Object list, select **Triggers**.
3. From the Object Selection pane, select a trigger.

   The Details view appears.
4. Click **Drop**.

3.11.8 Disabling and Enabling a Trigger

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

To disable and enable a trigger in Object Browser:

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

   Object Browser appears.
2. From the Object list, select **Triggers**.
3. From the Object Selection pane, select a trigger.

   The Details view appears.
4. Click **Disable**.

> **Note:**
>
> The Enable button is activated. If you want to enable the trigger, click **Enable**.

3.12 Managing Database Links

A database link is a schema object in one database that enables you to access objects in another database. You can create, browse, drop a database link and view report.

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.
- Browsing a Database Link
  Select a database link from the Object Selection pane and view different reports about the database link.
- Reports for Database Links
  Alternative views available when viewing a database links in Object Browser.

- Dropping a Database Link
  Select a database link from the Object Selection pane and click Drop.

3.12.1 Creating a Database Link

Create a database link using Object Browser.

To create a database link:

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

   Object Browser appears.
2. Click the **Create** icon.
3. From the list of object types, select **Database Link**.
4. For Define :
   a. **Database Link Name** - Enter 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.
   b. **Connect To Schema**- Enter the name of the database schema on the remote system to access.
   c. **Password** - Enter the password for the remote database schema.
   d. **Remote Hostname or IP** - Enter the hostname or IP address of the database server you wish to access.
   e. **Remote Host Port** - Enter the network port number on which the Oracle Net Listener is accepting requests. This is typically 1521.
   f. Identified by - Select Service Name or SID.

      If you select **SID** (Oracle System Identifier), enter the SID name if the remote database is identified by a SID. If you select **Service Name**, enter the service name if the remote database is identified by a service name.
5. Click **Next**.
6. Click **Create Database Link**.

3.12.2 Browsing a Database Link

Select a database link from the Object Selection pane and view different reports about the database link.

To browse a database link:

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

   Object Browser appears.
2. From the Object list, select **Database Links**.
3. From the Object Selection pane, select a database link.

   The Object Details view appears.
4. Click the tabs at the top of the page to view different reports about the database link.

3.12.3 Reports for Database Links

Alternative views available when viewing a database links in Object Browser.

Table 3-11 describes all available reports for database links.

Table 3-11 Available Reports for Database Links

View	Description
Object Details	(Default) Displays details about the database link. Actions you can perform include: • **Drop** - Deletes the database link • **Test** - Tests the database link
Dependencies	Displays a list of objects that use (or depend) upon this database link.
SQL	Displays the SQL necessary to re-create this database link.

3.12.4 Dropping a Database Link

Select a database link from the Object Selection pane and click Drop.

To drop a database link in Object Browser:

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

   Object Browser appears.
2. From the Object list, select **Database Links**.
3. From the Object Selection pane, select a database link.

   The Object Details View appears.
4. Click **Drop**.
5. To confirm, click **Finish**.

3.13 Managing Materialized Views

A materialized view provides indirect access to table data by storing the results of a query in a separate schema object. You can create, browse, drop a materialized view and view report.

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.

- Creating a Materialized View
  Create a materialized view using Object Browser.
- Browsing a Materialized View
  Select a materialized view from the Object Selection pane and view different reports about the materialized view.
- Reports for Materialized Views
  Alternative views available when viewing a materialized view in Object Browser.
- Dropping a Materialized View
  Select a materialized view from the Object Selection pane and click Drop.

> **See Also:**
>
> "*Oracle Database Concepts*" for information about materialized views

3.13.1 Creating a Materialized View

Create a materialized view using Object Browser.

To create a materialized view:

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

   Object Browser appears.
2. Click the **Create** icon.
3. From the list of object types, select **Materialized View**.
4. For Define:
   a. **Materialized View Name** - Enter the name of the view. View names must conform to Oracle naming conventions and cannot contain spaces, or start with a number or underscore.

      To preserve the case of the name you enter, click **Preserve Case**.
   b. **Query** - Specify a query to define the view.

      > **Tip:**
      >
      > To access Query Builder or SQL Commands, click the appropriate button at the bottom of the page. The selected tool displays in a pop-up window. Once you create the appropriate SQL, click **Return** to automatically close the popup window and return to the wizard with the SQL.

   c. Click **Next**.

      A confirmation page appears, which displays the SQL used to create the materialized view.
5. Click **Create Materialized View**.

> **See Also:**
>
> - "Using Query Builder"
> - " Using SQL Commands "

3.13.2 Browsing a Materialized View

Select a materialized view from the Object Selection pane and view different reports about the materialized view.

To view a materialized view:

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

   Object Browser appears.
2. From the Object list, select **Materialized Views**.
3. From the Object Selection pane, select a view.

   The Materialized View appears.
4. Click the tabs at the top of the page to view different reports about the materialized view.

3.13.3 Reports for Materialized Views

Alternative views available when viewing a materialized view in Object Browser.

Table 3-12 describes all available reports for materialized views.

Table 3-12 Available Reports for Materialized Views

View	Description
Materialized View	(Default) Displays details about the columns in the materialized view, including: • **Column Name** • **Data type** • **Nullable flag** • **Default value** • **Primary key** Click **Drop** to delete the current materialized view.
Data	Displays a report of the data in the columns. Actions you can perform include: • **Query** - Enables you to sort by column. To restrict specific rows, enter a condition in the Column Condition field. Use the percent sign (%) for wildcards. From Order by, select the columns you want to review and click Query. • **Count Rows** - Displays a report of the data in the current table. • **Download** - Click this link to export the data as a comma-delimited file (.csv) file.

Table 3-12 (Cont.) Available Reports for Materialized Views

View	Description
Details	Displays object details stored in DBA_SNAPSHOTS such as updatable and status.
Grants	Displays a list of grants on the current view, including grantee, privilege, and grant options. You can perform **Grant** and **Revoke** in this view.
Dependencies	Displays a list of objects that use (or depend) upon this materialized view.
SQL	Displays the SQL necessary to re-create this materialized view.

3.13.4 Dropping a Materialized View

Select a materialized view from the Object Selection pane and click Drop.

To drop a materialized view in Object Browser:

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

   Object Browser appears.
2. From the Object list, select **Materialized Views**.
3. From the Object Selection pane, select a view.

   The Materialized View appears.
4. Click **Drop**.
5. To confirm, click **Finish**.

3.14 Managing Synonyms

A synonym is an alias for a schema object. You can create, view and drop a synonym.

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

- Creating Synonyms
  Create synonyms using Object Browser.
- Viewing a Synonym
  Select a synonym from the Object Selection pane.
- Dropping a Synonym
  Select a synonym from the Object Selection pane and click Drop.

> **See Also:**
>
> "*Oracle Database Administrator's Guide*" for information about synonyms

3.14.1 Creating Synonyms

Create synonyms using Object Browser.

To create a synonym:

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

   Object Browser appears.
2. Click the **Create** icon.
3. From the list of object types, select **Synonym**.
4. For Define:
   a. **Synonym Name** - Enter a name.
   b. **Public or Private** - Specify whether the synonym should be public or private.
   c. **Schema** - Select the database schema (or user name) which owns the object upon which you want to create your synonym.
   d. **Object** - Enter the name of the object upon which you want to create a synonym.
   e. **Database Link** - Enter the name of the database link to use if the synonym is to be created on a remote object.
   f. Click **Next**.

   A confirmation page appears, which displays the SQL used to create the synonym.
5. Click **Create Synonym**.

3.14.2 Viewing a Synonym

Select a synonym from the Object Selection pane.

To view a synonym:

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

   Object Browser appears.
2. From the Object list, select **Synonyms**.
3. From the Object Selection pane, select a synonym.

   The Object Details view appears displaying the following:
   - **Synonym Owner**
   - **Synonym Name**
   - **Object Owner**
   - **Object Name**
   - **Object Type**
   - **Status**

3.14.3 Dropping a Synonym

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

To drop a synonym in Object Browser:

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

   Object Browser appears.
2. From the Object list, select **Synonyms**.
3. From the Object Selection pane, select a synonym and click **Drop**.
4. To confirm, click **Finish**.

3.15 Managing SODA Collections

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

- About SODA Collections
  You can load data to a SODA collection as JSON, TXT, or ZIP files.
- Creating a SODA Collection
  Use SQL Workshop to load documents to a new SODA collection.
- Viewing a SODA Collection
  Access existing SODA collections in Object Browser.
- Editing or Dropping a SODA Collection
  View a SODA collection in Object Browser, then use the 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

You can load data to a SODA collection as JSON, TXT, or ZIP files.

SODA collections are an Object Type in Object Browser. You use Object Browser to view or edit existing SODA collections, including drop them from the workspace.

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** - Application Express supports JSON files containing an array with multiple JSON objects. Application Express 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 SQL Workshop to load documents to a new SODA collection.

1. To load documents to a new SODA collection:
1. In Object Browser, click the **Create** icon (+) (top-right).
2. Select **SODA Collection**.

   The Load Data into SODA Collection dialog displays.

   > **Tip:**
   >
   > You can also access the Load Data wizard dialog with the **SODA Collection** shortcut in the Create Object column on various SQL Workshop pages.

3. Do one of the following
   - Drag and drop the desired JSON, TXT, or ZIP file into the dialog.
   - Click **Choose File**, browse your local system to the file location, and upload.

   The wizard prepares the next screen based on filetype.
4. Configure the options. For all filetypes, choose an upload option:
   - To create a new collection (default), select **New Collection**.
   - To upload to an existing collection, select **Existing Collection**.
5. For SODA Collection Name, enter the name of the collection.

   > **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. Click **Load Data**.

   The data loads. This may take some time.
7. When the upload completes, you can proceed in the following ways:
   - To view the SODA collection in Object Browser, click **View Collection**.
   - To jump to the Create App wizard (App Builder), click **Create Application**.
   - 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

Access existing SODA collections in Object Browser.

1. To access existing SODA collections:
1. On the Workspace home page, click **SQL Workshop**.
2. Click **Object Browser**.
3. In the Object Selection Pane (left), click the **Object Type dropdown menu** (Tables is selected by default).
4. Select **SODA Collections**.

   A list of existing SODA collections displays.
5. Click a collection to view it.

   There are three tabs to view:

   - **Collection Contents** - View the general contents of the collection. Contains the **Load Data** and **Drop** buttons for the collection.
   - **Data Guide** - View the Relational Views and full JSON Data Guide associated with the collection. Contains the **Drop Search Index** and **Create Relational View** buttons for the relational view. (Clicking a view under View Name navigates to Views in Object Browser.)
   - **Collection 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 the Load Data to upload a new version of the data or click the Drop button to remove the SODA collection from the workspace.

1. To view a SODA collection in Object Browser:
1. In Object Browser, click the **Object Type dropdown menu** and select **SODA Collections**.
2. Select the SODA collection to update.
2. To change a SODA collection:
3. Click the **Load Data** button.

   The Data Upload wizard opens.
4. Proceed through the wizard, ensuring to select **Existing Collection** for Load To.
3. To drop a SODA collection:
5. Click the **Drop** button.

   The confirmation screen displays.
6. Click the **Drop** button to confirm.

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 Application Express.
- 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 Database SQL Language Reference*" for detailed information about SQL statements and other parts of SQL, such as operators, functions, and format models
- "*Oracle Database Concepts*" for conceptual information about SQL
- "*SQL*Plus User's Guide and Reference*" for information about SQL*Plus, Oracle's version of SQL
- "*Oracle 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.

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"

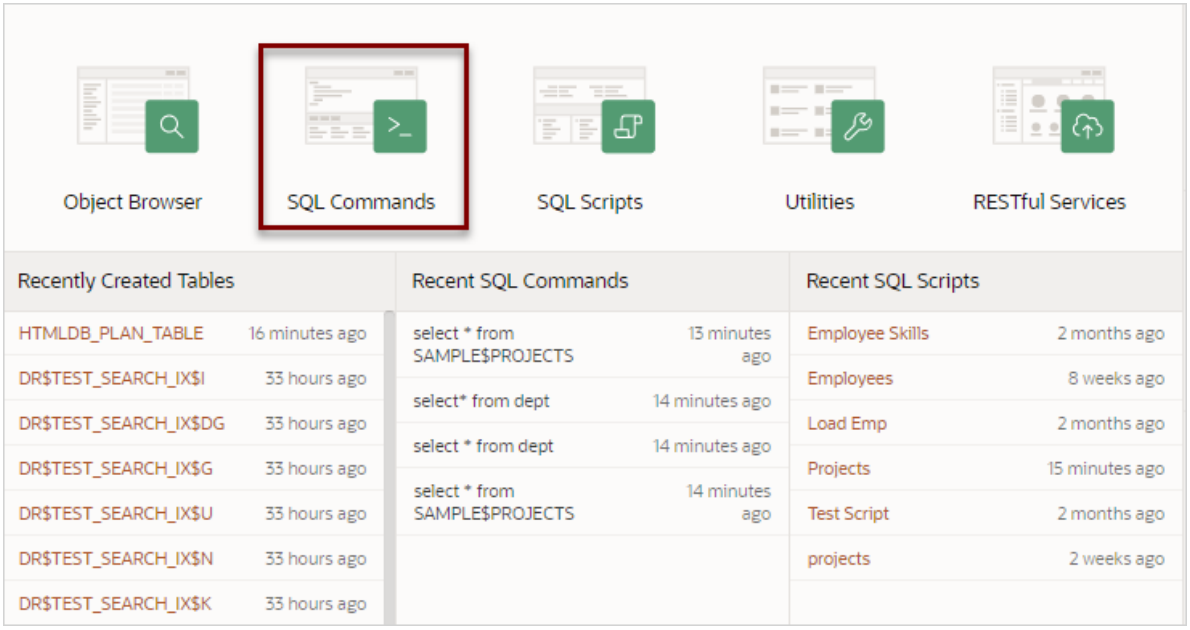
4.2 Accessing SQL Commands

Learn how to access SQL Commands.

To access SQL Commands:

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

2. Click **SQL Commands**.



The SQL Commands home page appears.

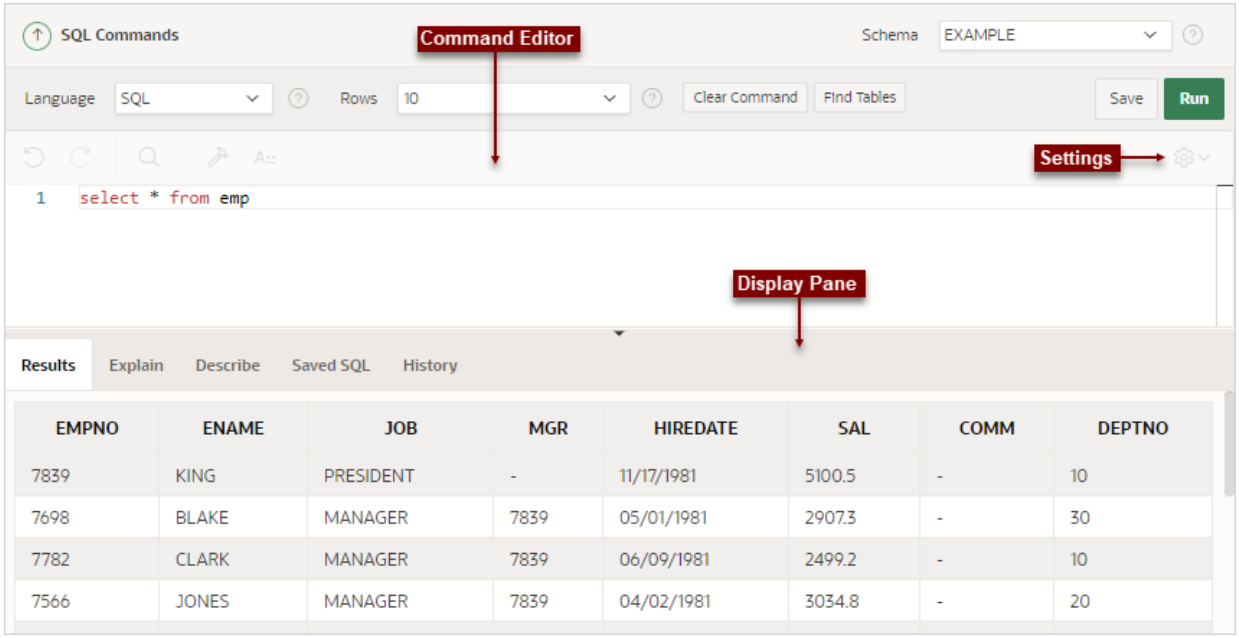
> **Note:**
>
> If the instance administrator has disabled RESTful Services for this Application Express instance, RESTful Services are not available for this instance and the RESTful Services icon does not display.

> **See Also:**
>
> "Configuring SQL Workshop" in *Oracle Application Express 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.
- **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.
- **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 Application Express.

- 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"

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 Application Express 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.

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.
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.
- 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.

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.

> **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.

   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.

5

Using Oracle Application Express Utilities

Oracle Application Express provides utilities to build SQL queries, load and unload data from an Oracle database, generate DDL, view object reports, manage User Interface 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 Query Builder
  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.
- 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
  Managing user interface defaults enables you to assign default interface properties, create default wizard, modify the table user interface defaults, add new attributes, and export the user interface 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.
- 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.
- 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.

- 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 Database and Oracle Application Express 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 Cloud (Autonomous Database Only)
  Load data from the 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 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.

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 Database and Oracle Application Express provide several powerful options for importing, exporting, loading, and unloading data.

Table 5-1 provides a summary of these options.

Table 5-1 Summary of Oracle Application Express Import/Export Options

Feature or Utility	Description
Load Data /Unload Data wizards in Oracle Application Express	• 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

Table 5-1 (Cont.) Summary of Oracle Application Express Import/Export Options

Feature or Utility	Description
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
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

Table 5-2 provides several load, unload, import, and export scenarios and suggests the appropriate option to use for each.

Table 5-2 Import/Export Scenarios and Recommended Options

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 Oracle Application Express
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 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.

1. 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**.

   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 Application Express 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 the 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 Application Express by copying and pasting CSV data, selecting a sample data set, or uploading a file.

Key capabilities when loading data into the Oracle Application Express 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"`, `"-"`.
- 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**.

      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 the Load Data Wizard.

XML files can also be uploaded to Oracle Application Express. However, Oracle Application Express supports only "**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**, 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 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.

5.1.5.4 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 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.

   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.
- 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:

   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 Get Started, click **Unload Data**.

   The Unload Data Wizard appears.

4. Select **XML Format** and click **Next**.

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

5. On Unload to XML - Columns, edit the following:

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

b. Table - Select the database object name you would like to export to an XML file format.

c. Columns - Highlight the database object columns you would like to export to an XML document.

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

e. Click **Next**.

6. Click **Unload Data**.

   The file is downloaded.

5.1.7 Loading Data From the Cloud (Autonomous Database Only)

Load data from the 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 Autonomous Database Users
  Data Workshop includes an additional Autonomous Database users also see the **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

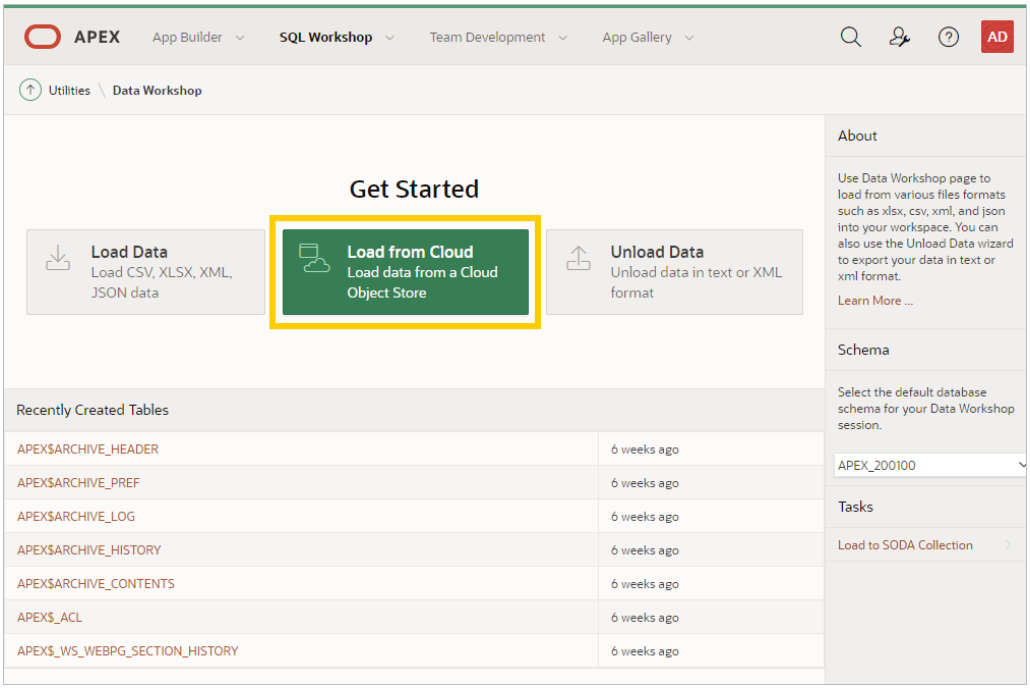
> **See Also:**
>
> - "REF DBMS_CLOUD Subprograms" in *Using Oracle Autonomous Data Warehouse on Shared Exadata Infrastructure*
> - "GRANT" in *Oracle Database SQL Language Reference*

5.1.7.2 User Interface Differences for Autonomous Database Users

Data Workshop includes an additional Autonomous Database users also see the **Load from Cloud** button on the Data Workshop home page.

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

Autonomous Database 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 Application Express 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, Application Express calls the data using the `DBMS_CLOUD.CREATE_EXTERNAL_TABLE` procedure.

> **See Also:**
>
> DBMS_CLOUD CREATE_EXTERNAL_TABLE Procedure in *Using Oracle Autonomous Data Warehouse on Dedicated Exadata Infrastructure*

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.

1. **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 REF File URI Formats.

   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**.

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.

1. 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.
2. 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**.

Application Express 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.

1. 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.

> **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.
2. To load the data to a local table:
6. On the Review External Table page under Load Data, configure how Application Express 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.

1. 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**.

   Application Express loads the data.

   The Load Data dialog displays.
6. Configure how Application Express 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.
7. Click **Load Data**.

5.2 Using Query Builder

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.

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

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

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

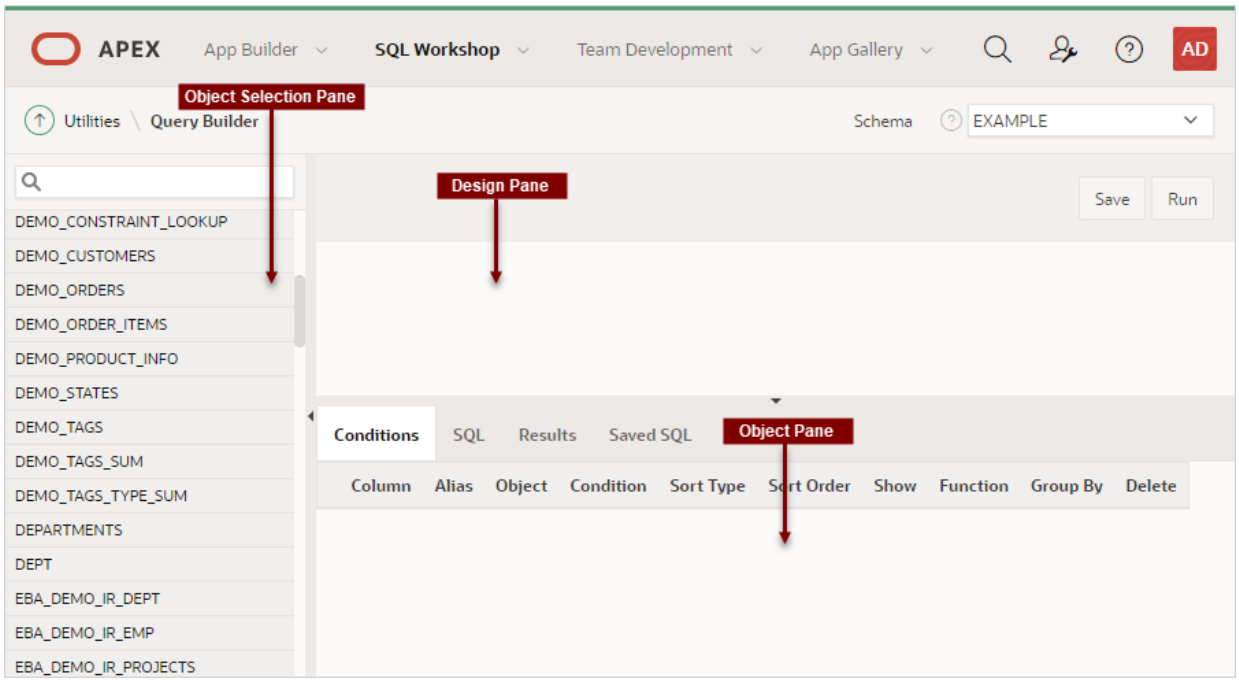
> **See Also:**
>
> " Using SQL Commands "

5.2.1 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.



> **See Also:**
>
> "Selecting a Schema"

5.2.2 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 Application Express by clicking the Query Builder button when editing a SQL attribute.

5.2.3 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.
2. Add objects to the Design pane and select columns.
3. **Optional**: Establish relationships between objects.
4. **Optional**: Create query conditions.
5. Execute the query and view results.

> **See Also:**
>
> - "Viewing Generated SQL"
> - "Working with Saved Queries"

5.2.4 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.

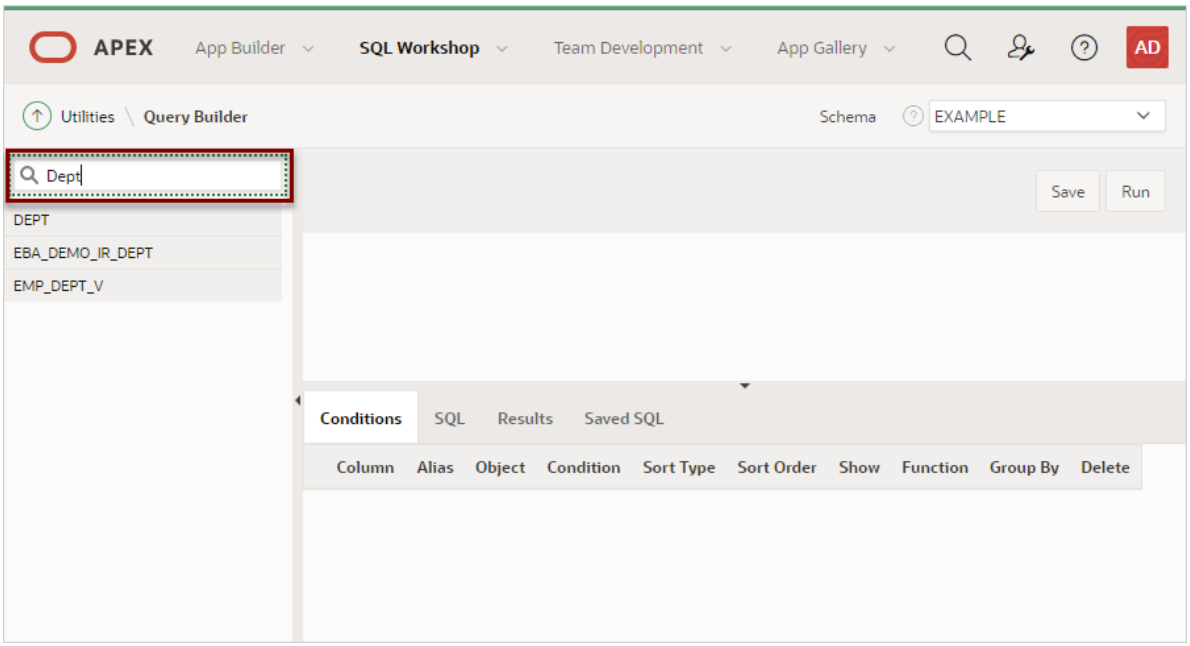
5.2.4.1 Searching and Filtering Objects

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.



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

5.2.4.2 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.

5.2.4.3 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.

5.2.5 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.
- 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.

5.2.5.1 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

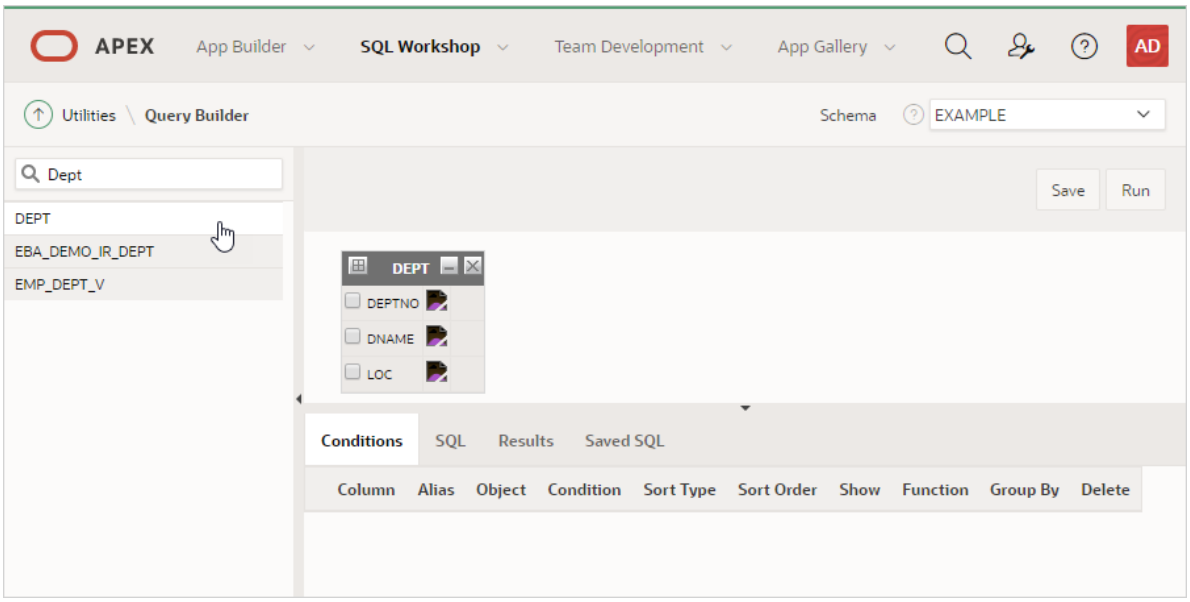
5.2.5.2 Adding an Object to the Design Pane

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.



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"

5.2.5.3 Resizing the Design and Results Panes

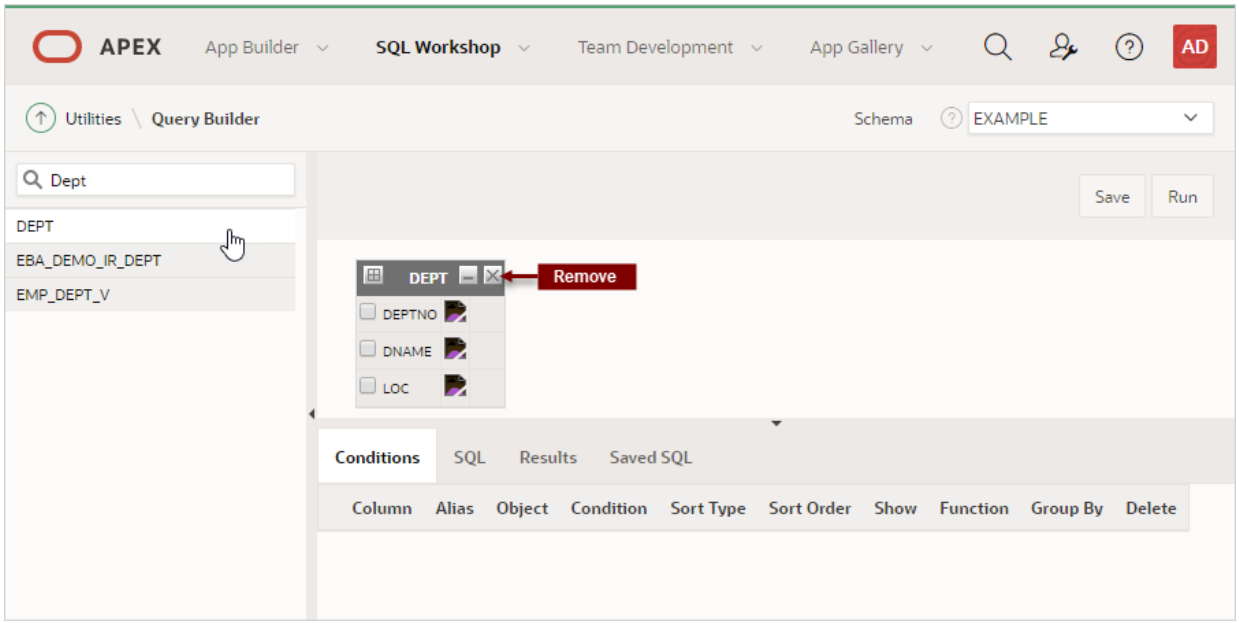
As you select objects, you can resize Design and Results panes by selecting the Bottom Splitter in the center of the page.

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.

5.2.5.4 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.



5.2.6 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. Table 5-3 describes the attributes available on the Conditions tab.

Table 5-3 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.
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`

Table 5-3 (Cont.) Conditions Tab

Condition Attribute	Description
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"

5.2.7 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.

5.2.7.1 About Join Conditions

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

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 Database SQL Language Reference*" for information about join conditions

5.2.7.2 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.

5.2.7.3 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.

5.2.8 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.
- Deleting a Saved Query
  Learn how to delete a saved SQL query.

5.2.8.1 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.

5.2.8.2 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.

5.2.8.3 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.

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

5.2.9 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 "

5.2.10 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.

5.3 Using Quick SQL

Rapidly design and prototype data models using a markdown-like shorthand syntax that expands to standards-based Oracle SQL.

- Getting Started with Quick SQL
  Learn about common Quick SQL use cases and the basic rules of Quick SQL shorthand syntax.
- Accessing Quick SQL
  Access Quick SQL by clicking SQL Workshop, Utilities, and then Quick SQL.
- Using Quick SQL Help
  Review Quick SQL Help to learn more about using Quick SQL.

- Generating Quick SQL with SQL Shorthand Syntax
  Quickly develop a script for simple tables and views by entering SQL shorthand syntax in the the left pane and clicking Generate SQL.
- Managing Quick SQL Models and Scripts
  Save entered Quick SQL shorthand syntax as model for future use, or save the generated SQL as a SQL script.
- Loading Quick SQL Samples
  Load and view Quick SQL samples to learn about about SQL shorthand syntax.
- Creating an App 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.

5.3.1 Getting Started with Quick SQL

Learn about common Quick SQL use cases and the basic rules of Quick SQL shorthand syntax.

- About Quick SQL
  Quickly develop a script for simple tables and views.
- About Quick SQL Shorthand Syntax
  Quick SQL shorthand syntax enables you to generate the SQL from an indented text document.

5.3.1.1 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.

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

5.3.1.2 About Quick SQL Shorthand Syntax

Quick SQL shorthand syntax enables you 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 will generate 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

Click the **Settings** button to view and configure generation options. You can automatically add Who Columns which indicate who created or last updated a given row and when. You can add a row sequence column that automatically increments by one on each row update. A row sequence 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"

5.3.2 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.

> **Note:**
>
> You can also access Quick SQL on the SQL Scripts page by clicking the **Quick SQL** button. See " Using SQL Scripts ."

5.3.3 Using Quick SQL Help

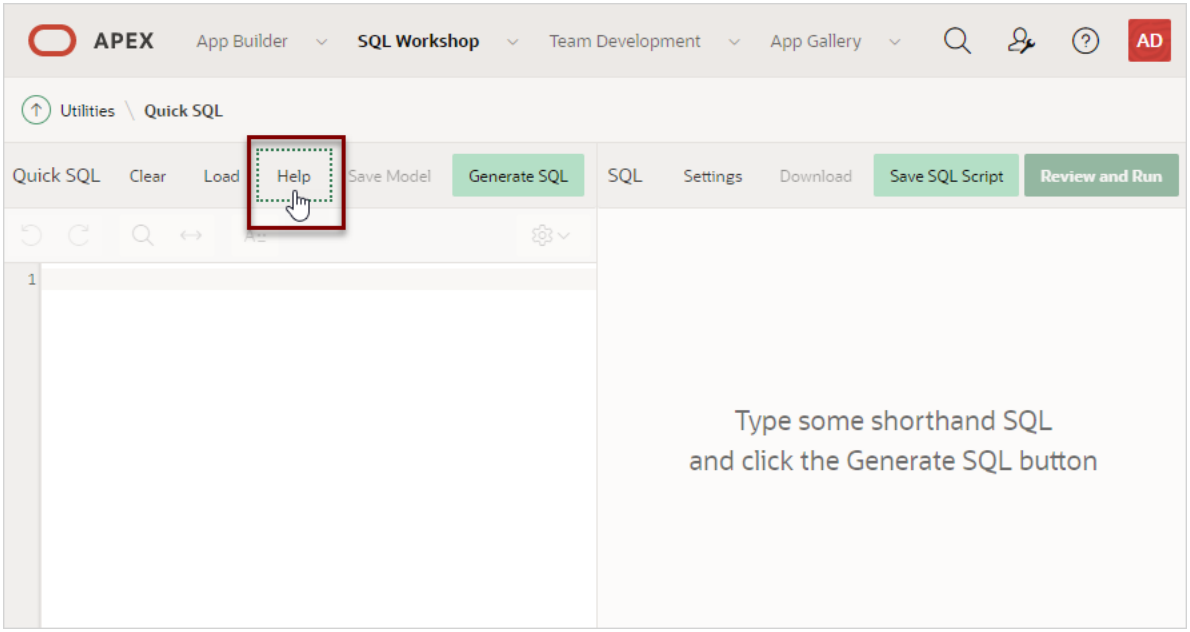
Review Quick SQL Help to learn more about using Quick SQL.

- Accessing Quick SQL Help
  Access Quick SQL Help by clicking Help at the top of the Quick SQL Shorthand pane.
- About Quick SQL Help Tabs
  Learn about the tabs available in Quick SQL Help.

5.3.3.1 Accessing Quick SQL Help

Access Quick SQL Help by clicking Help at the top of the Quick SQL Shorthand pane.

1. 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** at the top of the Quick SQL Shorthand pane.



The Quick SQL Help window appears.

3. Click one of the following tabs: **About**, **Data Types**, **Table Directives**, **Column Directives**, **Views**, **Settings**, or **Samples**.

> **See Also:**
>
> "About Quick SQL Help Tabs"

5.3.3.2 About Quick SQL Help Tabs

Learn about the tabs available in Quick SQL Help.

Quick SQL Help includes the following topics:

- **About** - Overview of Quick SQL together with tips on getting started and steps needed to create the database objects.
- **Data Types** - List of data types that can applied to each column.
- **Table Directives** - Commands used to modify tables.
- **Column Directives** - Commands used to extend column definitions.
- **Views** - Syntax for defining a view.
- **Settings** - Inline settings to explicitly set SQL syntax generation options.
- **Samples** - Samples of data models that can be used to populate the Quick SQL Shorthand.

> **See Also:**
>
> "Loading Quick SQL Samples"

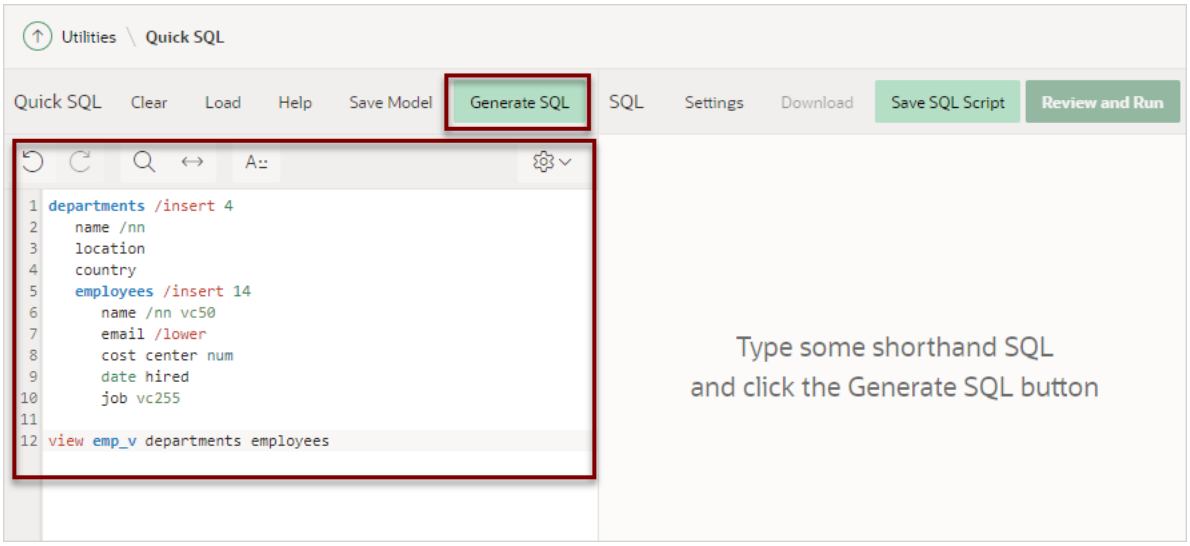
5.3.4 Generating Quick SQL with SQL Shorthand Syntax

Quickly develop a script for simple tables and views by entering SQL shorthand syntax in the the left pane and clicking Generate SQL.

> **Tip:**
>
> Viewing samples is a great way to learn about Quick SQL shorthand syntax. To view samples, click **Help** and then **Samples**. Select a sample by clicking **Load Model**.

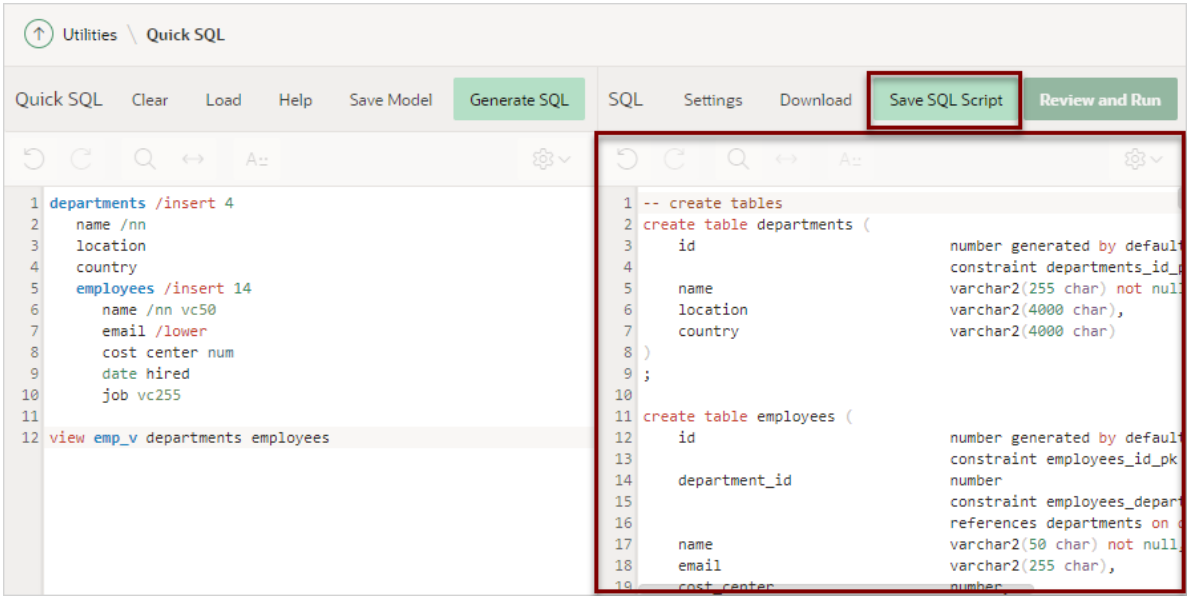
To generate the Quick SQL with SQL shorthand syntax:

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 Quick SQL Shorthand pane (the left pane), enter SQL shorthand syntax.



3. Click **Generate SQL**.

   The generated SQL appears in Oracle SQL Output pane.



> **Note:**
>
> You can save the generated script or review and run the script.

4. To save the SQL script:
   a. Click **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.

> **Note:**
>
> - "Saving a SQL Script"
> - "Configuring Quick SQL Settings"

5.3.5 Managing Quick SQL Models and Scripts

Save entered Quick SQL shorthand syntax as 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.
- Loading a Saved Quick SQL Model
  Access Quick SQL models from the **Load** window.

- Saving a SQL Script
  Save generated SQL as a script.
- Downloading SQL Scripts
  Download a generated SQL script locally.

5.3.5.1 Saving a Quick SQL Model

Reuse Quick SQL shorthand syntax by saving a model.

1. To save a model:
1. On the Quick SQL page, enter Quick SQL shorthand syntax in the left pane and click **Generate SQL**.

   The generated SQL appears on the Oracle SQL output pane.
2. Click **Save Model**.

   The Save Model dialog appears.
3. In the Save Model dialog:
   a. Model Name - Enter a name.
   b. Description - Enter a description for the model.
   c. Click **Save Model**.

   The model is saved.

5.3.5.2 Loading a Saved Quick SQL Model

Access Quick SQL models from the **Load** window.

Developers can view and load their own saved models under **My Models** or all workspace developer models under **Workspace Models**.

1. To load a saved Quick SQL model:
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 the **Load** button on the left Quick SQL Shorthand pane.
3. To load a saved model:
   a. Under either **My Models** or **Workspace Models**, choose a model.
   b. Click **Load Model**.

   The selected model appears.
4. To edit the model name or description, or delete a saved model:
   a. Load the saved model as described in the previous step.
   b. Click model name.

      The Edit Model dialog appears.
   c. To edit the model name or description, edit the appropriate fields and click **Save**.

d. To delete the model, click **Delete**.

5.3.5.3 Saving a SQL Script

Save generated SQL as a script.

1. To save a SQL script:
1. On the Quick SQL page, enter Quick SQL shorthand syntax in the left pane and click **Generate SQL**.

   The generated SQL appears on the Oracle SQL output pane.
2. Click **Save SQL Script**.

   The Save Script dialog appears.
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:**
>
> " Using SQL Scripts "

5.3.5.4 Downloading SQL Scripts

Download a generated SQL script locally.

1. To download.generated SQL script:
1. On the Quick SQL page, enter Quick SQL shorthand syntax in the left pane and click **Generate SQL**.
2. Scroll through generated SQL in the SQL Output pane.

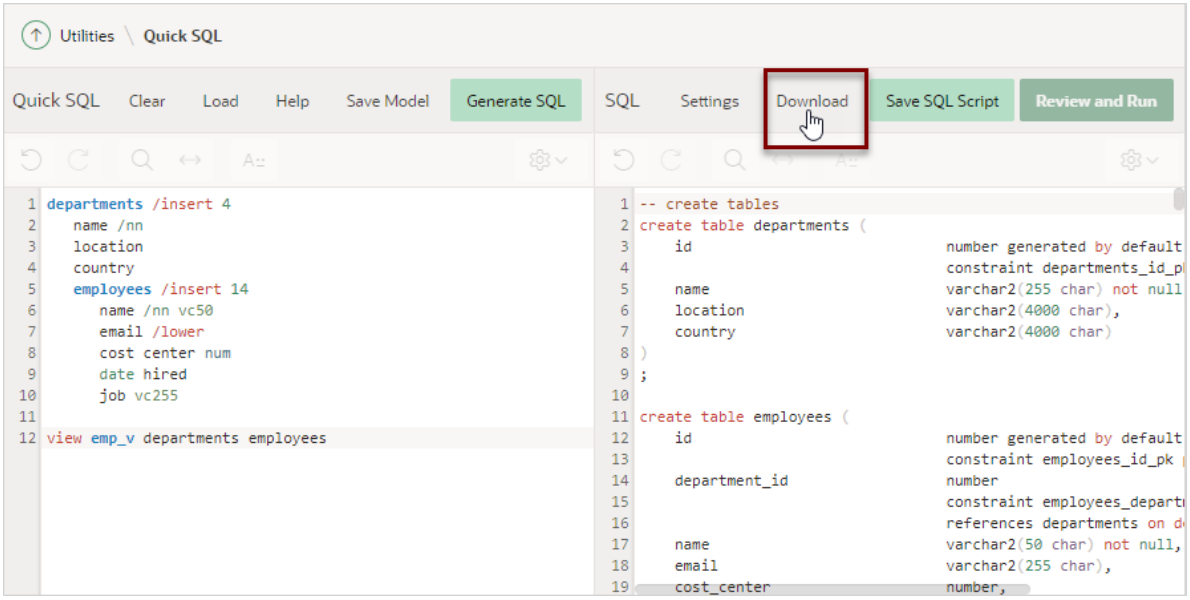
   The generated SQL appears on the Oracle SQL Output pane.

   At the bottom, the line starting with `-- Generated by Quick SQL` is the SQL shorthand syntax. If you specified any settings they display after line starting with `# settings = .` The following is the Quick SQL syntax and Settings in the previous example:

```
-- Generated by Quick SQL Wednesday May 01, 2019  10:04:45

/*
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

    # settings = { PK: "IDENTITY", semantics: "CHAR", language: "EN",
    APEX: true }
    */
```

3. Click **Download** to save both the Quick SQL shorthand and the generated SQL locally.



5.3.6 Loading Quick SQL Samples

Load and view Quick SQL samples to learn about about SQL shorthand syntax.

- About Quick SQL Samples
  Quick SQL includes the following samples.
- Loading a Quick SQL Sample
  Access Quick SQL samples from either the **Load** or **Help** windows.

5.3.6.1 About Quick SQL Samples

Quick SQL includes the following samples.

You can load these samples by clicking either the **Help** or **Load** buttons above the Quick SQL Shorthand pane. Available Quick SQL samples include:

- **Departments and Employees** - Shorthand SQL syntax creates a `DEPARTMENTS` and `EMPLOYEES` table with a SQL 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` is used to specify a SQL datatype. The `/INSERT` syntax is used to generate random data.
- **Product Sales** - Short hand syntax that 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.
- **ToDos** - Creates `ASSIGNEES` and `TODOS` tables. This sample is designed as a starting point to enable the creation of a customized ToDo system within minutes.

5.3.6.2 Loading a Quick SQL Sample

Access Quick SQL samples from either the **Load** or **Help** windows.

1. To access 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**.
2. Access samples by clicking either the **Load** or **Help** button on the left Quick SQL Shorthand pane:
3. To access samples from the Load window:
   a. Click **Load** on the Quick SQL Shorthand pane.
   b. Under **Samples**, choose a sample and click **Load Model**.

   The Sample loads on Quick SQL Shorthand pane and generated SQL is displayed in Oracle SQL Output pane.
4. To access samples from the Help window:
   a. Click **Help** on the Quick SQL Shorthand pane.
   b. Click **Samples** in the Help window.
   c. Choose a sample and click **Load Model**.

   The Sample loads on Quick SQL Shorthand pane and generated SQL is displayed in Oracle SQL Output pane.

5.3.7 Creating an App from a Generated SQL Script

Create an application from a saved script in SQL Scripts.

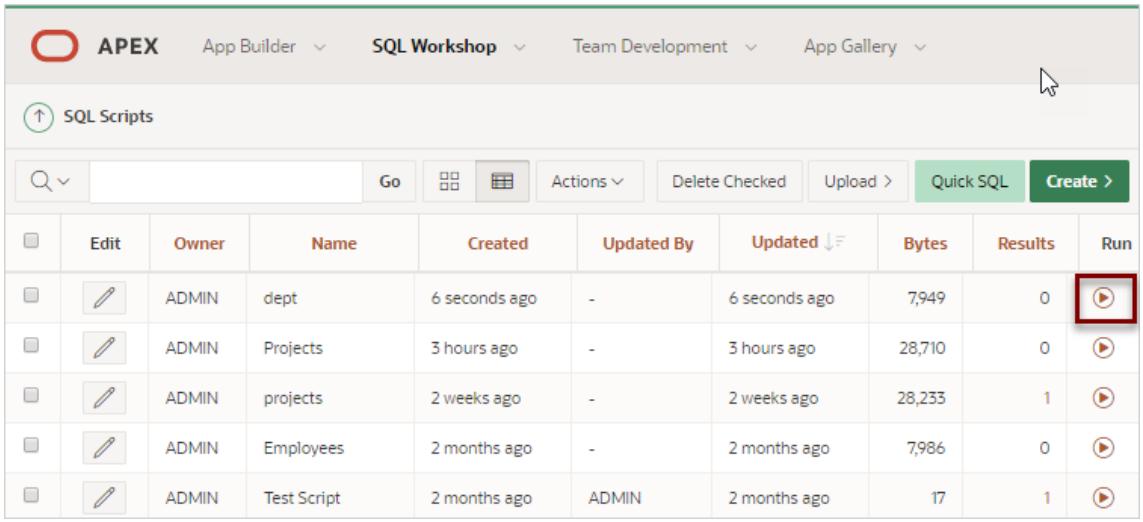
Saving a script, saves it to SQL Scripts. After you run the saved script, you can run the Create Application Wizard from SQL Scripts page.

1. To create an application from saved SQL script:
1. On the Workspace home page, click the **SQL Workshop** icon.
2. Click **SQL Scripts**.

The SQL Script page appears.

3. Run the saved script:

   a. Locate the script and click **Run**.



   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. In the Create Application Wizard:

   a. Enter the application name, select an appearance, add pages, select features, and configure application settings.

> **Tip:**
>
> To learn more, see online Help.

   b. Click **Create Application**.

> **See Also:**
>
> "Understanding Page Types, Features, and Settings"

5.3.8 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.

5.3.8.1 Configuring Settings Declaratively

Configure settings declaratively by clicking the Settings button at the top of the right pane.

1. To configure settings declaratively:
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 **Settings** on the Oracle SQL Output pane.

   The Settings page appears. Configure the appropriate attributes.
3. Under Table:
   - Object Prefix - Database object prefix. Prefixes all object names with the provided value .
   - Schema - Prefix object names with a schema name. The default is no schema prefix for object names.
   - On Delete - Defines how foreign keys behavebehave on delete of the parent row. Options include:
     – **Cascade** - A foreigh key with "on delete cascade" automatically deletes the child row when the correponding parent is deleted.
     – **Restrict** - A foreign key with "on delete restrict" prevents deletion of the parent row if a child row exists.
     – **Set Null** - A foreign key with "set null on delete" means that if a record in the parent table is deleted, then the corresponding records in the child table will have the foreign key fields set to null.
   - Compression - Determines if you want your tables to be compressed or not. 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 - 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.

4. Under Column:
   - Primary Keys - Defines how table primary keys are to be populated. 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.
   - Date Data Type - Defines what type of date to use to store columns identified as dates. Options include: **Date**, **Timestamp**, and **Timestamp with local time zone**.
   - Semantics- Options include:
     - **Default** - Default to the database setting. If you are unsure what this is, select **Default**.
     - **BYTE** - Indicates that the column will have byte length semantics.
     - **CHAR** - Indicates that the column will have character semantics.
5. Under Additional Columns:
   - Include - Additional columns to automatically add to your table. Options include: **Audit Columns**, **Row Key**, **Row Version Number**, and **Security Group ID**.
6. Under Options:
   - Data Language - Controls the language used for generating the data using the `/INSERT` flag.
   - PL/SQL API - Select **On** to generate a PL/SQL APIs with one package per table on all tables. 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;
     ```

   - History Tables - Select **On** to create a history table to log all updates and deletes to all tables. A PL/SQL after update or delete trigger will be created

that inserts into this history table. Select **Off** to create a history table only if one or more tables includes a `/history` option, for example:

```
employees /history
   name
   email
   phone num
```

- Auto Primary Key - Select **On** to have primary key columns automatically generated for tables. The primary key column name will be ID and it will be of type number.

> **Tip:**
>
> To see an example, see field-level Help.

- Longer Varchars - Available in Oracle Database 12.1 or later, Longer Varchars allow for columns to be up to 32K bytes. Ensure your database is configured to support longer varchars if you wish to use this feature.
- Editionable - When generating PL/SQL objects including triggers and packages make these editionable.
- APEX Enabled - Controls the syntax generated to support audit columns.
- Tags Framework - Choose **On** or **Off**.
- Compatibility - Select an Oracle Database release. Ensures generated SQL is compatible with the database release selected.

7. Under Preferences:
   - Prefix primary keys with table name - Prefix primary key database table columns with name of table. Choose **On** or **Off**.
   - Created Column Name - When generating audit columns, controls the name of this audit column.
   - Created By Column Name - When generating audit columns, controls the name of this audit column.
   - Updated Column Name - When generating audit columns, controls the name of this audit column.
   - Updated By Column Name - When generating audit columns, controls the name of this audit column.
8. To save your configuration, click **Save Changes**
9. To reset to the default settings, click **Reset**

5.3.8.2 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`

Entering settings directly into the Quick SQL Shorthand 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"
```

> **Tip:**
>
> To view a listing of settings, by clicking **Help** and then **Settings**.

5.3.9 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 parent child, also known as one too many relationships. 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.

5.3.10 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`.
- **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';
    ```

  - 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 is`1`.

- **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');
    ```

  - 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;
```

5.3.11 About Supported Data Types

Learn about supported data types.

Quick SQL supports the following data types:

- VARCHAR2
- NUMBER
- INTEGER
- DATE
- TIMESTAMP
- TIMESTAMP WITH TIME ZONE
- TIMESTAMP WITH LOCAL TIME ZONE
- CLOB
- BLOB

> **Tip:**
>
> To learn more about Quick SQL shorthand syntax for supported data types, click **Help** and select **Data Types**.

5.4 Using Sample Datasets

Use Sample datasets to build sample applications.

- About Sample Datasets
  Sample datasets enable you to easily build sample applications. Each dataset 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
  You can install sample dataset to your workspace.
- Removing a Sample Dataset
  You can remove the installed dataset.
- Refreshing a Sample Dataset
  You can refresh the installed dataset.
- Changing the Schema for a Sample Dataset
  You can change the schema for a installed dataset.

5.4.1 About Sample Datasets

Sample datasets enable you to easily build sample applications. Each dataset 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.

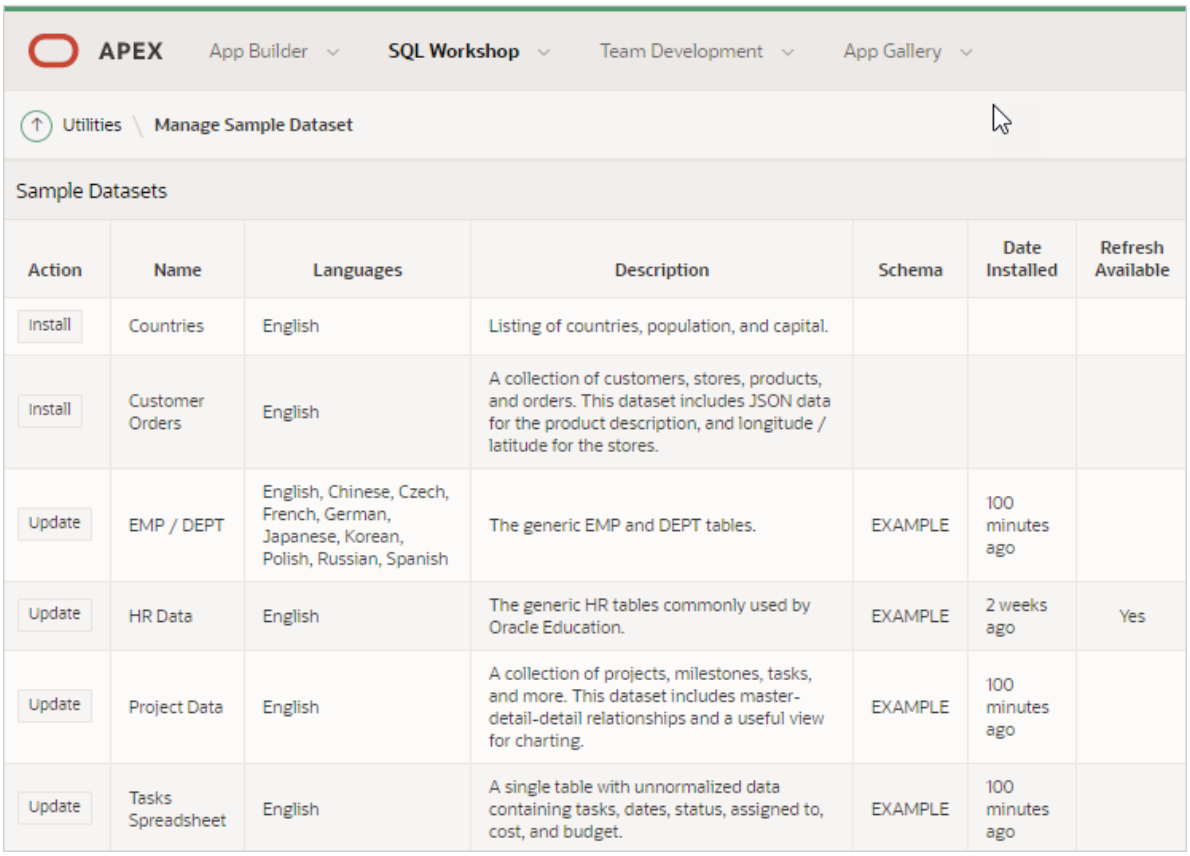
5.4.2 Accessing Sample Datasets

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.



5.4.3 Installing a Sample Dataset

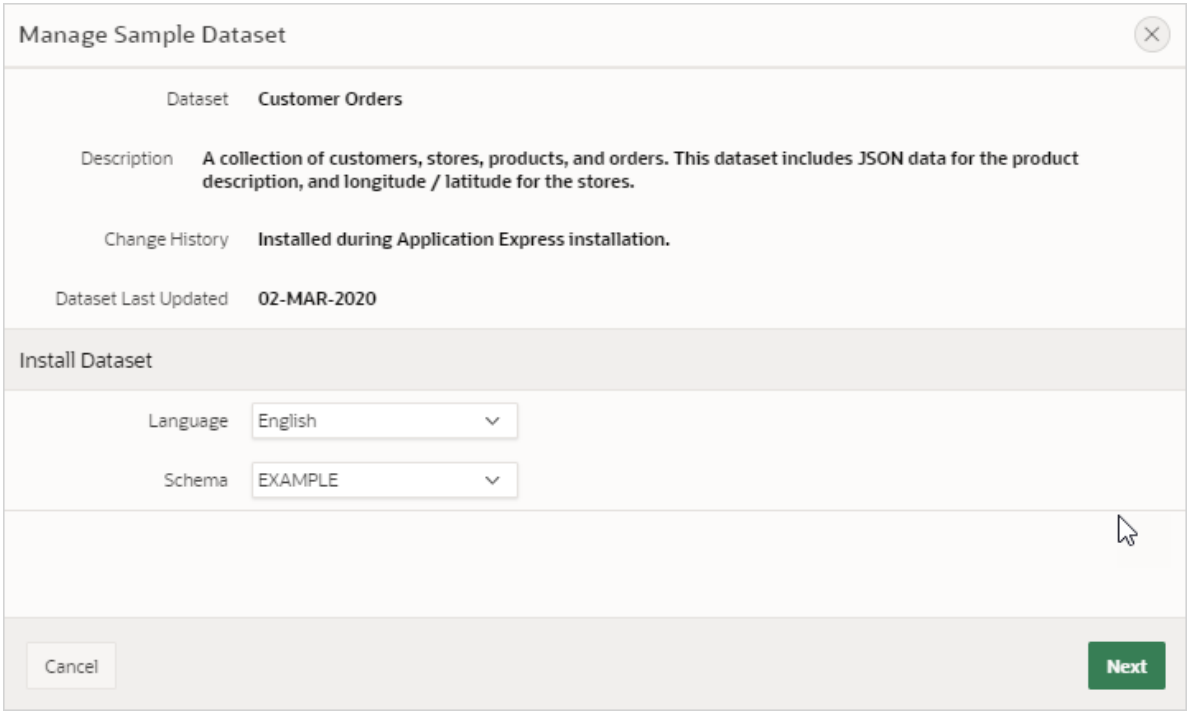
You can install sample dataset to your workspace.

To install the Sample Datasets:

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. Select the sample dataset and click **Install** under Action.

   The Manage Sample Dataset page appears.



5. Click **Next**.

   The Load Sample Dataset page appears with details of database objects.

6. Click **Install Dataset**.

   The Load Sample Dataset - Result page appears with the list of installed database objects.

7. On Load Sample Dataset, click **Exit**.

   - Click **Create Application** to launch the Create Application Wizard and pre-populates it with components built on the sample dataset.
   - Click **Exit** to exit the wizard.

> **See Also:**
>
> "Creating a Database Application Based on a Table or Query"

5.4.4 Removing a Sample Dataset

You can remove the installed 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 displays details of Schema and Date Installed.

4. Click **Update** under Action.

   The Manage Sample Dataset page appears.

5. Click **Remove Dataset**.

5.4.5 Refreshing a Sample Dataset

You can refresh the installed dataset.

To install the Sample Datasets:

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 displays details of Schema and Date Installed.

4. Click **Update** under Action.

   The Manage Sample Dataset page appears.

5. Click **Next**.
6. Select **Refresh Existing Dataset**.

5.4.6 Changing the Schema for a Sample Dataset

You can change the schema for a installed dataset.

To change the schema for a Sample Datasets:

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 displays details of Schema and Date Installed.

4. Click **Update** under Action.

   The Manage Sample Dataset page appears.

5. Select **Schema**.

> **Note:**
>
> This option is displayed if you have more than one schema associated with your workspace.

6. Click **Next**.

5.5 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**.
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 Database SQL Language Reference*" for information about DDL statements
> - "The Data Dictionary" in *Oracle Database Concepts* for information about the data dictionary

5.6 Managing User Interface Defaults

Managing user interface defaults enables you to assign default interface properties, create default wizard, modify the table user interface defaults, add new attributes, and export the user interface defaults.

- About User Interface Defaults
  User Interface Defaults enable you to assign default user interface properties for regions and items.

- Creating User Interface 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 User Interface Defaults
  Learn how to modify existing table user interface defaults.
- Creating User Interface Attributes
  Use the Attribute Dictionary to define and add new attributes.
- Modifying User Interface Attributes
  Modify existing user interface attributes on the Grid Edit page or by selecting a specific column.
- Exporting and Importing User Interface Defaults
  You export user interface defaults in the same way you export any related application file.

5.6.1 About User Interface Defaults

User Interface Defaults enable you to assign default user interface properties for regions and items.

This wizard enables you to specify whether you want to use User Interface Defaults if they exist. 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 user interface defaults can save valuable development time and has the added benefit of providing consistency across multiple pages in an application. User Interface Defaults are divided into two categories, the Table Dictionary and the Attribute Dictionary.

- The Table Dictionary enables you to specify defaults for tables and columns that are initialized from the database definition.
- The Attribute Dictionary enables you to create defaults based on attribute or column names, thus being usable across all tables. Attribute definitions can also have synonyms, allowing more than one attribute to share a common definition.

When you use User Interface 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.

5.6.2 Creating User Interface 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 user interface defaults for tables:

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

3. Click **User Interface Defaults**.

   The Dashboard page for User Interface 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 adjusts those of tables that do to match the database definition.

> **See Also:**
>
> "Modifying Table User Interface Defaults"

5.6.3 Modifying Table User Interface Defaults

Learn how to modify existing table user interface defaults.

To modify existing table defaults:

1. On the Workspace home page, click the **SQL Workshop**.
2. Click **Utilities**.
3. Click **User Interface Defaults**.

   The Dashboard page for User Interface 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.

> **Note:**
>
> 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 simply remove the column defaults from each table for those columns.

5.6.4 Creating User Interface 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 **User Interface Defaults**.

   The Dashboard page for User Interface Defaults appears.
4. Click **Attribute Dictionary**.

   The Attribute Dictionary page displays a report of all attributes in your workspace.
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.

5.6.5 Modifying User Interface Attributes

Modify existing user interface 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 **User Interface Defaults**.

   The Dashboard page for User Interface 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.

> **Note:**
>
> 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.

5.6.6 Exporting and Importing User Interface Defaults

You export user interface defaults in the same way you export any related application file.

Exporting user interface defaults from one development instance to another involves the following steps:

1. Export the user interface defaults using the Export User Interface Defaults utility.
2. Import the exported file into the target Oracle Application Express instance.
3. Install the exported file from Export Repository.

When you export user interface defaults, all user interface 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 PL/SQL API. You can use this file to import user interface defaults to another database and Oracle Application Express instance.

> **See Also:**
>
> - "Exporting User Interface Defaults" in *Oracle Application Express App Builder User's Guide*
> - "Importing User Interface Defaults" in *Oracle Application Express App Builder User's Guide*
> - "Installing Export Files" in *Oracle Application Express App Builder User's Guide*

5.7 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**.

5.8 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**.

5.9 Using the Recycle Bin

You can use the Recycle Bin to view and restore dropped database objects.

When you drop a table, the space associated with the table is not immediately removed. The Oracle 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.

> **Note:**
>
> The Recycle Bin feature is only available if you run with an Oracle 10g or later database.

- 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.

5.9.1 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**.
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**.

5.9.2 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.

5.10 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.

5.10.1 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 Menu" in *Oracle Application Express End User's Guide*

5.10.2 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.

5.10.2.1 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.

> **See Also:**
>
> "Customizing an Interactive Report Using the Actions Menu" in *Oracle Application Express End User's Guide*

5.10.2.2 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.

> **See Also:**
>
> "Customizing an Interactive Report Using the Actions Menu" in *Oracle Application Express End User's Guide*

5.10.2.3 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**.
5. 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 Application Express End User's Guide*

5.10.3 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 Application Express End User's Guide*

5.10.4 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.
- **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 Application Express End User's Guide*

5.10.5 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.

> **See Also:**
>
> - "Customizing an Interactive Report Using the Actions Menu " in *Oracle Application Express End User's Guide*
> - "*Oracle Database Concepts*" for information about the data dictionary

5.11 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.
5. To view additional information about installed options, currently used features, or National Language Support, select one of the following check boxes and click **Go**:
   - **Version**
   - **Settings**
   - **Options**
   - **National Language Support**
   - **CGI Environment**
   - **Parameters**

5.12 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.

> **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.

- 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.

5.12.1 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.

5.12.1.1 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**
   - **Open Cursors**

5.12.1.2 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**.

5.12.1.3 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**.

5.12.1.4 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**.

5.12.1.5 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**.

5.12.1.6 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:

- **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**.

5.12.1.7 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**.

5.12.2 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.

5.12.3 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**.

   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 Database Performance Tuning Guide*"

5.12.4 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.

5.12.5 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.

5.12.6 About Long Operations Page

The Long Operations page displays the status of various operations that run for longer than 6 seconds (in absolute time).

These operations currently include many backup and recovery functions, statistics gathering, and query execution, and more operations are added for every Oracle release.

5.12.7 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 Database Reference*

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:

- SQL*Plus 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:

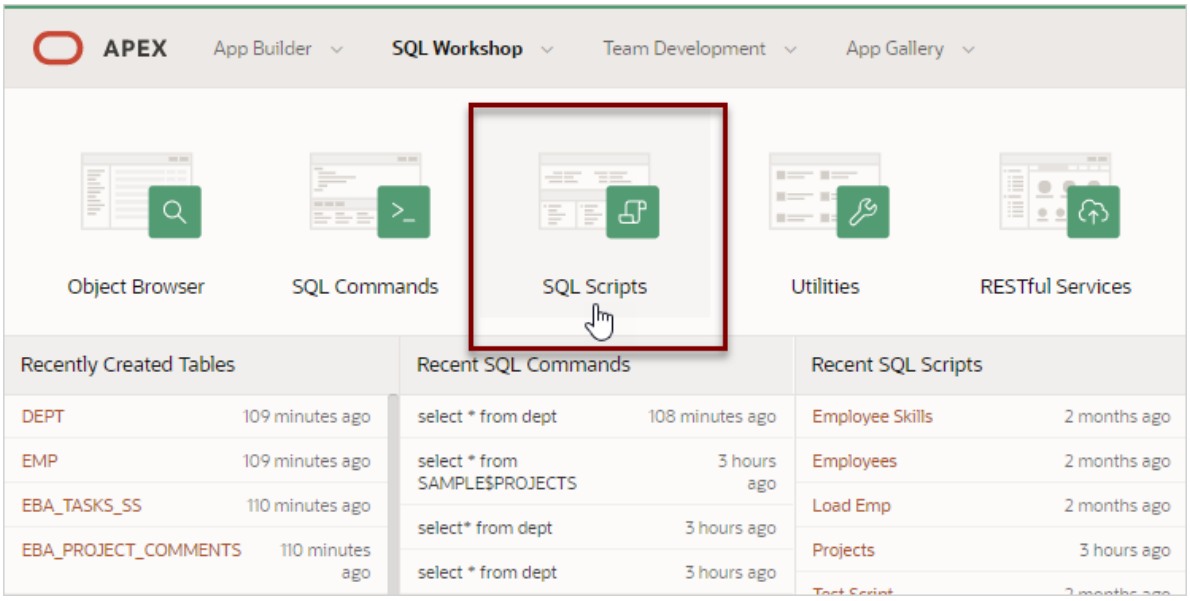
- " Using SQL Scripts "
- " Using SQL Commands "
- "About Long Operations Page"

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.

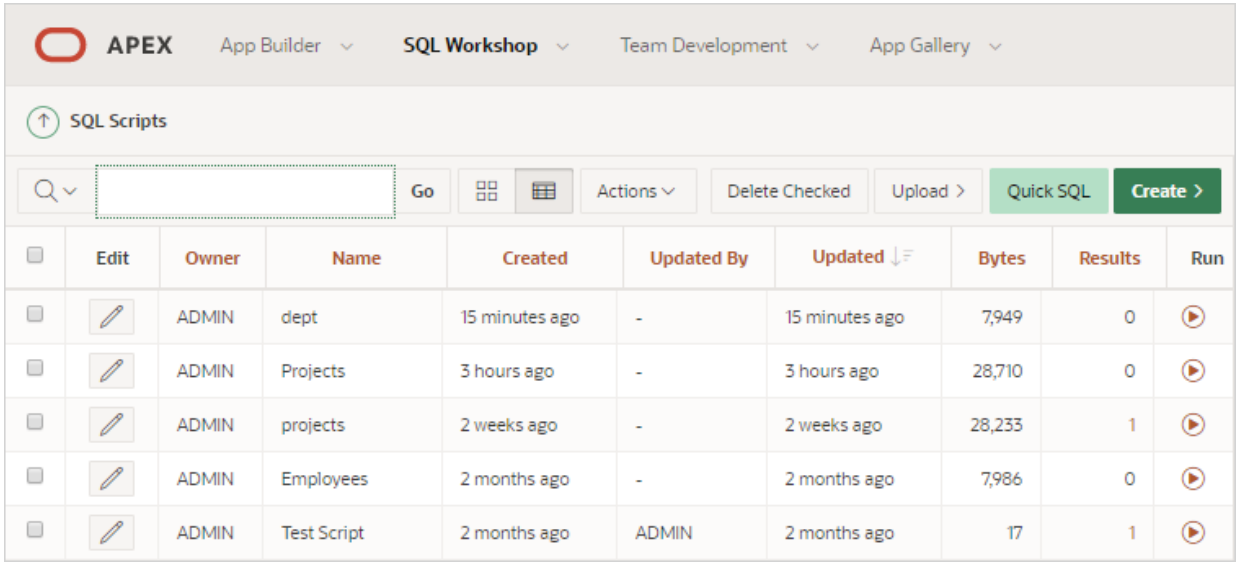
> **Note:**
>
> If the instance administrator has disabled RESTful Services for this Application Express instance, RESTful Services are not available for this instance and the RESTful Services icon does not display.

> **See Also:**
>
> - "Configuring SQL Workshop" in *Oracle Application Express 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.
- **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 the *Oracle Application Express 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"

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.
   Remember that SQL*Plus 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**.

   The SQL Scripts page appears listing your newly uploaded script.

> **Tip:**
>
> The script is parsed during runtime. When parsed, ignored statements such as SQL*PLUS 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.
   - **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.

Table 6-1 describes the buttons and controls available within the Script Editor

Table 6-1 Buttons and Controls 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.

Table 6-1 (Cont.) Buttons and Controls within the Script Editor

Button	Descriptions
Apply Changes	Saves the script and returns to the SQL Scripts report.
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+,)
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.

1. **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.

> **See Also:**
>
> "Using the Create Application Wizard" in the *Oracle Application Express 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:

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 SQL*Plus 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 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.
   - **Run in Background** - runs the script using `DBMS_SCHEDULER` rather than submitting for execution. This option is useful for long running scripts.
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**.

> **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.

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.

1. To launch the Create Application Wizard based on the script:

4. Click **Create App**.

2. 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

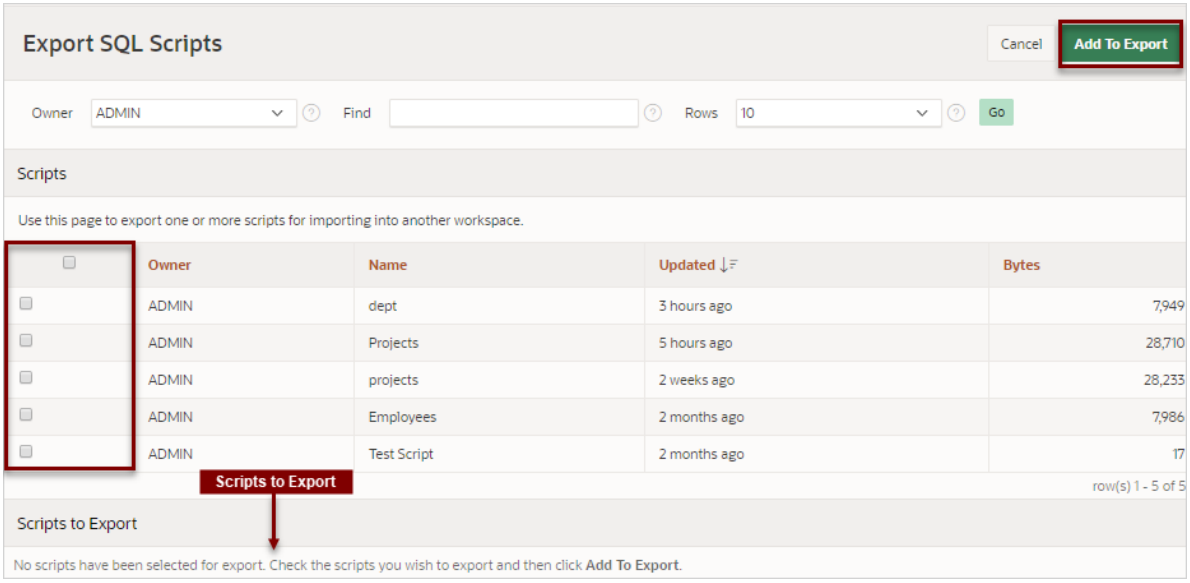
Move scripts from your current Script Repository by exporting them.

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.

1. 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:
   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.

1. 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.
   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 Application Express 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 Application Express 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 Application Express instance administrator and cannot be changed within the Workspace.
3. Click **Cancel** to return to the SQL Scripts page.

7

Enabling Data Exchange with RESTful Services

RESTful Services enable the declarative specification of RESTful services used to access the database.

RESTful Services enable the creation of a set of standards-based API's on top of database objects available for a workspace. Without connecting directly to the underlying data source, these API's allow external systems to interact securely with the data by querying, inserting, updating or deleting.

Prior to release 18.1, the definitions of RESTful services created within Oracle Application Express were stored within the metadata tables of the core Application Express schema. Starting with release 18.1, Oracle recommends migrating of all RESTful services to the Oracle REST Data Services (ORDS) repository. This migration makes it easier to manage RESTful services in a single place using a multitude of tools, including Application Express, SQL Developer, SQL Plus, SQLcl, and so on.

This section introduces you to the concepts of RESTful services and describes how to create, edit and delete RESTful Services using Application Express.

> **Note:**
>
> Your workspace administrator controls whether RESTful services are enabled. If disabled, the RESTful Services icon does not display.

- About Oracle RESTful Services in Application Express
  This section introduces RESTful Services as implemented by Oracle REST Data Services (ORDS) and provides clarification on the terminology used within Application Express and other Oracle tools to reference the different components that make up a RESTful Service.
- Enabling REST Objects from the Object Browser
- Enabling Authorization for REST Enabled Objects
  Restrict access for REST enabled objects on the REST tab in Object Browser. 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.

> **See Also:**
>
> "Controlling RESTful Services for a Workspace" in *Oracle Application Express Administration Guide*

7.1 About Oracle RESTful Services in Application Express

This section introduces RESTful Services as implemented by Oracle REST Data Services (ORDS) and provides clarification on the terminology used within Application Express 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.
- 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 Application Express 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 Application Express configuration includes Oracle REST Data Services (ORDS) 19.x or later.

> **Note:**
>
> The Oracle XML DB HTTP Server with the embedded PL/SQL gateway and Oracle HTTP Server with `mod_plsql` do NOT support RESTful Services.

- 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 Application Express Administration Guide*

Support for Existing RESTful Services from Earlier Releases

Prior to Oracle Application Express release 18.1, the metadata for Application Express based RESTful Services are defined in the core Oracle Application Express metadata repository.

As Oracle moves toward a unified RESTful Services repository based on Oracle REST Data Services (ORDS), you need to migrate RESTful Services previously defined in Oracle Application Express to the ORDS-based repository.

The behavior of Oracle REST Data Services in earlier releases differs from the current release:

- When running Oracle Application Express release 18.1 with Oracle REST Data Services prior to release 17.4.1, only the traditional Application Express based REST Services console is available. You can continue to create and maintain Application Express based RESTful services and they will be stored in the traditional Oracle Application Express metadata repository.
- When running Oracle Application Express release 18.1 with Oracle REST Data Services (ORDS) release 19.1 or later and the workspace currently contains Application Express based RESTful Services.
  - You only have read-only access to the traditional Application Express based RESTful Service pages. The current services continue to work, however, you are not be able to create new or edit existing Application Express based RESTful Services.

> **Note:**
>
> Clicking the **Migrate to ORDS RESTful Services** button migrates all existing Application Express-based RESTful services within the workspace to the ORDS metadata repository.

- When running Oracle Application Express release 18.1 with Oracle REST Data Services (ORDS) release 19.1 or later and the workspace currently does not contain any Application Express based RESTful Services, you are navigated to the new Oracle REST Data Services (ORDS) based RESTful Services pages and will not have access to the traditional Application Express based RESTful Services screens.

> **See Also:**
>
> "Installing Oracle REST Data Services" in *Oracle REST Data Services Installation, Configuration, and Development 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:

- 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. Oracle Application Express 19.2 provides a comprehensive set of components to make consuming RESTful services easier.

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.

`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://server.com/ords/anyco/hr/employees/7978
```

Where:

```
http://server_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://server.com/ords/anyco/hr/employees/7978
```

Server Path
`http://server.com/`

ORDS Alias
`/ords/`

Schema Alias
`/anyco/`

Base Path
`/hr/`

URI Template
`employees/7978`

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 Application Express App Builder User's Guide*

7.1.7 RESTful Services Terminology

Terminology used in Application Express 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.

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 from the Object Browser

Enable REST objects from Object Browser with the REST tab.A new REST tab appears in Object Browser when selecting a `TABLE`, `VIEW`, `PACKAGE`, `PROCEDURE`, or `FUNCTION`. The tab exposes a form that provides the ability to REST Enable a database object using ORDS.

> **Note:**
>
> Oracle Application Express 19.2 installations that utilize Oracle REST Data Services (ORDS) release 19.1 or later support the ability to REST enable database objects using the AutoREST feature of ORDS. While AutoREST 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 Installation, Configuration, and Development Guide*.

Required

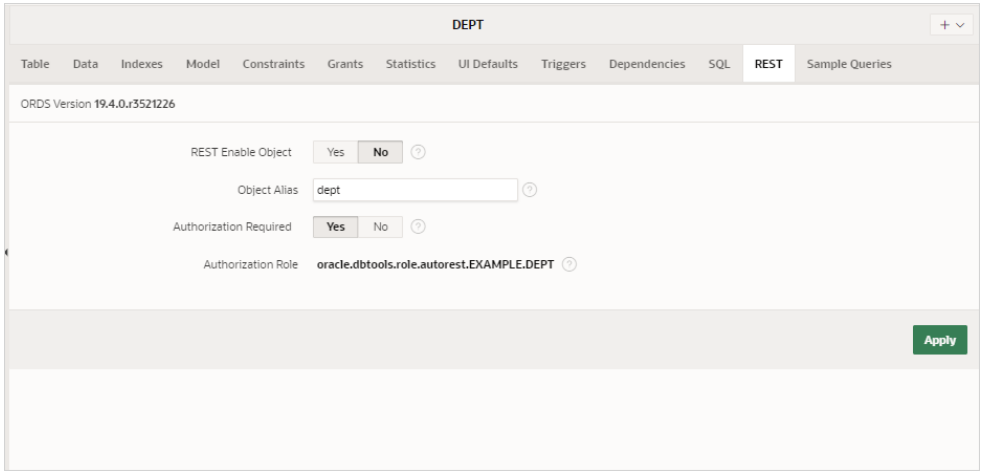
To perform this procedure, you must meet the following requirements:

- 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.

1. To REST Enable an object:
1. On the Workspace home page, click **SQL Workshop**.
2. Select **Object Browser**.
3. From the list of object types, select the object type (such as Tables).
4. Select the object.
5. Click the **REST** tab.

   The object details display the ORDS Version and the form to AutoREST enable the object is displayed.

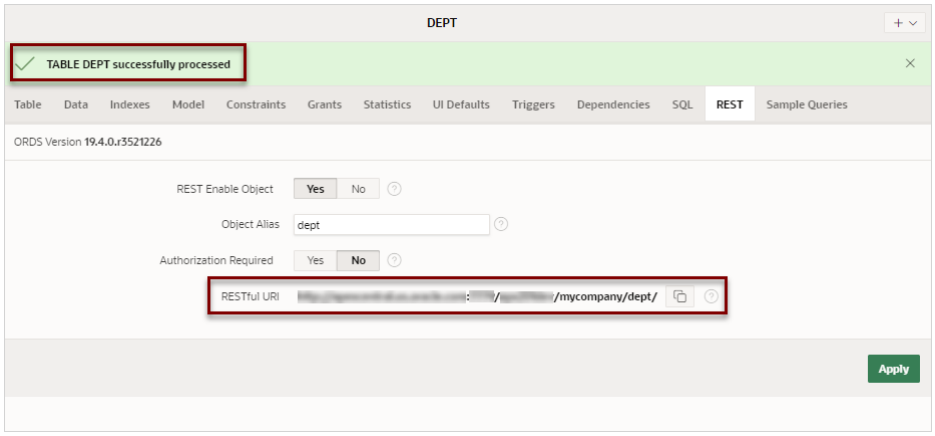


6. In the REST tab:
   a. REST Enable Object - click **Yes** to enable.
   b. Authorization Required - click **No** to disable.

> **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.

   c. Click **Apply**.

   A success message displays and a "RESTful URI" field appears. RESTful URI provides the case sensitive URI that is used to access the REST enabled object.



2. **Optional**

   Once the object is REST Enabled, you can access the data through the supplied URI. The URI is formatted in JSON.

   To view the plain text contents of the RESTful URI using a browser:

7. Copy the RESTful URI.

> **Tip:**
>
> You can click the Copy to Clipboard icon ( ) to quickly copy the RESTful URI.

8. 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:**
>
> - Enabling Authorization for REST Enabled Objects
> - Registering Schema with ORDS
> - Automatic Enabling of Schema Objects for REST Access (AutoREST) in the *Oracle REST Data Services Installation, Configuration, and Development Guide*

7.3 Enabling Authorization for REST Enabled Objects

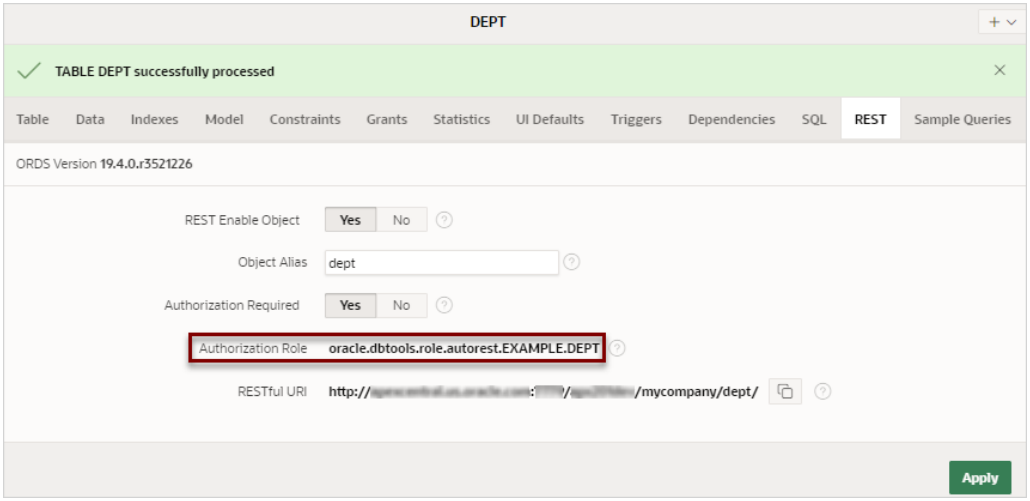
Restrict access for REST enabled objects on the REST tab in Object Browser. Use the resulting Authorization Role information to configure user roles in ORDS.

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 in Object Browser, you must use the resulting Authorization Role to configure your authorized user roles in ORDS.

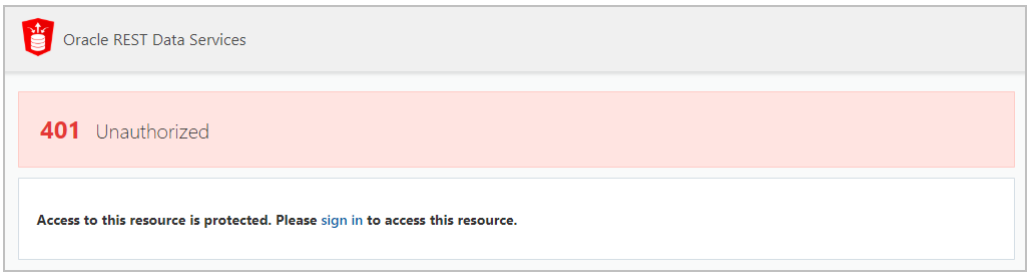
Use the procedures in Configuring Secure Access to RESTful Services in the *Oracle REST Data Services Installation, Configuration, and Development Guide* to configure ORDS.

1. To enable authorization on a REST enabled object:
1. On the Workspace home page, click **SQL Workshop**.
2. Select **Object Browser**.
3. From the list of object types, select the object type (such as Tables).
4. Select the REST enabled object.
5. Select the **REST** tab of the REST enabled object.
6. For Authorization Required, click to **Yes**.
7. Click **Apply**.

A new Authorization Role field appears showing the ORDS created role associated with the AutoREST Enabled object.



Attempting to access the RESTful URI for the object now displays a "401 - Unauthorized" error message.



> **See Also:**
>
> Configuring Secure Access to RESTful Services in the *Oracle REST Data Services Installation, Configuration, and Development Guide*

7.4 How to Access RESTful Services

Access RESTful Services from SQL Workshop.

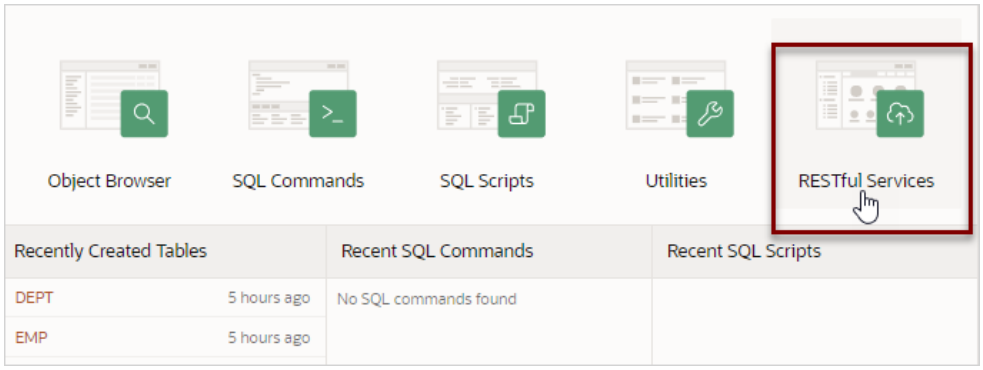
- Accessing RESTful Services
  Access RESTful Services from the Workspace home page by clicking SQL Workshop and then RESTful Services.
- Registering Schema with ORDS
  If you are accessing ORDS Restful Services in a new workspace, you must register the schema with ORDS RESTful Data Services.
- About 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.

> **See Also:**
>
> "Creating an ORDS RESTful Service Module"

7.4.2 Registering Schema with ORDS

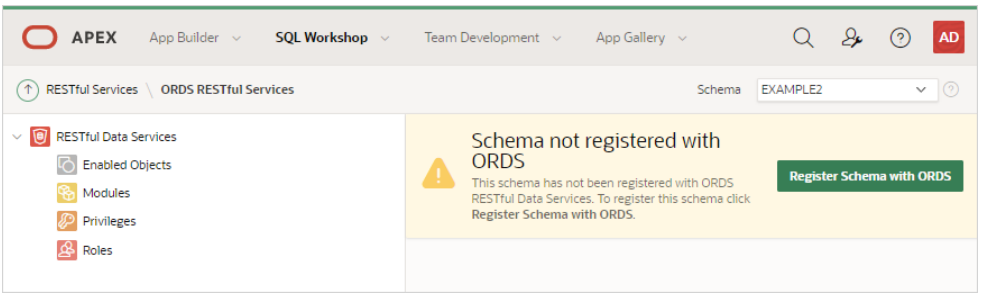
If you are accessing ORDS Restful Services in a new workspace, you must register the schema with ORDS RESTful Data Services.

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**.

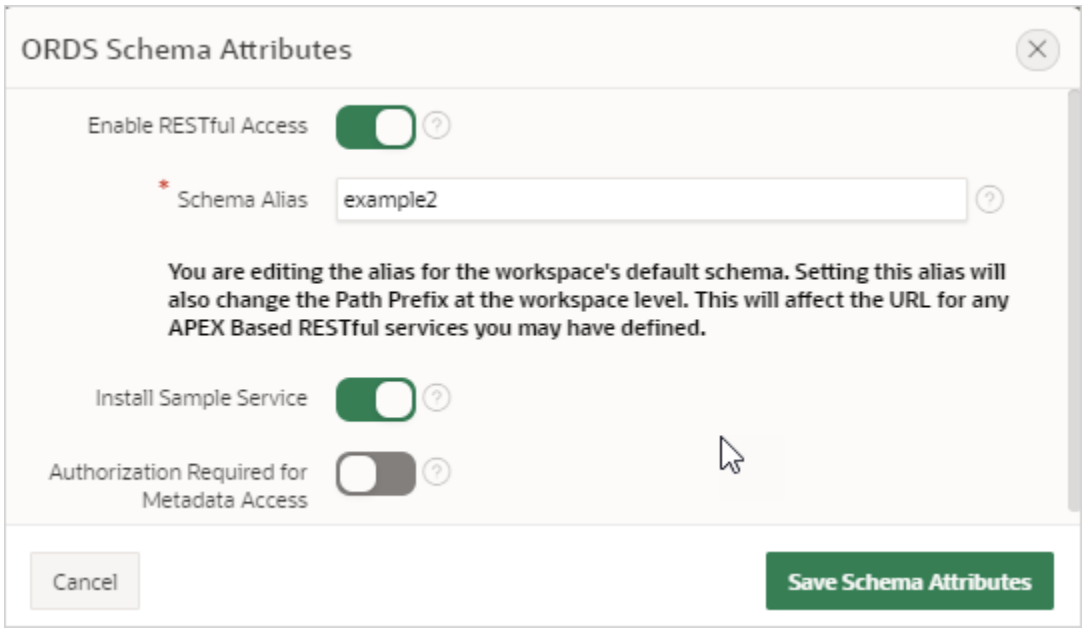
   ORDS RESTful Services page appears. If your schema is not registered with ORDS RESTful Data Services, the following message appears.



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. Oracle recommends that you do not ORDS enable schemas shared amongst multiple workpaces until you are running ORDS 18.3 or higher.



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.

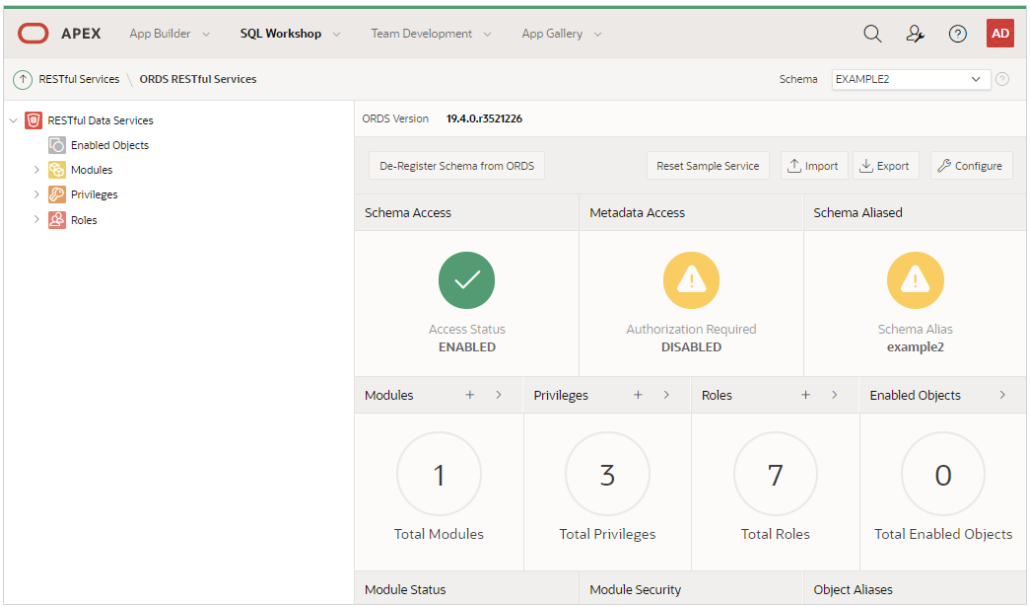
6. Click **Save Schema Attributes**.

   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 page appears displaying the ORDS version.



The following table details the information available in the ORDS RESTful Services Dashboard:

Table 7-1 ORDS RESTful Services Dashboard Parameters

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**: **Reset Sample Service Verification dialog** appears warning 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 Application Express.

Table 7-1 (Cont.) ORDS RESTful Services Dashboard Parameters

Name	Description
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. Oracle recommends that you do not ORDS enable schemas shared amongst multiple workpaces until you are running ORDS 18.3 or higher.
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 Application Express workspace by default has an example RESTful Service Module, `oracle.example.hr`. You can install the sample service while registering the schema with ORDS.

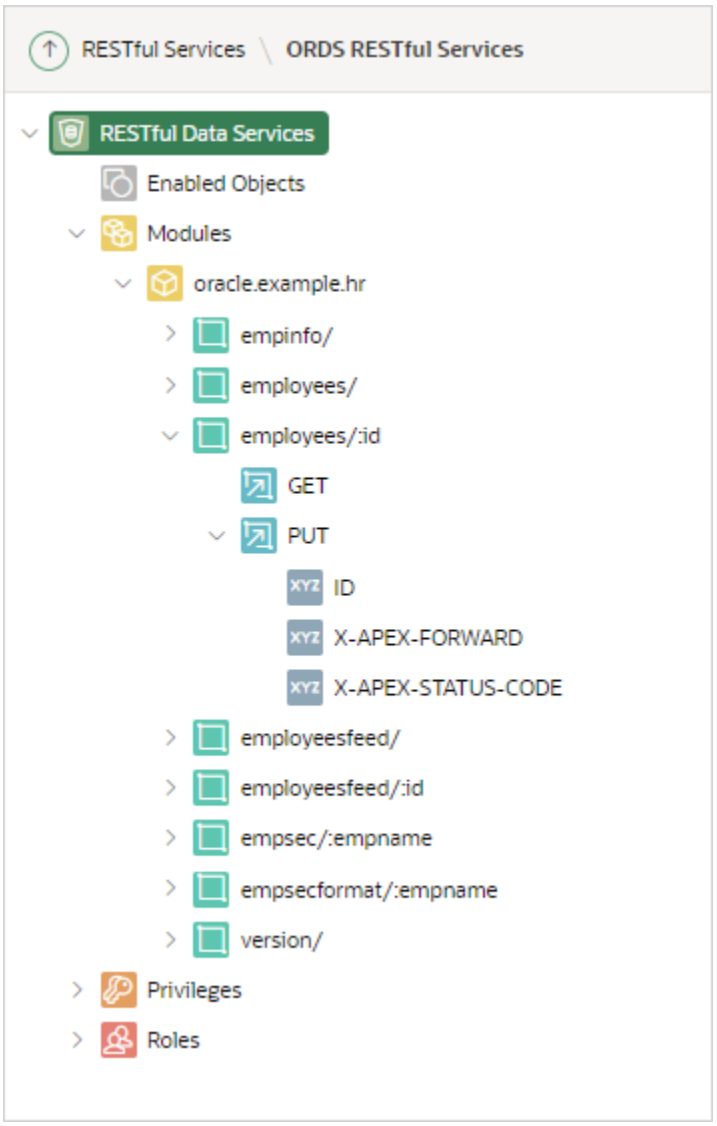
- About the Example RESTful Service Module (oracle.example.hr)
  In ORDS Based RESTful Services, you can choose to install the sample service `oracle.example.hr`, when registering schema with ORDS.
- Returning the Result Set Based on a PL/SQL Block (empsecformat/:empname)
  You can add and test your 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.

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.
- `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"
> - Oracle Learning Library for additional RESTful Service examples. Go to: http://www.oracle.com/oll/apex

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.
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.

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.

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**.

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 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.
- 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 Application Express.
- 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 instance of Application Express.
- 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 instance of Application Express.
- 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**.

   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.

> **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.

   > **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.

7.6.6 Managing an ORDS RESTful Service Privileges

Privileges to access RESTful Service Modules can be restricted in Application Express.

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:**
>
> - "Using Groups to Manage Application Express Users" in *Oracle Application Express 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"

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.
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 instance of Application Express.

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"

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 instance of Application Express.

> **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 Application Express instance level. This allows you to define the URL for a Swagger server. Oracle Application Express sends generated swagger document to the server for rendering when the URL is setup at the instance level. Oracle Application Express just displays the JSON generated for Swagger when the URL is not specified.

To generate a Swagger a document:

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 Application Express 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 Application Express 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:
   - **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**.

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.
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**.

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