Oracle® Cloud
Preparing Data in Oracle Business Intelligence Cloud Service
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November 2015
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Learn how to load and model data, manage users, and administer the service.

**Topics:**
- Audience
- Related Documents
- Conventions

**Audience**

*Preparing Data in Oracle Business Intelligence Cloud Service* is intended for business intelligence analysts and administrators who use Oracle BI Cloud Service:

- Administrators manage access to Oracle BI Cloud Service and perform other administrative duties such as backing up and restoring information for others.
- Business intelligence analysts load and model data and create reports for consumers. Data integration options range from self-service import to operational ETL updates. Analysts can select interactive visualizations and create advanced calculations to reveal insights in the data.
- Business intelligence consumers customize dashboard pages and work with their favorite reports. Dashboards allow consumers to quickly analyze and manage activity across their system.

**Related Documents**

These related Oracle resources provide more information.

- Oracle Public Cloud
  * [http://cloud.oracle.com](http://cloud.oracle.com)
- Getting Started with Oracle Cloud
- Using Oracle Business Intelligence Cloud Service
- REST API Reference for Oracle Business Intelligence Cloud Service
- Data Modeler REST APIs for Oracle BI Cloud Service
- Using Oracle Database Cloud Service (Database as a Service)
Conventions

The text conventions used in this document are described in this topic.

<table>
<thead>
<tr>
<th>Convention</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>boldface</strong></td>
<td>Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.</td>
</tr>
<tr>
<td><em>italic</em></td>
<td>Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.</td>
</tr>
<tr>
<td><strong>monospace</strong></td>
<td>Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.</td>
</tr>
</tbody>
</table>
What’s New in Oracle BI Cloud Service?

Anyone who subscribes to Oracle BI Cloud Service receives automatic upgrades as soon as new features become available. You don’t need to request an upgrade or take any actions yourself. Here’s an overview of new features and enhancements added recently to improve your Oracle BI Cloud Service experience.

November 2015

• Fresh new look to Oracle BI Cloud Service
  Improved design that’s simple to navigate and easy to use. Includes a brand new Academy to help you get the most out of Oracle BI Cloud Service.

• View your data in a heat matrix
  Use a heat matrix view to see a two-dimensional depiction of data in which values are represented by a gradient of colors. See Editing Heat Matrix Views.

• Visualize geographical data on maps
  Use a map view to display data on a map in several different formats and to interact with the data. See Editing Map Views.

• Manage your data files
  Review, download, and delete data files you’ve uploaded for analysis. Quickly see whether you’re close to reaching your quota. See Managing Data Files.

• Enhancements to Data Modeler:
  – Let Oracle BI Cloud Service recommend fact and dimension tables when you start to build your data model. See Creating Fact and Dimension Tables from a Single Table or View.
  – Override the aggregation set for a measure for one or more dimensions. See Specifying Aggregation for Measures in Fact Tables.
  – Sort attribute values by a different column. See Editing Columns.
  – Define variables that return multiple values. See Defining Variables.
  – Programmatically delete any query data cached for your model through new REST APIs. See Data Modeler REST APIs for BI Cloud Service.
  – To make sure the data model is always backed up, a copy of your data model saves automatically when you publish changes to the model. Now it’s easier to recover to a previous version if something goes wrong.
April 2015

- **Explore data using Visual Analyzer**
  Visual Analyzer provides self-service analysis, seamlessly transitioning you between all phases of the analysis lifecycle: data staging, analysis, composition, and consumption. See Getting Started with Visual Analyzer.

  Manage access to Visual Analyzer through a new application role called BIDiscoveryContentAuthor. See Application Roles Predefined in Oracle BI Cloud Service.

- **Add your own data to analyses**
  You can add data from an external source to an analysis in Oracle BI Cloud Service. Adding your own data is sometimes referred to as “mash-up.” See Adding Data from External Sources to Analyses.

- **Upload data models from a file**
  If you’ve modeled your data with Oracle Business Intelligence Enterprise Edition, then you don’t need to start from scratch in Oracle BI Cloud Service. Simply upload your on-premises data model file (.rpd) to Oracle BI Cloud Service and start exploring your data through visualizations, reports, and dashboards. See Uploading On-Premises Data Models.

- **Integrate with Oracle Database Cloud - Database as a Service**
  Connect Oracle BI Cloud Service to any Oracle Database Cloud - Database as a Service instance. See Changing the Database Connection.

March 2015

**Loading Data**

- **Load data programmatically**
  Use methods of REST APIs to programmatically create, manage, and load schemas, tables, and data into Oracle BI Cloud Service. See About the Oracle BI Cloud Service REST API.

February 2015

**Modeling Data**

- **Copy objects in Data Modeler**
  Sometimes it’s quicker to copy objects rather than starting from scratch. You can copy fact tables, dimension tables, database tables, and database views. See Copying Model Objects.

- **Drag and drop to extend dimensions**
  We’ve made it easier to add columns to dimension tables. Simply drag and drop tables or views that contain columns that you want to add to the dimension table. See Adding Columns from Another Source to a Dimension Table.

- **Aggregate before or after calculating the expression for a measure**
  You can create calculations that contain pre-aggregated measures. See About Creating Calculated Measures.

- **Use fact tables indirectly joined through dimension tables in expressions**
When you define a calculated measure in Expression Editor, the Expression Elements section includes the current fact table, any dimension tables joined to that table, and any fact tables indirectly joined through a dimension table. See About the Expression Editor.

- **Data Modeler detects relationships and suggests facts and dimensions for your model**

  When you add source objects with relationships to other tables or views to the model, Data Modeler asks whether you want to include related fact or dimension tables and offers to add them to the model.
This part introduces you to Oracle BI Cloud Service.

**Chapters:**

- Getting Started with Data Preparation in Oracle Business Intelligence Cloud Service
Getting Started with Data Preparation in Oracle Business Intelligence Cloud Service

This topic describes how to get started with Oracle BI Cloud Service.

Topics:

• About Oracle BI Cloud Service
• How Does Oracle BI Cloud Service Integrate with Oracle Database Cloud Service?
• Before You Begin with Oracle Business Intelligence Cloud Service
• How to Begin with Oracle Business Intelligence Cloud Service
• Typical Workflow for Administrators of Oracle BI Cloud Service
• Accessing Oracle BI Cloud Service
• Top Tasks for Oracle BI Cloud Service

About Oracle BI Cloud Service

Oracle BI Cloud Service is a BI platform in the cloud that makes analytics available to everyone, from the workgroup to the enterprise. With Oracle BI Cloud Service, it’s easy to combine data from diverse sources and quickly create rich, interactive analytic applications and reports.

Reports built with Oracle BI Cloud Service are immediately available on mobile devices, with no additional programming. All iOS and Android devices are supported.

Preparing business data for analysis is easy with Oracle BI Cloud Service:

• Use simple ETL tools and industry standard APIs to import your curated data into the Oracle database and perform ongoing updates. Allow others to load data self-service. See Loading Data in Oracle Business Intelligence Cloud Service.

• Build data models to present data for analysis that better reflects the structure of your business. See Modeling Data in Oracle Business Intelligence Cloud Service.

• Manage what people can see and do in Oracle BI Cloud Service. Determine who can load and model data, who can create reports and dashboards from the data model, and who can build ad-hoc visualizations based on the same data or any alternative data source they choose to upload. See Managing What Users Can See and Do.

• Take regular snapshots to back up the data model, content that analysts save to the catalog, and security information. See Backing Up and restoring.
Assemble compelling analytics from your business data with dozens of interactive visualizations and automatic suggestions. Read Using Oracle Business Intelligence Cloud Service to learn how to create analytics in Oracle BI Cloud Service and share them with others.

**How Does Oracle BI Cloud Service Integrate with Oracle Database Cloud Service?**

You need a database to store and manage the data that you analyze in Oracle BI Cloud Service. Oracle BI Cloud Service can integrate with Oracle Database Cloud - Database Schema Service or Oracle Database Cloud - Database as a Service:

- **Oracle Database Cloud - Database Schema Service** — Single schema-based service, included with Oracle BI Cloud Service.
  
  Oracle BI Cloud Service comes integrated with Database Schema Service so there’s no extra step if you want to use this database.
  
  See also Using Oracle Database Cloud - Database Schema Service.

- **Oracle Database Cloud - Database as a Service** — Dedicated virtual machine with a fully configured, running Oracle Database instance.
  
  You can configure Oracle BI Cloud Service to integrate with Database as a Service. For this to work, Oracle BI Cloud Service and Database as a Service must be running in the same data center and your administrator must provide the connection details. See Changing the Database Connection.
  
  See also Using Oracle Database Cloud - Database as a Service.

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**Note:**

Similar to Oracle Database Cloud Service, Oracle BI Cloud Service uses the concepts of column and table. See Terminology for important information on how Oracle BI Cloud Service uses these terms.

---

**Before You Begin with Oracle BI Cloud Service**

It’s the administrator’s job to get Oracle BI Cloud Service ready for others to use.

Before you allow users to sign in to Oracle BI Cloud Service, familiarize yourself with:

- **Oracle Cloud**
  
  Create and configure your account on Oracle Cloud. For more information about creating an account on Oracle Cloud, see Requesting a Trial Service or Purchasing a Subscription to an Oracle Cloud Service in Getting Started with Oracle Cloud.

- **Oracle Database Cloud Service**
  
  You need Oracle Database Cloud - Database Schema Service or Oracle Database Cloud - Database as a Service to store and manage data for Oracle BI Cloud Service. See How Does Oracle BI Cloud Service Integrate with Oracle Database Cloud Service?

- **Oracle Business Intelligence Cloud Service**
  
  Set up accounts for others and assign them roles in Oracle BI Cloud Service. Connect Oracle BI Cloud Service to a different database, if required. For more
information about setting up Oracle BI Cloud Service, see Typical Workflow for Administrators of Oracle BI Cloud Service.

**Typical Workflow for Administrators of Oracle BI Cloud Service**

Here are the common tasks to administer Oracle BI Cloud Service.

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>More information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start trial and paid services</td>
<td>Provide your information and sign up for a free trial service, or request a paid service.</td>
<td>Requesting a Trial Subscription or Purchasing a Subscription to an Oracle Cloud Service section in Getting Started with Oracle Cloud</td>
</tr>
<tr>
<td>Activate trial and paid services</td>
<td>After Oracle provisions your service, sign in and activate it.</td>
<td>Activating Your Trial Subscription or Activating Your Order for an Oracle Cloud Service section in Getting Started with Oracle Cloud</td>
</tr>
<tr>
<td>Add and manage users</td>
<td>Create accounts for your users.</td>
<td>Managing Users and Roles section in Getting Started with Oracle Cloud</td>
</tr>
<tr>
<td>Access the service</td>
<td>Access Oracle BI Cloud Service.</td>
<td>Accessing Oracle BI Cloud Service</td>
</tr>
<tr>
<td>Manage what other users can see and do</td>
<td>Assign appropriate application roles to everyone using the service.</td>
<td>Managing What Users Can See and Do</td>
</tr>
<tr>
<td>Connect to a different cloud database</td>
<td>Integrate Oracle BI Cloud Service with a different cloud database.</td>
<td>Changing the Database Connection</td>
</tr>
<tr>
<td>Monitor the service</td>
<td>Check on the day-to-day operation of your service, monitor performance, and review important notifications.</td>
<td>My Account versus My Services in Getting Started with Oracle Cloud</td>
</tr>
<tr>
<td>Manage the service</td>
<td>Manage Oracle BI Cloud Service including users, backups, database connections, and more.</td>
<td>Managing Oracle Business Intelligence Cloud Service</td>
</tr>
<tr>
<td>Upsize your service subscription</td>
<td>Add capacity to your existing paid service by upsizing it to a higher subscription level.</td>
<td>Changing Your Paid Subscription to an Oracle Cloud Service in Getting Started with Oracle Cloud</td>
</tr>
</tbody>
</table>

**About Oracle BI Cloud Service Roles and Users**

Administrators must ensure everyone’s roles and privileges are properly configured before users sign in to Oracle BI Cloud Service.

Some roles are specific to Oracle BI Cloud Service and some roles apply across Oracle Cloud services:

- **Oracle Cloud** — See Oracle Cloud User Roles and Privileges in *Getting Started with Oracle Cloud* for information about roles and privileges that are common across Oracle Cloud services.

- **Oracle BI Cloud Service** — Administrators control access to features in Oracle BI Cloud Service through a set of predefined application roles. See Application Roles Predefined in Oracle BI Cloud Service and Functionality Enabled by Application Roles to learn which features a user can access with a particular application role.
How to Begin Preparing Data in Oracle BI Cloud Service

Administrators, data loaders, and data modelers each play a part preparing business data for analysis. When your business data is ready for analysis, publish the data model so that BI content developers can start to visualize the data and share analytics with co-workers, clients, and business partners.

<table>
<thead>
<tr>
<th>Task</th>
<th>User</th>
<th>More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sign in to Oracle BI Cloud Service as the administrator</td>
<td>Administrator</td>
<td>Accessing Oracle BI Cloud Service</td>
</tr>
<tr>
<td>Enable other users to load and model data through application roles</td>
<td>Administrator</td>
<td>Typical Workflow for Managing What Users See and Do</td>
</tr>
<tr>
<td>Sign in to Oracle BI Cloud Service</td>
<td>All</td>
<td>Accessing Oracle BI Cloud Service</td>
</tr>
<tr>
<td>Load data for analysis into Oracle Database Cloud Service</td>
<td>Data loaders</td>
<td>Typical Workflow for Loading Files</td>
</tr>
<tr>
<td>Model the data so content developers can visualize the data through reports and dashboards</td>
<td>Data modelers</td>
<td>Typical Workflow for Modeling Data</td>
</tr>
<tr>
<td>Change the database connection, take regular snapshots, and more</td>
<td>Administrators</td>
<td>Managing Oracle Business Intelligence Cloud Service</td>
</tr>
</tbody>
</table>

Note: To learn how to report on the data, read Using Oracle Business Intelligence Cloud Service.

Accessing Oracle BI Cloud Service

Your “Welcome to Oracle BI Cloud Service” email contains a direct link to the service. Simply click this link and sign in. Alternatively, sign in to Oracle Cloud at cloud.oracle.com and then select Oracle BI Cloud Service.

Oracle BI Cloud Service displays a product tour when you sign in for the first time. At the end of the tour, you see your Home page which has links to all the Oracle BI Cloud Service features available to you.
Top Tasks for Oracle BI Cloud Service

In Oracle BI Cloud Service, there are top tasks for data loading, data modeling, and managing.

Tasks:

- Top Tasks for Data Loading
- Top Tasks for Data Modeling
- Top Tasks for Managing

Top Tasks for Data Loading

The top tasks for data loading are identified in this topic.

- Loading Your Files into a New Table
- Loading Your Files into an Existing Table
- Correcting Errors in Data Loads
- Loading Relational Tables Using SQL Developer
- Loading On-Premises Relational Sources and Files to the Cloud Using Oracle BI Cloud Service Data Sync
- Automating Loading Data Using Programmatic Methods
Top Tasks for Data Modeling

The top tasks for data modeling are identified in this topic.

- Reviewing Source Tables and Data
- Adding Your Own Source Views
- Creating Fact and Dimension Tables from a Single Table or View
- Creating Fact Tables Individually
- Creating Dimension Tables Individually
- Joining Fact and Dimension Tables
- Creating Calculated Measures
- Creating Derived Attributes
- Creating a Time Dimension
- Editing Hierarchies and Levels
- Securing Access to Objects in the Model
- Publishing Changes to the Data Model

Top Tasks for Managing

The top tasks for managing Oracle BI Cloud Service are identified in this topic.

- Assigning Members and Actions to Application Roles
- Assigning Application Roles to Users
- Assigning Application Roles to User Roles
- Adding Your Own Application Roles
- Taking a Snapshot
- Restoring from a Snapshot
- Downloading Snapshots
- Changing the Database Connection
- Uploading Data Models from a File (.rpd)
Part II

Loading Data for Oracle Business Intelligence Cloud Service

This part explains how to load data that you want to model using Oracle Business Intelligence Cloud Service.

Chapters:

• Getting Your Data to the Cloud
• Loading Data from Files
• Loading Data from Relational Tables
• Automating Loading Data Using Programmatic Methods
Getting Your Data to the Cloud

This topic describes how to get data into the cloud database integrated with Oracle BI Cloud Service so you can start modeling the data.

**Topics:**

- Uploading Your Data to the Cloud

**Uploading Data to the Cloud**

Oracle BI Cloud Service requires you to upload your data to an Oracle Database Cloud Service before you can start to build a data model from which you can create projects, reports and dashboards.

Oracle BI Cloud Service can integrate with Database Schema Service or Database as a Service. See How Does Oracle BI Cloud Service Integrate with Oracle Database Cloud Service?

Oracle BI Cloud Service provides simple tools to upload files and relational tables, as well as automated mechanisms for data movement to the cloud.

You can:

- Load your data from files using Data Loader (a web-based data loader available in Oracle BI Cloud Service) or Data Sync.
  
  See Loading Data from Files.

- Load data from relational tables (for example, an Oracle database) using Data Sync or SQL Developer.
  
  See Loading Data from Relational Tables.

- Use programmatic methods to automate data loading from on-premises and cloud sources using REST APIs or PL/SQL scripts.

  See Automating Loading Data Using Programmatic Methods.

This topic describes different ways to load data that you want to model. Users can also load their own data for ad-hoc analysis with Visual Analyzer. See Adding Your Own Data in Using Oracle Business Intelligence Cloud Service.

**Compare Data Loading Tools**

This table compares the various tools that are available.

<table>
<thead>
<tr>
<th></th>
<th>Data Loader</th>
<th>Data Sync</th>
<th>SQL Developer</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSV and delimited files</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Feature</td>
<td>Data Loader</td>
<td>Data Sync</td>
<td>SQL Developer</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------</td>
<td>-----------</td>
<td>---------------</td>
</tr>
<tr>
<td>Excel files</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oracle database source</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Other relational database source</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post load processing</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Scheduler</td>
<td>Yes</td>
<td></td>
<td>Yes*</td>
</tr>
<tr>
<td>Auto-retry on failure</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer network uses proxy</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

* Operating system scheduler
Loading Data from Files

You can load data from text files and spreadsheets into the database included with Oracle BI Cloud Service using Data Loader. Alternatively, you can use Data Sync. With Data Sync, you can load data from files into either Oracle Database Cloud Service (Database Schema Service or Database as a Service).

Topics

- Loading Data from Files using Data Loader
- Loading Data from Files using Data Sync

Loading Data from Files Using Data Loader

You can load data from text files (TXT and CSV) and Microsoft Excel spreadsheets (XLS and XLSX) into the Oracle Database Cloud - Database Schema Service included with Oracle BI Cloud Service.

Topics

- Typical Workflow for Loading Files using Data Loader
- About Data Loader
- Loading Your Files into a New Table
- Loading Your Files into an Existing Table
- Viewing Data Load History
- Correcting Errors in Data Loads

Typical Workflow for Loading Files using Data Loader

Here are the common tasks to load files containing data you want to model:

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load files into a new table.</td>
<td>Use Data Loader to load files from an external source into a new table on Oracle Database Cloud - Database Schema Service.</td>
<td>Loading Your Files into a New Table</td>
</tr>
<tr>
<td>Load files into an existing table.</td>
<td>Use Data Loader to load files into an existing table, to add new records, or to overwrite previously uploaded values.</td>
<td>Loading Your Files into an Existing Table</td>
</tr>
<tr>
<td>View reports of previous data loads.</td>
<td>View the results of previous attempts to load files with Data Loader.</td>
<td>Viewing Data Load History</td>
</tr>
</tbody>
</table>
This topic describes how to load data that you want to model. Users can also load their own data for ad-hoc analysis with Visual Analyzer. See Adding Your Own Data in Using Oracle Business Intelligence Cloud Service.

**About Data Loader**

Data Loader is an easy-to-use browser-based tool for loading text files (TXT and CSV) and Microsoft Excel spreadsheets (XLS and XLSX) into the Oracle Database Cloud - Database Schema Service included with Oracle BI Cloud Service. You don’t need the assistance of a database administrator to load data files because Data Loader is wizard-driven and intuitive.

**Note:** Data Loader loads data to Oracle Database Cloud - Database Schema Service. If your Oracle BI Cloud Service is connected to Oracle Database Cloud - Database as a Service, see Loading Data from Relational Tables and Automating Loading Data Using Programmatic Methods.

Use Data Loader to perform a full manual refresh, increment manual data loading, upsert (insert and update) data into existing tables, and add data to your model.

You can:

- Load moderate amounts of data from sources, such as Microsoft Excel spreadsheets, into destination tables on Oracle Database Cloud - Database Schema Service, so that you can include the data in analyses and dashboards.
- Perform simple data transformations.
- Map columns.
- Correct load errors.

Data Loader can handle input files of up to 500,000 rows. After loading data, use Data Modeler to model your business data for reports and dashboards.

As a guideline, use SQL Developer for input files exceeding 500,000 rows. You view and download SQL Developer and corresponding documentation on Oracle Technology Network (OTN).

In addition to Data Loader, there are other ways that you can upload data that you want to model. See Loading Data from Relational Tables and Automating Loading Data Using Programmatic Methods for more information.

**Note:** This topic describes how to load data that you want to model. Users can also load their own data for ad-hoc analysis with Visual Analyzer. See Adding Your Own Data in Using Oracle Business Intelligence Cloud Service.
About Column Types

Data that you upload to Oracle BI Cloud Service through Data Loader is stored as either a number, date, or character, and is in UTF-8 character encoding.

<table>
<thead>
<tr>
<th>Column Type</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMBER</td>
<td>Stores only numbers of the following characters: numbers from 0-9, the period, and the dash.</td>
<td>You can optionally specify the column length and number of decimal places. If you specify decimal places without specifying column length, then you can specify an asterisk (*). The asterisk indicates that the column length is obtained from the underlying database.</td>
</tr>
<tr>
<td>TIMESTAMP</td>
<td>Stores dates in different formats, depending on the regional configuration of the underlying database.</td>
<td>If the type is TIMESTAMP, you can’t specify a column length or number of decimal places.</td>
</tr>
<tr>
<td>VARCHAR2</td>
<td>Stores a character string.</td>
<td>You must specify a column length if the column type is VARCHAR2. Supported lengths for character strings are 4000 for Oracle Database 11g and up to 32767 for Oracle Database 12c, depending on the database configuration.</td>
</tr>
</tbody>
</table>

Transforming Your Data

When you upload data to Oracle Database Cloud - Database Schema Service using Data Loader you can use transformations to normalize the content of the data.

Several types of transformations are available:

<table>
<thead>
<tr>
<th>Transformation Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uppercase</td>
<td>Converts every character in the data column to upper case.</td>
</tr>
<tr>
<td>Lowercase</td>
<td>Converts every character in the data column to lower case.</td>
</tr>
<tr>
<td>Trim spaces</td>
<td>Deletes trailing spaces in the data column. For example, &quot;ABC &quot; is trimmed to &quot;ABC&quot; in the data column.</td>
</tr>
<tr>
<td>Format as a number</td>
<td>Preserves specific characters in the string. These characters include numbers from 0 through 9, a period, and a dash. For example, the string &quot;$-1,000.00&quot; is transformed into &quot;-1000.00&quot;, which is a valid column of type NUMBER in the table.</td>
</tr>
</tbody>
</table>

Loading Your Files into a New Table

You can load your files into a new table on Oracle Database Cloud - Database Schema Service. For example, you might want to upload a denormalized file that contains fact and dimensional data that you want to use in your data model.

Video

To load data into a new table using Data Loader:

1. Sign in to Oracle BI Cloud Service.
2. On the Home page, click **Load**.

![Load](Image)

3. In Data Loader, click the **Load Data** button.

4. Use the Select Data page to specify the data to load into the database. Click **Upload** to select a file from which to upload data, and then click **Open**.

Alternatively, you can copy the data from another source and paste it into the preview pane on the page. The data loads into the pane and becomes read-only.

If the results aren’t what you expected to see in the preview pane, click **Clear** to remove pasted or uploaded text, and then try again.

5. Optionally, specify the following on the Select Data page:

<table>
<thead>
<tr>
<th>Field or Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignore the first <em>number</em> lines</td>
<td>Enter the number of first rows to skip during loading. For example, you might want to skip rows that are related to the title of the file.</td>
</tr>
<tr>
<td>The first line contains header names</td>
<td>Select this option to indicate that the first row of data to load contains header names. The first row of data is the one after the number of rows that you specified to skip.</td>
</tr>
<tr>
<td>Delimiter</td>
<td>Select the type of delimiter that is used to separate the data in your file. The delimiter can be a <strong>Comma</strong>, <strong>Pipe</strong>, or <strong>Tab</strong>.</td>
</tr>
</tbody>
</table>

6. Click **Next**.

7. On the Select Destination page, select **New Table**, and then name the table. Data Loader analyzes the data and suggests data types, lengths, and column names for the new table.

Data Loader also provides a proposed mapping of the first row, the destination table, and the uploaded data. Review the proposed mapping, and then optionally apply the following changes before loading the data:

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Transformation</td>
<td>Specify transformations such as converting cases, removing blank spaces at the start or end, or formatting the values of the column as a number. For more information, see Transforming Your Data.</td>
</tr>
<tr>
<td>Table Column Name</td>
<td>Change the default name for the column.</td>
</tr>
<tr>
<td>Table Column Type</td>
<td>Change the default data type for the column, such as NUMBER, TIMESTAMP, or VARCHAR2. For more information, see About Column Types.</td>
</tr>
<tr>
<td>Column Name</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Table Column Length</td>
<td>Specify an integer value for the length of the column. You must specify a length if the column type is VARCHAR2. Don’t specify a length if the type is TIMESTAMP. The maximum length is 4,000 bytes. Be careful that you don’t exceed this limit when loading characters with multi-byte encoding.</td>
</tr>
<tr>
<td>Table Column Number of Decimal Places</td>
<td>For columns with a numeric data type, specify an integer value for the number of decimal places to use for the data.</td>
</tr>
</tbody>
</table>

8. Click Next.

9. On the Review page, select **Rows to be Inserted** or **Rows to be Updated** to review the rows to be loaded.

![Rows to be Inserted](image)

10. Click Next to load the data to the table. When the data is loaded, you see details of records that were either loaded successfully or unsuccessfully.

   The Summary page provides a link for you to download successfully processed records. If you encountered errors, a second link is provided to download the unsuccessfully processed records.
11. Optionally, click **Download Records** to open or save a Microsoft Excel file of the records that were processed successfully or unsuccessfully. See **Correcting Errors in Data Loads** for more information.

12. Click **OK**.

After the data is loaded, you can model it as described in **Modeling Data in Oracle Business Intelligence Cloud Service**.

### Loading Your Files into an Existing Table

You can load your files into an existing table on Oracle Database Cloud - Database Schema Service. For example, you might want to upload two new columns that were added to a table, or you might want to overwrite columns whose names have changed.

To load data into an existing table using Data Loader:

1. Sign in to Oracle BI Cloud Service.

2. On the Home page, click **Load**.

3. In Data Loader, click the **Load Data** button.

4. Use the Select Data page to specify the data to load into the database. Click **Upload** to select a file from which to upload data, and then click **Open**.

Alternatively, you can copy the data from another source and paste it into the preview pane on the page. The data loads into the pane and becomes read-only.

If the results aren’t what you expected to see in the preview pane, then click **Clear** to remove pasted or uploaded text, and then try again.

5. Optionally, specify the following on the Select Data page:

<table>
<thead>
<tr>
<th>Field or Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignore the first <em>number</em> lines</td>
<td>Enter the number of first rows to skip during loading. For example, you might want to skip rows that are related to the title of the file.</td>
</tr>
<tr>
<td>The first line contains header names</td>
<td>Select this option to indicate that the first row of data to load contains header names. The first row of data is the one after the number of rows that you specified to skip.</td>
</tr>
<tr>
<td>Delimiter</td>
<td>Select the type of delimiter that is used to separate the data that your file. The delimiter can be a <strong>Comma</strong>, <strong>Pipe</strong>, or <strong>Tab</strong>.</td>
</tr>
</tbody>
</table>

6. Click **Next**.

7. On the Select Destination page, select **Existing Table**, and then select the table name. Select whether to remove existing data before loading the updated data.
Data Loader provides a proposed mapping of the first row, the destination table, and the uploaded data. Review the proposed mapping, and then optionally apply the following changes before loading the data:

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Column Name</td>
<td>Select which column to load for each row. Compare the Data Column Name with the Table Column Name to ensure that the columns will load appropriately. Select <strong>Do not load this column</strong> to skip loading for that row.</td>
</tr>
</tbody>
</table>

**Data Transformation** Specify transformations, such as converting cases, removing blank spaces at the start or end, or formatting the values of the column as a number. See Transforming Your Data for more information.

**Update Row on Match** Select this option to update (overwrite) data when the uploaded data matches the data for the destination column. If the data doesn’t match, or if you don’t select this option, the data is inserted (appended). Note that in some cases, you need to select multiple columns to identify matching columns (for example, customer first name and customer last name).

8. Click **Next**.

9. On the Review page, select **Rows to be Inserted** or **Rows to be Updated** to review the rows to be loaded.
10. Click **Next** to load the data to the table. When the data is loaded, you see details of records that were loaded successfully or unsuccessfully.

The Summary page provides a link for you to download successfully processed records. If you encountered errors, a second link is provided to download the unsuccessfully processed records.

11. Optionally, click **Download Records** to open or save a comma-separated file of the records that were processed successfully or unsuccessfully.

You can open this file in Microsoft Excel. See [Correcting Errors in Data Loads](#) for additional information.

12. Click **OK**.

### Viewing Data Load History

After loading data into new or existing tables, you can view reports of previous data loads. For example, you can view a report about data that you loaded yesterday from Microsoft Excel.

To view the results of previous data loads:

1. Sign in to Oracle BI Cloud Service.
2. On the Home page, click **Load**.

Data Loader shows information about previous data load operations.

![Data Loader Table]

3. Click a link in the list of reports to display details for that data load operation. For example, click the number of inserted records to see a report of the rows that were added. See [Correcting Errors in Data Loads](#) for additional information.

4. In the Search bar, use the **Search** button to filter the reports. Select **All Columns** or select a column name to search only results displaying in a specific column, and then enter a search string and click **Go**.
For example, you can create filters, such as "User contains default" or "Inserted Records contains 100."

5. Optionally, create filters by clicking on the headers for each column in the report to display a list in which you select a particular value for the filter. Select **Sort Ascending** or **Sort Descending** to sort your column.

You can add (or remove) a **Control Break** in a column header. A **Control Break** separates the report into various categories, depending on the data. The figure shows that the **Control Break** occurs on the Inserted Records column and separates content into different headers taken from the distinct operation on the values of that column.
Correcting Errors in Data Loads

If you find that some data records do not load, then you can display a report of the errors that occurred and correct those errors.

Video

When you load data, you might:

• See numeric data type mismatches — A common error when loading data results from a mismatch of data types between the loaded data and the database table structure. Look for yellow shading that indicates these types of errors. To resolve this error, select the **Format as a number** data transformation for all numeric columns during a data load. See Transforming Your Data for additional information.

• Load data to a table or experience a system issue that prevents all of your data from properly loading. You can resolve this issue by removing all data in the existing table and starting over. You can reload the data and set the **Remove existing data before loading new data** option on the Select Data page.

• Load data to the incorrect column or make a similar mistake that requires you to modify tables in Oracle Database Cloud - Database Schema Service. You can use Oracle APEX utilities for more extensive maintenance, such as dropping tables and uploading, inserting, and deleting data from existing tables. See About PL/SQL Database Scripts for additional information on Oracle APEX.

To review data load issues, you click the errors on the page that are highlighted in red (by default). Because the details report is filtered, click **Reload Records**. The Select Destination page and certain options are selected by default. You can load the number of records that match the filter. This number is the same as the last number that is displayed on the report pagination element at the bottom of the page.

To resolve errors in attempts to load data:

1. Sign in to Oracle BI Cloud Service.
2. On the Home page, click **Load**.
   
   ![Load]

   Data Loader shows information about previous data load operations.
3. In the Not Loaded Records column, click a number greater than zero.
4. You use the Load Details page to view information about the records that were processed and those that encountered errors. For example, you might see that the value of a record was too large for the column.

5. Optionally, click Download ERROR Records to save the error report to a CSV file. When you have downloaded the error records, you can correct and re-load them as appropriate.

6. Optionally, click Reload Records to display the Select Destination page, from which you can specify a new or existing table for the uploaded data. Select Remove existing data before loading new data on the Select Data page to remove data before loading.
This topic describes how to load relational tables into the Oracle Database Cloud Service integrated with Oracle BI Cloud Service.

Topics:

- Loading On-Premises Relational Sources and Files to the Cloud Using Oracle BI Cloud Service Data Sync
- Loading Relational Tables Using SQL Developer

Loading On-Premises Relational Sources and Files to the Cloud Using Oracle BI Cloud Service Data Sync

Oracle BI Cloud Service Data Sync is a wizard-driven utility that enables you to upload on-premises relational sources or CSV files to Oracle Database Cloud Service.

Consider using Oracle BI Cloud Service Data Sync when you want to:

- Load data sources other than Oracle.
- Load a combination of data sources, such as CSV and Oracle relational files.
- Perform incremental data loads or rolling deletes.
- Perform insert-only or append strategies.
- Merge data from multiple sources.
- Schedule data loads. You can replace, append, and update data in tables by scheduling data loads and using the Load Strategy option of this utility.

Use Oracle BI Cloud Service Data Sync to load relational files from these databases:

- Oracle
- DB2
- Microsoft SQL Server
- MySQL
- Teradata
- TimesTen

You can:

- Interactively load data.
• Schedule data loads for one or more tables.
• Run and monitor data loads.

For both initial and incremental data loads in Oracle Database Cloud Service, you can append, replace, and update data in tables.

You can download Oracle BI Cloud Service Data Sync tool from Oracle Technology Network (OTN) software downloads page. This tool synchronizes on-premises data with Oracle BI Cloud Service by using the Oracle BI Cloud Service REST API.

To find out more, see Getting Started with Oracle Business Intelligence Cloud Service Data Sync and Using Oracle Business Intelligence Cloud Service Data Sync. Both these documents are available from the download page. Click Help at any time while using Data Sync to access online help.

**Loading Relational Tables Using SQL Developer**

You can use Oracle SQL Developer Release 3.2 or later to upload and administer data in Oracle Database Cloud Service.

Oracle SQL Developer is an integrated, transparent, and seamless bulk-data loading facility with full object browsing capabilities. This Java-based tool runs on a client machine and accesses your Oracle Database Cloud Service through a set of RESTful Web Service calls that allow you to access and load data and data structures into Oracle Database Cloud Service. See REST API for Oracle Java Cloud Service for additional information.

You can:
• Connect to the database through Oracle SQL Developer.

**Note:** To configure Oracle SQL Developer connections for uploading data, refer to the Data Loading and the Oracle Database Cloud Service tutorial.

• Add any Oracle SQL Developer object.

• Move data from on-premises databases to any target Oracle Cloud database.

• Create deployment shopping carts. Oracle SQL Developer creates a cart containing objects that you want to load into your service, connects to your service, and then securely deploys data from the cart to the service. You can also compare the environments and carts.

• Load data incrementally on a schedule by using Oracle SQL Developer. See Using SQL Developer for Data Loading in Using Oracle Database Cloud Service (Database Schema) for more information.

**Note:** Oracle SQL Developer uses the database utility SQL*Loader to perform the data load. To find out more about restrictions on data loading, see the Oracle Database Utilities book.

As a guideline, use Oracle SQL Developer to input files greater than 500,000 rows. See Using SQL Developer for Data Loading in Using Oracle Database Cloud Service (Database Schema) for more information.

**Note:** Before loading data into an existing schema or table, consider backing up your data for safekeeping. See Using Oracle Database Backup Service for additional information.
This topic describes how to use programmatic methods to load your data. Generally, you use these methods to load large volumes of data, perform complex transformations, create indexes, and perform database management and monitoring tasks.

**Topics:**

- About the Oracle BI Cloud Service REST API
- About the Oracle Database Cloud Service API
- About PL/SQL Database Scripts

**About the Oracle BI Cloud Service REST API**

You use the Oracle BI Cloud Service REST API to define or customize your own API and programmatically load on-premises data on Oracle Database Cloud Service. Once data is loaded on to a cloud database, you can manage the data, load schemas and tables, and so on. The Oracle BI Cloud Service REST API is optimized for loading large volumes of data (thousands to millions) from one or more sources.

You can:

- Insert, update, upsert, and delete large numbers of records by streaming batches of records.
- Update statistics.
- Drop or create indices on tables on the Oracle Database Cloud Service.
- Write programs and scripts in your favorite programming language and then combine them with additional application logic to invoke the Oracle BI Cloud Service REST API.
- Invoke the script or application with your on-premises scheduler.
- Automate incremental data loading or integrate with ETL tools using the Oracle BI Cloud Service REST API. See Oracle Cloud REST API Reference for Oracle Business Intelligence Cloud Service for detailed information.
- Create a customized API using the Oracle BI Cloud Service REST API framework.
About the Oracle Database Cloud Service REST API

If Oracle BI Cloud Service integrates with Oracle Database Cloud - Database Schema Service you can load data programmatically using the Oracle Database Cloud Service REST API.

Create RESTful Web Services to access SQL and PL/SQL queries in Oracle Database Cloud - Database Schema Service from outside the cloud. You use the RESTful Web Services wizard to create RESTful Web Services. The RESTful wizard provides a mechanism to access the service and enables you to define a set of Uniform Resource Identifiers (URIs) to a SQL query or PL/SQL script. You can call out to any SQL query to read any data and return a result, or call out to PL/SQL code to read, write, modify, or delete data.

You can define your own REST API that can be invoked from on-premises environments. You can define any PL/SQL block with BIND variables that can modify tables in Oracle Database Cloud - Database Schema Service.

In addition, you can use the APEX_WEB_SERVICE API within a PL/SQL block to invoke any REST or SOAP API that is supported by cloud applications and retrieve data from an external system. The data can be transferred directly from the on-premises source to the cloud database. You can then programmatically automate the web service.

See Implementing RESTful Web Services in Using Oracle Database Cloud - Database Schema Service.

About PL/SQL Database Scripts

Oracle Database Cloud - Database Schema Service only. You can use PL/SQL database scripts to load data from external, generic web services.

You can retrieve and load data from other cloud services, such as Oracle’s Fusion Cloud or Salesforce.com. The API can be called from your PL/SQL code created by using SQL Workshop, a robust developer’s tool that you use to create user-friendly,
front-end applications to execute complex database operations (for example, data entry applications that execute PL/SQL to pass parameters entered by users).

SQL Workshop is part of Oracle Application Express (APEX). Oracle APEX is Oracle’s primary tool for developing web applications with SQL and PL/SQL. Using only a web browser, you can develop and deploy professional Web-based applications for desktops and mobile devices.

You can build PL/SQL scripts in SQL Workspace that:

- Author and execute SQL queries against objects in the Database Schema Service.
- Author and execute database procedures.
- Maintain database objects. For example, you can:
  - Create and maintain indices to improve performance.
  - Drop unneeded objects, such as tables.
  - Create views to expose functionality in the database.
  - Add columns.
  - Modify objects created post-load, such as conform date types.
  - Perform post-load transformations.

See SQL Syntax in Using Oracle Database Cloud - Database Schema Service.
Part III

Modeling Data in Oracle Business Intelligence Cloud Service

This part explains how to model data in Oracle Business Intelligence Cloud Service.

Chapters:

- Understanding Data Modeling
- Starting to Build Your Data Model
- Defining Hierarchies and Levels for Drilling and Aggregation
- Securing Your Data Model
Understanding Data Modeling

You can build a model of your business data using Oracle Business Intelligence Cloud Service.

Topics:

• About Modeling Data
• Planning a Data Model
• Roadmap for Modeling Data

About Modeling Data

A data model is a design that presents business data for analysis in a manner that reflects the structure of the business. Data models enable analysts to structure queries in the same intuitive fashion as they ask business questions. Well-designed models are simple and mask the complexity of the underlying data structure.

Tip:

Before modeling data, ensure that you understand the data modeling definitions that are included in Oracle BI Cloud Service Terminology.

Data Modeler enables you to model data in Oracle BI Cloud Service. Using Data Modeler you can model data from various source types, such as star and snowflake, in various ways that make sense to business users. You must have the BIDataModelAuthor role to use Data Modeler.

Although not all source objects have star relationships, Data Modeler presents data as a simple star structure in the data model. In other words, the data model represents measurable facts that are viewed in terms of various dimensional attributes.

When building the data model, you perform the following tasks:

• Add source tables or views to the model and classify them as either a fact table or a dimension table.

• Define joins between fact and dimension tables

• Ensure that every dimension table maps to at least one fact table, and that every fact table maps to at least one dimension table.

• Specify aggregation rules for different fact columns, create derived measures based on expressions, create dimension hierarchies to support drilling, and create level-based measures.

• Publish your data model to permanently save the changes and make the data available for use in analyses.
Source data from files or relational sources must be uploaded to destination tables in the Oracle Database Cloud Service integrated with Oracle BI Cloud Service. See How Does Oracle BI Cloud Service Integrate with Oracle Database Cloud Service? and Loading Data in Oracle Business Intelligence Cloud Service.

After you create your data model, you can start creating analyses from the Home page of Oracle BI Cloud Service. Your data model displays as a subject area that you can use for creating analyses. The name of the subject area matches the name of your data model.

Note that when you model source objects with multiple star relationships, they are all part of the same data model and are included in the same subject area.

### Planning a Data Model

Before using Data Modeler in Oracle BI Cloud Service, take some time to think about your business requirements and to understand data modeling concepts.

**Topics:**

- Understanding Data Model Requirements
- Components of Data Models
- About Modeling Source Objects with Star Relationships
- About Modeling Source Objects with Snowflake Relationships
- About Modeling Denormalized Sources
- About Modeling Normalized Sources

### Understanding Data Model Requirements

Before you can begin to model data, you must first understand your data model requirements:

- What kinds of business questions are you trying to answer?
- What are the measures required to understand business performance?
- What are all the dimensions under which the business operates? Or, in other words, what are the dimensions used to break down the measurements and provide headers for the reports?
- Are there hierarchical elements in each dimension, and what types of relationships define each hierarchy?

After you have answered these questions, you can identify and define the elements of your business model.
Components of Data Models

Fact tables, dimension tables, joins, and hierarchies are key components you will come across when building your data model in Oracle BI Cloud Service.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fact Tables</td>
<td>Fact tables contain measures (columns) that have aggregations built into their definitions. Measures aggregated from facts must be defined in a fact table. Measures are typically calculated data such as dollar value or quantity sold, and they can be specified in terms of hierarchies. For example, you might want to determine the sum of dollars for a given product in a given market over a given time period. Each measure has its own aggregation rule such as SUM, AVG, MIN, or MAX. A business might want to compare values of a measure and need a calculation to express the comparison.</td>
</tr>
<tr>
<td>Dimension Tables</td>
<td>A business uses facts to measure performance by well-established dimensions, for example, by time, product, and market. Every dimension has a set of descriptive attributes. Dimension tables contain attributes that describe business entities (like Customer Name, Region, Address, or Country). Dimension table attributes provide context to numeric data, such as being able to categorize Service Requests. Attributes stored in this dimension might include Service Request Owner, Area, Account, or Priority. Dimension tables in the data model are conformed. In other words, even if there are three different source instances of a particular Customer table, the data model only has one table. To achieve this, all three source instances of Customer are combined into one using database views.</td>
</tr>
<tr>
<td>Joins</td>
<td>Joins indicate relationships between fact tables and dimension tables in the data model. When you create joins, you specify the fact table, dimension table, fact column, and dimension column you want to join. Joins allow queries to return rows where there is at least one match in both tables. Tip: Analysts can use the option Include Null Values when building reports to return rows from one table where there no matching rows in other table. See Suppressing Null Values in Views in Using Oracle Business Intelligence Cloud Service.</td>
</tr>
<tr>
<td>Hierarchies</td>
<td>Hierarchies are sets of top-down relationships between dimension table attributes. In hierarchies, levels roll up from lower levels to higher levels. For example, months can roll up into a year. These rollups occur over the hierarchy elements and span natural business relationships.</td>
</tr>
</tbody>
</table>

About Modeling Source Objects with Star Relationships

Star sources consist of one or more fact tables that reference any number of dimension tables. Because Data Modeler presents data in a star structure, working with star sources is the simplest modeling scenario. In star sources, dimensions are normalized with each dimension represented by a single table.

For example, assume that you have separate sources for Revenue Measures, Products, Customers, and Orders. In this scenario, you load data from each source to separate
database tables. Then, you use Data Modeler to create a fact table (Revenue Measures) and dimension tables (Products, Customers, and Orders). Finally, you create joins between the dimension tables and the fact table.

When you create your fact and dimension tables, you can drag and drop the source objects into the data model, or you can use menu options to create the fact and dimension tables individually.

See Roadmap for Modeling Data for a full list of data modeling tasks.

**About Modeling Source Objects with Snowflake Relationships**

Snowflake sources are similar to star sources. In a snowflake structure, however, dimensions are normalized into multiple related tables rather than in single dimension tables.

For example, assume that you have separate sources for Revenue Measures, Products, Customers, and Orders. In addition, you have separate sources for Brands (joined to Products) and Customer Group (joined to Customers). The Brands and Customer Group tables are considered to be “snowflaked” off the core dimension tables Customers and Products.

In this scenario, you load data from each source to separate database tables. Next, you create database views that combine the multiple dimension tables into a single table. In this example, you create one view that combines Products and Brand, and another view that combines Customer and Customer Group.

Then, you use Data Modeler to create a fact table (Revenue Measures) and dimension tables (Products + Brand view, Customers + Customer Group view, and Orders). Finally, you create joins between the dimension tables and the fact table.

See Roadmap for Modeling Data for a full list of data modeling tasks.

**About Modeling Denormalized Sources**

Denormalized sources combine facts and dimensions as columns in one table (or flat file). With a denormalized flat source, one data file is loaded into one table. The data file consists of dimension attributes and measure columns.

In some cases, the data model might consist of a hybrid model that involves a combination of star, snowflake, and denormalized sources. For example, a denormalized source might include information about revenue measures, products, customers, and orders - but all in a single file rather than in separate source files.

In this scenario, you first load the denormalized file as a single database table. Then, you use the Add to Model wizard to partition columns into multiple fact and dimension tables. In this example, you drag and drop revenue measure columns to create a fact table, then drag and drop columns for products, customers, and orders to create three separate dimension tables. Finally, you create joins between the dimension tables and the fact table.

See Roadmap for Modeling Data for a full list of data modeling tasks.

**About Modeling Normalized Sources**

Normalized or transactional sources distribute data into multiple tables to minimize data storage redundancy and optimize data updates. In a normalized source, you have
multiple data files that correspond to each of the transactional tables. Data from Oracle Cloud applications is likely partitioned into a normalized source.

Similar to snowflake sources, modeling normalized sources involves creating database views to combine columns from multiple source tables into individual fact and dimension tables. Some normalized sources are very complex, requiring a number of database views to organize the data into a star-type model.

For example, assume that you have source files for Products, Customers, Orders, and Order Items. Orders and Order Items both contain facts.

In this scenario, you first load the files as separate database tables. Next, you create a database view that combines the multiple fact columns into a single table. In this example, you create a view that combines columns from Orders and Order Items.

Then, you use Data Modeler to create a fact table (Orders + Order Items view) and dimension tables (Products and Customers). Finally, you create joins between the dimension tables and the fact table.

See Roadmap for Modeling Data for a full list of data modeling tasks.
Starting to Build Your Data Model

This section provides information about first steps for building a data model, such as adding dimension tables, fact tables, and joins.

Video

Topics:

- Typical Workflow for Modeling Data
- Using Data Modeler
- Reviewing Source Tables and Data
- Adding Your Own Source Views
- Adding Fact Tables and Dimension Tables to the Data Model
- Joining Fact and Dimension Tables
- Creating a Time Dimension
- Using Columns in the Data Model
- Copying Model Objects

Typical Workflow for Modeling Data

Here are the common tasks for modeling data.

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read about Data Modeler</td>
<td>Get familiar with Data Modeler, including how to refresh your data, publish changes, and find the Action menus.</td>
<td>Using Data Modeler</td>
</tr>
<tr>
<td>Browse source objects</td>
<td>Review source tables to determine how to structure your data model.</td>
<td>Reviewing Source Tables and Data</td>
</tr>
<tr>
<td>Create new views in the database if needed</td>
<td>Create views for role-playing dimensions, or create views to combine multiple tables into a single view, as in snowflake or normalized sources.</td>
<td>Adding Your Own Source Views</td>
</tr>
<tr>
<td>Add fact tables and dimension tables</td>
<td>Create fact tables and dimension tables from source objects.</td>
<td>Adding Fact Tables and Dimension Tables to the Data Model</td>
</tr>
</tbody>
</table>
### Using Data Modeler

Data Modeler enables you to model the data that is needed to produce analyses.

**Topics:**

- Opening Data Modeler
- Using the Left Pane in Data Modeler
- Using the Right Pane in Data Modeler
- Using Action Menus
- Locking the Data Model
- Validating the Data Model
- Refreshing and Synchronizing Source Objects and Data Model Objects
- Publishing Changes to the Data Model
- Clearing Cached Data
- Deleting the Data Model
- Renaming the Data Model
Opening Data Modeler

Open Data Modeler from the Home page in Oracle BI Cloud Service.

1. Sign in to Oracle BI Cloud Service.
2. Click Modeler on the Home page.

Using the Left Pane in Data Modeler

Various data modeling menus are available from the left pane in Data Modeler.

- **Database** — Lists source objects such as database tables and views
- **Data Model** — Lists data model objects such as fact tables, dimension tables, hierarchies, fact columns, and dimension columns
- **Variables** — Lists variables for use in data security filters and in column expressions
- **Roles** — Lists roles that you can use when defining object permissions and data security filters

To filter objects in the left pane:

1. In Data Modeler, in the left pane, open the Database, Data Model, Variables, or Roles menu.
2. Click the Filter icon to the right of the selected menu.
3. In the Filter area, enter a string value for filtering the display.

4. Delete the text or click the Filter icon again to remove the filter.

Using the Right Pane in Data Modeler

The right pane in Data Modeler is a contextual pane that changes depending on what task you are performing. After you have started modeling data, the default or home view shows the fact tables, dimension tables, and joins that you have defined so far.

- In the fact tables and dimension tables area you can see the number of joins for each fact and dimension table, as well as the number of measures in each fact table.

- Joins are listed below the fact and dimension tables. Click the up or down arrow in each column header to sort.

- When you click an object to open its editor, the editor appears in the right pane. For example, clicking a dimension table name from the Data Model menu in the left pane opens the dimension table editor in the right pane.
Using Action Menus

Data Modeler provides action menus for most objects. Action menus are represented by a gear icon.

Action menus contain actions that are relevant for a particular object or context, and are visible when the object is selected. For example, select a source object in the Database menu in the left pane to see its action menu.

A global Model Actions menu is also provided in the upper right corner. You use the global Model Actions menu for tasks that apply to the entire data model, such as renaming, deleting, refreshing, or unlocking the model.

Deleting Individual Data Model Objects in Data Modeler

You can use action menus to delete data model objects. Note the following about deleting objects:

• You must lock the model before deleting an object.

• You can delete source views but you can’t delete source tables. Use SQL Workshop to drop source tables in Oracle Database Cloud - Database Schema Service.

• You can’t delete model objects upon which other objects depend. For example, you can’t delete a dimension table that is joined to another table until the join is removed. Similarly, you can’t delete a column that is used in an expression, or a source view that is being used in another view.

• Objects are not truly deleted until changes are published, with the exception of source views. Source views are deleted when you complete the action.

Locking the Data Model

You must always lock the data model before making any changes. Click **Lock to Edit** to lock the data model.

Always publish changes you want to keep before leaving Data Modeler for an extended length of time. When your HTTP browser session times out (after 20 minutes of inactivity), the lock is released and any unpublished changes are discarded.

Similarly, closing a browser ends the HTTP session and discards any unpublished changes. However, closing the browser does not release the lock. In this case, you can start a new session in a new browser and sign in with the same user name. When you attempt to lock the model in the new session, Data Modeler asks whether you want to reacquire the lock.
Changing Database Views

You must also lock the model if you want to change database views from Data Modeler. Changes you make to database views are immediately saved to the database. This is different to data model changes which are only saved when you publish them.

Locking the model prevents other users from changing database views using Data Modeler. The lock does not stop someone from modifying database objects using other tools, such as APEX and SQL Developer.

Overriding Locks

If you have administrative privileges, you can override locks set by other users. To do this, select **Override Lock** from the global Model Actions menu in the upper right corner. Overriding a lock discards changes made by other users in their browser sessions. You must have the BIServiceAdministrator role to override a lock.

Validating the Data Model

You can use the global **Validate** checkmark icon in the upper-left corner to check whether the data model is valid.

The data model is also validated automatically when you publish changes. Validation errors are shown at the bottom of the right pane.

You can use the **Message Actions** menu to customize the types of messages displayed (Errors, Warnings, and Information).

Some tasks are validated when they are performed. For example, you cannot save a source view unless its SQL query is valid. Expressions for calculated measures and derived columns must be valid before they can be saved. Validation messages that are displayed as you are performing tasks provide more information about any validation errors.

Refreshing and Synchronizing Source Objects and Data Model Objects

Data Modeler provides three ways to refresh data to ensure you are looking at the most up-to-date information. You can refresh source objects, refresh the data model, or synchronize the data model with source object definitions in the database.

Refreshing Source Objects

You can refresh the Database pane to ensure that the source objects list reflects the latest objects in the database. For example, you can refresh the source objects list to include any new database tables that were added. The source objects list is not refreshed automatically after new objects are loaded into the database.

To refresh source objects, select **Refresh** from the **Database Actions** menu in the left pane.
Refreshing the Data Model

In some cases, other Data Modeler users might have locked the model and made changes. You can refresh the data model to ensure that Data Modeler is displaying the latest version of the model.

To refresh the data model, select **Refresh** from the **Data Model Actions** menu in the left pane.

Alternatively, select **Refresh** from the **Model Actions** gear menu next to the Lock to Edit button.

Synchronizing with the Database

You can synchronize the data model with source objects in the database. Synchronization identifies objects in the model that have been deleted in the database, as well as tables and columns that are new. It also identifies other discrepancies like column data type mismatches.

To synchronize all model objects and source objects with the database, select **Synchronize with Database** from the global **Model Actions** menu in the upper right corner.

To synchronize individual fact tables or dimension tables, select **Synchronize with Database** from the **Actions** menu for the given fact table or dimension table in the Data Model objects list in the left pane. Then, click **OK**.

You must lock the data model to synchronize with the database.

Synchronization discrepancies are displayed in a message box at the bottom of the right pane. Use the **Message Actions** menu to customize the types of messages displayed (Errors, Warnings, and Information), select or deselect all messages, and perform sync-up actions on selected messages. For example, you can select all data type mismatch warnings and then select **Sync-up selected** from the **Actions** menu to make the relevant synchronization changes.
Publishing Changes to the Data Model

As you update a data model, you make changes that you can save or discard. You publish a model to save the changes permanently and make the data available for use in reports. The published data model displays as a subject area in Oracle BI Cloud Service.

**Tip:**

Although changes to the data model are saved as you work, they are saved in the browser session only. The changes are not truly saved until you publish the model.

When you publish a data model, it is validated automatically. Any validation errors appear in the bottom of the right pane. If you see validation errors, fix them and then try to publish the data model again.

After making changes to your data model, you can perform these actions using the menus in the upper-right corner:

- **Publish and Unlock** — Verifies that the model is valid, saves the changes, and publishes the model for use with reports. The model is unlocked for other users.

- **Publish and Keep Lock** — Verifies that the model is valid, saves the changes, and publishes the model for use with reports. The lock is retained for further edits.

- **Unlock** — Removes the lock on the model so that other users can update it. Your unpublished changes to the model are discarded.

- **Revert** — Returns the model to its previously published state. Your unpublished changes to the model are discarded, but the model remains locked.

You can also click **Undo** and **Redo** in the upper right corner to revert or reapply individual changes.

**Tip:**

You do not need to publish the model to save database changes. Changes made to database views and other source database objects are saved to the database when you complete the action, not to the data model. For database changes, **Undo** and **Redo** are not available.

After publishing your model it takes up to two minutes for changes to the data model to reflect in reports and dashboards. To see changes immediately, open the report and click **Refresh > Reload Server Metadata**.
Oracle BI Cloud Service takes a snapshot when you or someone else publishes changes to the data model. If you’re having some problems with the latest data model, you can ask your administrator to restore an earlier version. See Restoring from a Snapshot.

Clearing Cached Data

Oracle BI Cloud Service caches data to maximize high performance access to data. This means data updates may not immediately reflect in analyses, dashboards, and Data Modeler.

After loading new data in your tables, you might want to clear the cache to see your new data:

- To see new data in Data Modeler, select the Refresh Model menu.
- To see new data in analyses and dashboards, manually clear the cache from the Data Model menu in the left pane
  - To clear cached data for a particular fact or dimension table, right-click the table and select Clear Cached Data.
  - To clear all cached data, click Data Model Actions, then select Clear All Cached Data to remove all data from the cache.

You can also select Clear All Cached Data from the global Model Actions menu in the upper-right corner.

Tip:
Always clear the cache manually after loading new data to ensure that the most recent data is displayed in analyses.

Deleting the Data Model

You can delete all objects from your data model if you want to clear your model and start over. To remove all objects from your data model, select Delete Model from the global Model Actions menu in the upper right corner.

This action permanently removes all data model objects. The model objects are not recoverable after you delete the model. Before deleting the model, we recommend that you or your administrator take a snapshot of the model as a backup. For instructions, see Backing Up and Restoring.

Renaming the Data Model

To rename your data model, select Rename Model from the global Model Actions menu in the upper-right corner.

This action also renames the corresponding subject area in analyses and dashboards.

Reviewing Source Tables and Data

This topic describes how you can learn more about the source database objects that are available for your data model.

Topics:

- Viewing Source Objects
• Previewsing Data in Source Objects

Viewing Source Objects

You can see a list of source tables and views in the Database menu in the left pane. Click a table or view to see its properties.

The Overview tab for source tables and views shows column information, like column name, data type, whether it’s unique, and whether it accepts null values. The Data tab enables you to preview data, as described in Previewsing Data in Source Objects.

Previewsing Data in Source Objects

You can preview database tables and views to see the first 25 rows of data. By reviewing the initial rows, you can get ideas for modeling the database tables and views as either dimension tables or fact tables.

To preview data in database tables and views:

1. Open Data Modeler.
2. From the Database menu in the left pane, click a database table or view to open it.
3. Click the Data tab.
4. Review the first 25 rows of data for the table or view. You can resize the columns in the display table if needed.

5. Click Get Row Count to retrieve a complete row count for the table or view. This take might take some time to complete if the table is large.
6. Click Done.

Creating Source Views

Create source views as a base for model objects when you think you might want to perform subsequent changes.

Topics:

- About Source Views
- Defining Source Views
- Defining Filters for Source Views

About Source Views

Source views are saved queries of data in the database. You can think of a source view as a "virtual table."

In Oracle BI Cloud Service, you create source views when using a single table as a source for more than one dimension table. For example, you can create source views that use the Employee source table as a source for the Employee and Manager dimension tables.

You also create source views when creating a dimension table that is based on multiple source tables, as in a snowflake source. For example, you can create a source view that combines columns from the Customer and Customer Group source tables to create a single Customers dimension table.

You can also perform pre-aggregation calculations in a source view. For example, to create an Average Revenue column that is calculated pre-aggregation, you can include the calculation in the SQL query for the view:

```
SELECT
"BICS_REVENUE_FT1"."UNITS",
"BICS_REVENUE_FT1"."ORDER_KEY",
"BICS_REVENUE_FT1"."REVENUE",
"BICS_REVENUE_FT1"."PROD_KEY",
"BICS_REVENUE_FT1"."REVENUE"/"BICS_REVENUE_FT1"."UNITS" AS AVERAGE_REVENUE
FROM
"BICS_REVENUE_FT1"
```

In general, create source views as a base for model objects when you think you might want to perform subsequent changes. Creating a data model based on source views provides greater flexibility than using source tables directly. For example, using source views makes it much easier to extend model objects, create filters, and add pre-aggregation calculations.

Adding Your Own Source Views

You can add views to the source database from Data Modeler. For example, you can create a source view that combines the Brands and Products source tables to create a single source for your dimension table.

Create source views as a base for model objects when you think you might want to perform subsequent changes. You can create a view from scratch and add any column you want from other tables and views in the database. Alternatively, you can create a view by copying an existing source table or another source view.
To create source views:

1. In Data Modeler, lock the model for editing.

2. From the Database menu in the left pane, click **Actions**, then click **Create View**.

   ![Database menu with Create View selected]

   Initially the view is empty. You can add any column you want from other tables and views in the database.

   **Tip:** To create a view from an existing source table or source view, navigate to the database object you want to copy, click **Actions**, and then click **Duplicate**. See also **Copying Model Objects**.

3. In the View editor, specify the name and description for the view. Optionally deselect **Remove duplicate rows** if you want to include duplicate rows in the view.

   ![View editor with name and description fields]

4. Add columns to the database view by dragging and dropping tables or views from the Database menu into the Columns area of the View editor.

   Alternatively, click **Add Columns**, select a source database table or view, select columns, and then click **Add**.

   ![Columns dialog with database table and columns selected]

5. Define aliases for columns if needed. You can also optionally move rows up or down using the **Action** menu for a specific row.
6. From the Joins tab, you can define joins for the view. Click **Create Join**, then specify the left side table, right side table, columns, and the join type. You must include more than one source table in your view to create joins.

7. From the Filters tab, you can define filters for the view, as described in **Defining Filters for Source Views**.

8. From the SQL Query tab, review the code for the SQL query for the source view.

You can edit the SQL code for the query here, but do so only if you are very familiar with SQL code. Entering invalid SQL code can produce unexpected results.

If you do edit the SQL query directly, simple updates are reflected back in the Overview, Join, and Filters tabs and you can use these tabs to further edit the view later. For example, you can include:

- Simple SELECT clause with aliases and DISTINCT keyword
- FROM clause with joins
- WHERE clause with filter conditions which combined with AND keyword

If you use the SQL Query tab to make more advanced code changes you cannot use the Overview, Joins or Filters tabs to further edit the view. For example, if you include:

- SQL aggregation functions, GROUP BY clause, HAVING clause
- ORDER BY clause
- OR keyword in WHERE clause

9. Optionally, click the Data tab to preview the first 25 rows of data. You can also get a complete row count. It is best to view data only after defining joins between all tables for better performance.

10. Click **Save and Close**.

**Defining Filters for Source Views**

A filter specifies criteria that are applied to columns to limit the results that are returned. In other words, a filter is the **WHERE** clause for the view statement. For example, you can define a filter where Customer Country is equal to USA.

To define a filter:
1. Create a view, as described in Defining Source Views.

2. Click the Filters tab.

3. Click Create Filter.

4. In the WHERE row, first select the column for the filter. Next, select the condition, such as "is not equal to" or "is greater than". Finally, specify the value for the filter. You can specify a variable if needed.

5. Optionally, click Create Filter again to add an "and" row to the filter. Specify the column, condition, and value. Repeat as needed.

6. To remove a row, click Actions, then select Delete.

7. Click Save.

Adding Fact Tables and Dimension Tables to the Data Model

Use fact tables and dimension tables to represent aspects of your business that you want to understand better.

Topics:

- About Fact Tables and Dimension Tables
- Creating Fact and Dimension Tables from a Single Table or View
- Creating Fact Tables Individually
- Creating Dimension Tables Individually
- Editing Fact Tables and Dimension Tables
- Adding More Columns to Fact and Dimension Tables

About Fact Tables and Dimension Tables

Fact tables and dimension tables hold the columns that store the data for the model:

- Fact tables contain measures, which are columns that have aggregations built into their definitions. For example, Revenue and Units are measure columns.
- Dimension tables contain attributes that describe business entities. For example, Customer Name, Region, and Address are attribute columns.
Fact tables and dimension tables represent the aspects of your business that you want to understand better. See Components of Data Models for more information.

Before you begin modeling fact tables and dimension tables, make sure that the data that you need to model is available in the source tables list. Also ensure that you have created any source views upon which to base model objects.

If you think the list of source objects in the database has changed since you opened Data Modeler, then you can click Refresh from the Database Actions menu. If the data that you need has not yet been loaded into the database, then you can load it as described in Loading Data in Oracle Business Intelligence Cloud Service.

Creating Fact and Dimension Tables from a Single Table or View

Some source tables contain both facts and dimensions. For these source tables, Data Modeler provides a wizard to help you partition the fact and dimension columns into fact tables and dimension tables.

**Video**

For example, you might have a source that contains both product and customer attributes, as well as revenue measures. Use the wizard to create the corresponding fact and dimension tables.

To create fact and dimension tables from a single source:

1. In Data Modeler, lock the model for editing.

2. In the Database menu in the left pane, right-click the source table that contains the fact and dimensional data that you want to model, select Add to Model, and then select Add as Fact and Dimension Tables.

3. To let Data Modeler suggest some fact tables, dimension tables, and joins for the source table, select Let Data Modeler Recommend and click OK. You can review suggestions in Step 4.

   If you’d rather choose fact and dimension tables yourself from scratch:

   a. Deselect Let Data Modeler Recommend and click OK.

   b. Drag measures from the source table onto the fact table.

      **Tip:** You can also click the Plus icon in the column header area to select a column to include in the fact table.
c. Enter a name for the fact table, such as Costs or Measures.

d. Add a dimension table for each group of related attributes, and enter a meaningful name, such as Products. Drag and drop related columns from the source table to the appropriate dimension table.

e. To add more dimension tables, click **Add** and repeat the previous step.

f. To delete a dimension table, click **X** next to the table name.

g. Specify the join columns for each of the dimension tables. Select the box beside the appropriate columns to mark those columns as join columns.

If the join column you select is missing from the fact table, a corresponding column gets added automatically to the fact table.

4. Review fact tables, dimension tables, and join columns. For example:

   - Rename fact and dimension tables.
   - Add or remove columns.
   - Add, delete, or merge dimension tables.
   - Move columns from one dimension table to another.

5. Click **Next**.

6. Review the objects that will be created.
7. Click Create.

8. Click Done.

New fact tables, dimension tables, and joins display in Data Modeler. New views display in the Database pane.

Creating Fact Tables Individually

You can add individual source tables containing fact data to your data model.

If you have distinct source tables with fact data, such as in a star source, then you can add them to your data model individually. For example, if you have a source table that contains only revenue measures, then you can use this method to create the corresponding fact table.

Alternatively, you might have sources with fact information spread across multiple tables, such as normalized transactional sources. In this case, create source views first to combine tables in a way that resembles a star model. For information about creating views, see Defining Source Views. For information about modeling different source types, see Planning a Data Model.

Tip:

Create source views as a base for model objects when you think you might want to perform subsequent changes like extending model objects, creating filters, and adding pre-aggregation calculations. Creating a fact table based on source views provides greater flexibility than using source tables directly.

When you use this method to create individual fact tables, all columns in the source table or view are assigned to a single fact table and if the source has relationships with other tables or views, we’ll offer to add them to your model.

After locking the model, perform one of the following actions to create fact tables individually:

- Drag the source table or view from the Database menu in the left pane to the Fact Tables area of the Data Model.

- From the Database menu in the left pane, right-click the table or view, then click Add to Model, then Add as Fact Table.

- From the Database menu in the left pane, click Table Actions or View Actions, click Add to Model, then Add as Fact Table.
• From the Database Table or View editor for a particular source table or view, click **Add to Model**, then **Add as Fact Table**.

• In the right pane, click **Add** in the Fact Tables area of the Data Model. Then, select one or more source tables and views from the Database Objects list and click **OK**.

• To copy an existing fact table, click **Fact Table Actions** for the fact table you want to copy, and then click **Duplicate**. See also **Copying Model Objects**.

After adding the source table or view to the model, you can edit the fact table, as described in **Editing Fact Tables and Dimension Tables**.

### Creating Dimension Tables Individually

You can add individual source tables containing dimension data to your data model. If you have distinct dimensional source tables, such as in a star source, then you can add them to your data model individually. For example, if you have a source table that contains only customer attributes, then you can use this method to create the corresponding dimension table.

Alternatively, for snowflake or normalized (transactional) sources, create source views to combine source objects in a way that resembles a star model. For information about creating views, see **Defining Source Views**. For information about modeling different source types, see **Planning a Data Model**.

**Tip:**

Create source views as a base for model objects when you think you might want to perform subsequent changes like extending model objects, creating filters, and adding pre-aggregation calculations. Creating a dimension table based on source views provides greater flexibility than using source tables directly.

When you use this method to create individual dimension tables, all columns in the source table or view are assigned to a single dimension table and if the source has relationships with other tables or views, we'll offer to add them to your model.

After locking the model, perform one of the following actions to create dimension tables individually:

• Drag the table or view from the Database menu in the left pane to the Dimension Tables area of the Data Model.

• From the Database menu in the left pane, right-click the table or view, click **Add to Model**, and then select **Add as Dimension Table**.

• From the Database menu in the left pane, click **Table Actions** or **View Actions** for a table or view, click **Add to Model**, and then select **Add as Dimension Table**.

• Click **Add** in the Dimension Tables area, and then select **Add Database Tables**. From the Database Objects list, select one or more sources and then click **OK**.

• From the Database Table or View editor for a particular source table or view, click **Add to Model** and then select **Add as Dimension Table**.

• To copy an existing dimension table, click **Dimension Table Actions** for the dimension table you want to copy, and then click **Duplicate**. See also **Copying Model Objects**.
After adding the source table or view to the model, you can edit the dimension table, as described in Editing Fact Tables and Dimension Tables.

Editing Fact Tables and Dimension Tables

You can edit properties of fact and dimension tables in your data model and preview the source data.

To edit a fact table or dimension table:

1. In Data Modeler, lock the model for editing.
2. Click the fact table or dimension table that you want to edit.
3. Change settings on the Overview tab as needed:

<table>
<thead>
<tr>
<th>Field or Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time dimension</td>
<td>For dimension tables only. Specifies that hierarchies for this dimension table support a time dimension.</td>
</tr>
<tr>
<td>Enable skipped levels and Enable unbalanced hierarchies</td>
<td>For dimension tables only. Set properties for hierarchies associated with this dimension table. See Setting Dimension Table Properties for Hierarchies for information.</td>
</tr>
<tr>
<td>Column list</td>
<td>Click the link for a column to edit that column in the Column editor. Or, right-click the row for the column and click Edit. See Editing Columns for more information.</td>
</tr>
<tr>
<td>Field or Element</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Aggregation     | For fact tables only. Click to select a type of aggregation for the column from a dropdown list, or select **Set Aggregation** from the Column Actions menu. Aggregation types include:  
  **None**: Applies no aggregation.  
  **Sum**: Calculates the sum by adding up all values.  
  **Average**: Calculates the mean value.  
  **Median**: Calculates the middle value.  
  **Count**: Calculates the number of rows that are not null.  
  **Count Distinct**: Calculates the number of rows that are not null. Each distinct occurrence of a row is counted only once.  
  **Maximum**: Calculates the highest numeric value.  
  **Minimum**: Calculates the lowest numeric value.  
  **First**: Selects the first occurrence of the item.  
  **Last**: Selects the last occurrence of the item.  
  **Standard Deviation**: Calculates the standard deviation to show the level of variation from the average.  
  **Standard Deviation (all values)**: Calculates the standard deviation using the formula for population variance and standard deviation.  
  
  **Tip**:  
  Some calculated measures show **Pre-Aggregated** for aggregation. These measures have calculations involving measures that already have an aggregation applied. To edit a calculation that contains pre-aggregated measures, click the column name. See also, **Creating Calculated Measures**. |
| Available       | Click to mark a column as **Available** or **Unavailable** to choose whether that column is displayed in analyses that are created. You can also select **Mark as Unavailable** or **Mark as Available** from the Column Actions menu. |
| Edit All        | You can click to edit properties for individual columns in the table, or select **Edit All** to edit all rows at once. |
| Add Column      | Click **Add Column** to display the Column editor and create a new column. See **Editing Columns** for more information. |
4. From the Source Data tab, you can preview the first 25 rows of source data for the table. Resize the columns in the display table if needed. Click **Get Row Count** to retrieve a complete row count for the table or view.

5. For dimension tables only: from the Hierarchies tab, edit the hierarchies and levels for the table as described in **Editing Hierarchies and Levels**.

6. From the Permissions tab, specify object permissions as described in **Securing Access to Objects in the Model**.

7. From the Data Filters tab, you can define data filters that provide row-level filtering for data model objects, as described in **Defining Data Security Filters**.

8. Click **Done** to return to the Data Model.

### Adding More Columns to Fact and Dimension Tables

There are different ways to add more source columns to fact and dimension tables in your model.

- **Synchronize with the database**
  
  If new columns are added to a source table and you want to include them in fact tables and dimension tables in your model, synchronize the fact or dimension table with the database. Synchronization identifies any new columns and adds them to the fact or dimension table. See **Refreshing and Synchronizing Source Objects and Data Model Objects**.

- **Include columns from another source** (dimension tables only)
  
  Dimension tables can combine columns from multiple sources. See **Adding Columns from Another Source to a Dimension Table**.

### Adding Columns from Another Source to a Dimension Table

You can add the columns from another source table or view to an existing dimension table. For example, you may want to include attributes from a Product Category table in your Products dimension table.

To add columns from another source to a dimension table:

1. In Data Modeler, lock the model for editing.

2. Select the dimension table you want to edit so its Overview tab displays.
3. Drag and drop the source table or view that contains the columns you want to add from the Database pane to the dimension table (columns area).

Alternatively, right-click the dimension table you want to edit, click Add Columns, and then select the source table or view that contains the columns you want to add.

4. Select appropriate join columns and click OK.

View the dimension table to see the additional columns. The Source property shows that the dimension table is based on a new database view. Data Modeler creates a new database view whenever you add columns from another source.

**Joining Tables in the Data Model**

A join in the model indicates a relationship between one fact table and one dimension table.

Video

**Topics:**

- About Joins
- Joining Fact and Dimension Tables

**About Joins**

A join in the model indicates a relationship between one fact table and one dimension table. When you use the Add to Model wizard in Oracle BI Cloud Service to model data, the wizard creates joins automatically between a fact table and each of its corresponding dimension tables.

When you model fact and dimension tables individually, joins are automatically created between them if the join references exist in the source tables.

You can also manually create joins in the data model. To do this, you drag and drop a dimension table to a fact table, or click Create Join in the Joins area.

When you define a join between a fact table and dimension table, you select a join column from each table. You can create a join on more than one column.
Joining Fact and Dimension Tables

Define joins between fact tables and dimension tables to enable querying of related data. For example, you can define a join between the Profit Metrics fact table and the Products dimension table.

To create a join:

1. In Data Modeler, lock the model for editing.

2. In the Dimensions Tables area, drag and drop a dimension table to the Fact Tables area. Or, in the Joins area, click Create Join.

3. In the Joins area, specify the appropriate Fact Table, Fact Column, Dimension Table, and Dimension Column to use for the join.

   For example, you might specify a billing date column and a calendar date column.

4. Click the checkmark icon to save the changes to the join.

   If you want to remove your changes, then click the X icon. If you start to create a new join and click X, then the new row for the join is removed from the Joins table.

After you create joins, you can see the default hierarchies and levels when you click the Hierarchies tab for the given dimension table.

Creating a Time Dimension

Time series functions provide the ability to compare business performance with previous time periods, enabling you to analyze data that spans multiple time periods. For example, time series functions enable comparisons between current sales and sales a year ago, a month ago, and so on. To use time series functions, the data model must include a time dimension.

Video

When you create a time dimension, the Create Time Dimension wizard creates a table in the database, populates it with time data, creates a corresponding time dimension table in the data model, and creates a time hierarchy.

The Create Time Dimension wizard populates the source table with time data from 01-JAN-1970 to 31-DEC-2020.

To create a time dimension:

1. In Data Modeler, lock the model for editing.

2. In the Dimension Tables area, click Add, then Create Time Dimension.
3. In the Create Time Dimension wizard, specify names for the database table, the dimension table, and the hierarchy.

4. In the Hierarchy Levels, specify which levels to include, such as Year, Quarter, and Month.

5. Click Next.

6. On the next page, review the tasks that the wizard will perform to create the time dimension.

7. Click Create to enable the wizard to create the dimension.

   The wizard adds a time dimension with data to the database and creates a corresponding dimension in the data model. This action might take up to 30 seconds.

8. Click Done.

9. To create joins between columns in the fact table and columns in the Time dimension table, click Create Join in the data model.

   The time dimension has two unique columns. The DAY_TS column has the type TIMESTAMP, and the DATE_ID column has the type NUMBER. When you create a join, you specify either the column with the timestamp format or with the numeric format (depending on whether the column in the fact table has a date or number type).

10. In the Joins area for the new definition, select the appropriate fact column, then select the appropriate timestamp or numeric column from the Time dimension.

    After you create the joins, you can display the Hierarchies tab in the Time Dimension editor to view the default hierarchies and levels.

11. Edit the tables in the model, as described in Editing Fact Tables and Dimension Tables.

12. Click Done to return to the data model.
Adding Measures and Attributes to the Data Model

This topic describes how to add measures and attributes to the data model.

**Video**

**Topics:**
- Editing Measures and Attributes
- Specifying Aggregation for Measures in Fact Tables
- Creating Calculated Measures
- Creating Derived Attributes
- Creating Expressions in the Expression Editor
- Copying Measures and Attributes

**Editing Measures and Attributes**

Use the table editor to add, edit, and delete measures and attributes in your data model.

To edit measures and attributes:

1. In Data Modeler, lock the model for editing.
2. Click the fact table or dimension table that contains the measure or attribute that you want to edit.
3. To edit all the columns directly in the table editor, select **Edit All**.
   
   To edit, copy, or delete a selection of columns at the same time, Shift + click or Ctrl + click the rows you want.

4. In the table editor, right-click a column and optionally click **Copy** or **Delete** as appropriate.
5. In the table editor, click the column that you want to edit or click **Add Column**.
6. Change settings on the Overview tab as needed.
   
   - Edit the display name and description.
• Change the sort order.

By default, columns are sorted based on the data in the column and reports display data in this order. To sort a column based on the data in another column, select **Sort by a different column** and select the **Sort By** value you prefer. For example, instead of sorting a Month Name attribute alphabetically, you could sort by month number, such as 1 (January), 2 (February), 3 (March), and so on.

7. Change settings for calculated measures or derived attributes:

   For fact tables, see **Creating Calculated Measures**.

   For dimension tables, see **Creating Derived Attributes**.

8. From the Permissions tab, optionally modify object permissions as described in **Securing Access to Objects in the Model**.

9. From the Data Filters tab, optionally define data filters that provide row-level filtering for data model objects, as described in **Defining Data Security Filters**.

10. From the Levels tab for columns in a fact table, optionally create a level-based measure as described in **Setting Aggregation Levels for Measures**.

11. Click **Done** to return to the table editor.

### Specifying Aggregation for Measures in Fact Tables

You can specify aggregation for a **measure** in a fact table. For example, you can set the aggregation rule for a Revenue column to **Sum**.

See also **Setting Aggregation Levels for Measures**.

To specify aggregation for measures:

1. In Data Modeler, lock the model for editing.

2. In the Fact Tables area, click the fact table for which you want to create measures.

3. In the Columns list, change the aggregation rule for the appropriate columns to specify that they are measures.
To apply the same aggregation rule to multiple columns, Shift + click or Ctrl + click the appropriate columns.

Aggregation options include:

**None**: No aggregation.

**Sum**: Calculates the sum by adding up all values.

**Average**: Calculates the mean value.

**Median**: Calculates the middle value.

**Count**: Calculates the number of rows that are not null.

**Count Distinct**: Calculates the number of rows that are not null. Each distinct occurrence of a row is counted only once.

**Maximum**: Calculates the highest numeric value.

**Minimum**: Calculates the lowest numeric value.

**First**: Selects the first occurrence of the item.

**Last**: Selects the last occurrence of the item.

**Standard Deviation**: Calculates the standard deviation to show the level of variation from the average.

**Standard Deviation (all values)**: Calculates the standard deviation using the formula for population variance and standard deviation.

**Tip:**

Some calculated measures are **Pre-Aggregated**. These measures have calculations involving measures that already have an aggregation applied. To edit a calculation that contains pre-aggregated measures, click the column name. See also **Creating Calculated Measures**.
For most measures, the same aggregation rule applies for each dimension but for some measures you’ll want to specify one aggregation rule for a given dimension and specify other rules to apply to other dimensions.

Time dimensions are most likely to require different aggregation. For example, Headcount (calculated measure) typically aggregates as SUM across Organization and Geography dimensions but SUM does not apply for a Time dimension. Aggregation for the Time dimension should be LAST, so you can show Headcount on the last week or day of the year.

4. To override the aggregation for specific dimensions:
   a. Click the name of the measure column.
   b. Deselect **Same for all dimensions**.
   c. Click **Add Override**.
   d. Select the dimension you want to aggregate differently, for example Time.
   e. Select an aggregation rule for the dimension.
   f. If required, override aggregation for another dimension.
   g. Click **Done**.

When dimension-specific aggregation rules are defined for a measure, you see an asterisk * next to the aggregation rule in the Columns table. For example, **Sum***.
5. By default, all the columns in the fact table are displayed in reports. Deselect the Available box for any columns that you do not want to display. You can use Shift + click or Ctrl + click to select multiple rows.

6. Click Cancel to cancel any of your changes.

7. Click Done to return to the table editor.

Creating Calculated Measures

If a fact table does not include all the measures that you need, then you can create calculated measures. For example, you can create a calculated measure called Average Order Size using the formula Revenue/Number of Orders.

To create calculated measures:

1. In Data Modeler, lock the model for editing.

2. In the Fact Tables area, click the fact table for which you want to create measures.

3. In the Columns area, click Add Column.

4. In the New Column editor, enter a name and description for the column.

Then, enter an expression directly in the Expression box, or click Full Editor to display the Expression editor.

See also Creating Expressions in the Expression Editor for more information.

5. Expressions can contain measures that are already aggregated, as well as measures with no aggregation applied. Do one of the following:

   • Set Aggregation to Before Calculating, if your expression includes measures that are already aggregated or aggregation is not required.

   • Set Aggregation to After Calculating and select an aggregation rule, such as Sum, Average, Count, to apply aggregation after calculating the expression. For detail, see Setting Aggregation Levels for Measures.

For more information and examples, see About Creating Calculated Measures.

6. Click Done to return to the table editor.
About Creating Calculated Measures

Calculated measures, as the name suggests, are calculated from other measures. For example, you can create a measure that calculates Average Order Size using the formula Revenue/Number of Orders.

Calculations can contain measures that are already aggregated, as well as measures with no aggregation applied. For example:

- Calculation includes aggregated measures: `Sum(Revenue)/Sum(Orders)`
- Calculation includes measures with no aggregation applied: `UnitPrice \times Quantity`

If the measures in your calculation are not pre-aggregated, such as `UnitPrice` and `Quantity`, you may apply aggregation after the calculation. For example, `Sum(UnitPrice \times Quantity)`.

Check the measures in your calculations before choosing whether to apply aggregation Before Calculating or After Calculating your expression. See also Creating Calculated Measures.

Example 7-1 Calculations Include Measures Already Aggregated

Set Aggregation to Before calculating if the calculation contains pre-aggregated measures. For example: `Sum(Revenue)/Sum(Orders)`

![Example screenshot](image)

**Note:** If you select After calculating, any aggregation applied to measures in the calculation is ignored.

Example 7-2 Calculations Include Non Aggregated Measures

Optionally, you can apply aggregation after your calculation. Set Aggregation to After calculating and then select an aggregation rule from the drop down list. For example, **Sum, Average, Count** and so on.
Note:  When you apply aggregation after a calculation:

- Don’t include expression columns in the calculation.
- If you include aggregated columns in the calculation, aggregation on the columns is ignored.

Creating Derived Attributes

You can create custom or derived attributes for dimension tables that are based on an expression. For example, you can use an expression to concatenate multiple address columns into a single Full Address column.

To create derived attributes:

1. In Data Modeler, lock the model for editing.
2. In the Dimension Tables area, click the dimension table for which you want to create derived attributes.
3. In the Columns area, click Add Column.
4. In the New Column editor, enter a name and description for the column. Then, enter an expression directly in the Expression box, or click Full Editor to display the Expression editor. See Creating Expressions in the Expression Editor for more information.

You can use a variable in a column expression. See Defining Variables for details.
5. Click **Done** to return to the table editor.

### Creating Expressions in the Expression Editor

You can use the Expression Editor to create constraints, aggregations, and other transformations on columns.

#### Topics:

- About the Expression Editor
- Creating an Expression

#### About the Expression Editor

When modeling data, you can use the Expression Editor to create constraints, aggregations, and other transformations on columns. For example, you can use the Expression Editor to change the data type of a column from date to character. You can also use the Expression Editor to create expressions for data filters.

The Expression Editor contains the following sections:

- The Expression box on the left-hand side enables you to edit the current expression.
- The toolbar at the bottom contains commonly used expression operators, such as a plus sign, equals sign, or comma to separate items.
- The Expression Elements section on the right-hand side provides building blocks that you can use in your expression. Examples of elements are tables, columns, functions, and types.

The Expression Elements section only includes items that are relevant for your task. For example, if you open the Expression Editor to define a calculated measure, the Expression Elements section only includes the current fact table, any dimension tables joined to that table, plus any fact tables indirectly joined through a dimension table. Similarly, when you define a derived attribute, you see the current dimension table, any fact tables joined to that table, and any dimension table joined to those fact tables.

Another example is that time hierarchies are only included if the Time fact table is joined to the current table.

See [Expression Editor Reference](#) for more information about items in the Expression Elements section.
Creating an Expression

You can use the Expression Editor to create constraints, aggregations, and other transformations on columns.

To create an expression:

1. Add or edit a column from the Table editor, as described in Editing Columns.
2. Type an expression in the Expression box and click **Done**. Or, click **Full Editor** to launch the Expression Editor.
3. Use the Expression Elements menus to locate the building blocks you want to use to create your expression.

   Drag and drop an element to add it to your expression. You can also double-click an element to insert it, or you can select the element and click the arrow icon.

   When you add a function, brackets indicate text that needs to be replaced. Select the text, then type, or use the Expression Elements menus to add the appropriate element.

   See Expression Editor Reference for information about operators, expressions, and functions.

4. Click **Filter** and then type text in the search box to filter the available elements.

   Remove the text to revert to the full list of elements.

5. Click **Actions** to show or hide menus under Expression Elements, or to expand or collapse all menus.

6. Click an item on the toolbar to insert an operator.
7. Click **Undo** or **Redo** as needed when building your expression.

8. Click **Validate** to check your work.

9. Click **Save** when you are finished.

**Copying Measures and Attributes**

You can copy measures and attributes in your data model.

To copy measures and attributes:

- From the Data Model menu in the left pane, right-click the column that you want to copy and select **Copy**.

  To copy multiple columns, Shift + click or Ctrl + click all the rows that you want and right-click to select **Copy**.

- From the Data Model menu in the left pane, click **Column Actions** for the column that you want to copy and select **Copy**.

The copy is displayed with a number added to the name.

**Copying Model Objects**

Sometimes it’s quicker to copy objects rather than starting from scratch.

In Data Modeler you can copy fact tables, dimension tables, database tables, and database views:

- **Fact tables**

  To copy an existing fact table, select **Duplicate** from the **Fact Table Actions** menu. When you copy a fact table, Data Modeler includes joins by default. See also [Creating Fact Tables Individually](#).

  Aggregation level settings for measures are not copied as, in most cases, level settings in the original fact table and the copied version differ. After copying a fact table, review and set the aggregation levels for measures as required.

- **Dimension tables**

  To copy an existing dimension table, select **Duplicate** from the **Dimension Table Actions** menu. When you copy a dimension table, Data Modeler excludes joins by default. See also [Creating Dimension Tables Individually](#).

- **Database tables and views**

  To copy an existing database object, select **Duplicate** from the **Actions** menu. When you copy a table or view, Data Modeler creates a view based on the table or view you copy. See also [Defining Source Views](#).
Defining Hierarchies and Levels for Drilling and Aggregation

You can define hierarchies and levels in Data Modeler.

Topics:

• Typical Workflow for Defining Hierarchies and Levels
• About Hierarchies and Levels
• Editing Hierarchies and Levels
• Setting Aggregation Levels for Measures

Typical Workflow for Defining Hierarchies and Levels
Here are the common tasks to add hierarchies and levels to your data model.

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add hierarchies and levels</td>
<td>Create hierarchies and levels for your dimension tables</td>
<td>Editing Hierarchies and Levels</td>
</tr>
<tr>
<td>Set aggregation levels for measures</td>
<td>Set custom aggregation levels for measures that are different from the default level</td>
<td>Setting Aggregation Levels for Measures</td>
</tr>
</tbody>
</table>

About Hierarchies and Levels

A hierarchy shows relationships among groups of columns in a dimension table. For example, quarters contain months and months contain days. Hierarchies enable drilling in reports.

A dimension table can have one or more hierarchies. A hierarchy typically begins with a total level, then has child levels, working down to the lowest detail level.

All hierarchies for a given dimension must have a common lowest level. For example, a time dimension might contain a fiscal hierarchy and a calendar hierarchy, with Day as the common lowest level. Day has two named parent levels called Fiscal Year and Calendar Year, which are both children of the All root level.

All levels, except the total level, must have at least one column specified as the key or display column. However, it is not necessary to explicitly associate all of the columns from a table with levels. Any column that you do not associate with a level is automatically associated with the lowest level in the hierarchy that corresponds to that dimension table.
There is no limit to the number of levels you can have in a hierarchy. The total number of levels is not by itself a determining factor in query performance. However, be aware that for extremely complex queries, even a few levels can impact performance.

**Editing Hierarchies and Levels**

After creating dimension tables, you can add hierarchies and levels to those tables.

**Video**

A hierarchy is a system of levels in a dimension that are related to each other by one-to-many relationships. For example, the Geography hierarchy might include levels for Country, State, and City.

When fact tables and dimension tables are joined, a default hierarchy is created. You cannot add hierarchies for a particular dimension table until it has been joined to a fact table. Columns used in a join from a dimension table are used as key columns for the detail level in a hierarchy.

To create a hierarchy and its levels:

1. In Data Modeler, lock the model for editing.
2. In the Dimension Tables area, click the dimension table for which you want to add a hierarchy. The dimension table must have at least one join to a fact table.
3. In the Dimension editor, click the Hierarchies tab.
4. In the Hierarchies area, click **Add Level**. The upper part of the Add Level box shows dimension columns that have not yet been used in a level.

   The lower part of the box shows shared levels that have already been used in another hierarchy for this table.

   Select the dimension column or shared level that you want to use.

5. Continue to click **Add Level** and select the appropriate columns or shared levels, until you have added all the levels.

6. Drag and drop levels to a different location in the order, as appropriate. You can also right-click a level and select **Move left** or **Move right**.
7. Click a level to display a dialog in which you can specify the level name, the key column, and the display column for the level.

When you edit a shared level, the changes are made in all instances of the level. For example, if you change Country Name to Country, the level name is changed in all hierarchies where the shared level is used.

8. To delete a level, right-click the level and then click Delete, or click the level and select Delete level from the Level dialog. You cannot delete the default Total and Detail levels.

When you delete a shared level, you can choose whether to delete it from the current hierarchy only, or to delete it from all hierarchies.

For example, assume you want to delete the shared level Country Name from the current hierarchy only, called Hierarchy 1. Right-click the level in Hierarchy 1, select Delete, then select from Hierarchy 1.

Tip:
Selecting Delete level from the Level dialog only deletes the level from the current hierarchy. To remove a shared level from all hierarchies, right-click the level and select Delete, then select from all hierarchies.

9. Deselect Available if you do not want the hierarchy visible in analyses.

10. To add another hierarchy, click Add Hierarchy and repeat the steps in this procedure. Or, click Done when you are finished.

Setting Dimension Table Properties for Hierarchies

From the Overview tab for a particular dimension table, you can set properties that apply to all hierarchies for that table.

To set properties for hierarchies:

1. In Data Modeler, lock the model for editing.

2. Click the dimension table that you want to edit.

3. Change settings on the Overview tab as needed:

   • **Time dimension** — Specifies that hierarchies for this dimension table support a time dimension. Hierarchies for time dimensions cannot include skip levels or be unbalanced.

   • **Enable skipped levels** — Specifies that this dimension table supports hierarchies with skipped levels. A skip-level hierarchy is a hierarchy where there are members that do not have a value for a particular ancestor level. For example, in a Country-State-City-District hierarchy, the city "Washington, D.C." does not belong to a State. In this case, you can drill down from the Country level (USA) to the City level (Washington, D.C.) and below.

   In a query, skipped levels are not displayed, and do not affect computations. When sorted hierarchically, members appear under their nearest ancestors.

   • **Enable unbalanced hierarchies** — Specifies that this dimension table supports unbalanced hierarchies. An unbalanced (or ragged) hierarchy is a hierarchy where the leaves (members with no children) do not necessarily have the same depth. For example, a site can choose to have data for the current month at the
day level, previous months data at the month level, and the previous 5 years data at the quarter level.

**Setting Aggregation Levels for Measures**

You can set aggregation levels for measures.

For information, see [About Setting Aggregation Levels for Measures](#).

To set a custom aggregation level for a measure:

1. In Data Modeler, lock the model for editing.
2. In the Fact Tables area, click the fact table in which the measure is located.

   **Tip:**
   
   The fact table must be joined to at least one dimension table.

3. Specify the aggregation rule for the new column that you want to become the level-based measure.

4. Click the column name, then click *Levels*.

5. In the Levels tab, for one or more hierarchies, use the slider to select the aggregation level for the measure.

6. Click *Done* to return to the table editor.

**About Setting Aggregation Levels for Measures**

By default, measures are aggregated at the level of the dimension attributes that are selected in an analysis. For example, in an analysis that includes Sales Person and Revenue columns, the Revenue is aggregated at the level of a Sales Person.

To calculate ratios, you often need measures that are aggregated at a level that is different than the grain of the analysis. For example, to calculate the Revenue Percent Contribution for a Sales Person with respect to his department, you need Department Revenue at the Sales Person level in an analysis (Sales Person, Revenue, Revenue *100 / Revenue@Dept). In this example, Revenue@Dept has a custom aggregation level that is different from the default level.
You can define object-level permissions and row-level security data filters for your data model in Oracle BI Cloud Service.

Topics:
- Typical Workflow for Securing Your Data
- Creating Variables to Use in Expressions
- Securing Access to Objects in the Model
- Securing Access to Data

**Typical Workflow for Securing Your Data**

Here are the common tasks to secure your data model.

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define variables, if needed</td>
<td>Optionally, create variables that dynamically calculate and store values for use in column expressions and data filters.</td>
<td>Creating Variables to Use in Expressions</td>
</tr>
<tr>
<td>Create object permissions</td>
<td>Object permissions control visibility for fact tables, dimension tables, and columns.</td>
<td>Securing Access to Objects in the Model</td>
</tr>
<tr>
<td>Define row-level security filters</td>
<td>Data filters limit results returned for fact tables, dimension tables, and columns.</td>
<td>Securing Access to Data</td>
</tr>
</tbody>
</table>

**Creating Variables to Use in Expressions**

In Data Modeler, you can define variables that dynamically calculate and store values so that you can use those values in column expressions or data filters.

Topics:
- About Variables
- Defining Variables
About Variables

Variables dynamically calculate and store values so that you can use those values in expressions. You can use variables in column expressions, or in data filters. For example, suppose User1 belongs to Department1 and User2 belongs to Department2. Each user must access only the data that is specific to his department. You can use the DEPARTMENT_NUMBER variable to store the appropriate values for User1 and User2. You can use this variable in a data filter in which the data is filtered by Department2 for User1 and Department2 for User2. In other words, variables dynamically modify metadata content to adjust to a changing data environment.

Values in variables are not secure, because object permissions do not apply to variables. Anybody who knows or can guess the name of the variable can use it in an expression. Because of this, do not put sensitive data like passwords in variables.

You cannot use a variable in an expression that defines another variable.

Defining Variables

You can create a variable for use in column expressions and data filters. For example, a variable called SalesRegion might use a SQL query to retrieve the name of the sales region of the user.

Tip:

Only reference source database objects in the SQL query for a variable. Do not include names of data model objects in the query.

To define a variable:

1. In Data Modeler, lock the model for editing.
2. In the Variables menu in the left pane, click the Plus icon.
3. Enter a SQL query to populate the value of the variable:
   a. Specify whether the variable returns A single value or Multiple values.
   b. Enter a SQL query to populate the value or values of the variable. For example:
      — Return a single value with the query like: SELECT prod-name FROM products
      — Return multiple values with a query like: SELECT 'MyVariable', prod-name FROM products
      For multiple values, always use the format: SELECT 'VariableName', VariableValue FROM Table
   c. Provide a default starting value if needed.
   d. Click Test to validate that the query returns an appropriate value
4. To create a variable that refreshes its value at the start of each user session, select **On sign in** for **Update Value**.

5. To create a variable that refreshes its value on a schedule that you set, select **On a schedule** for **Update Value**.

   In the **Run SQL Query** area, select the frequency and start date for refreshing the variable.

6. To create a variable with a static value that never changes, select **Never** for **Update Value** and provide a value for the variable in the **Value** field.

7. Click **Done** to return to the data model.

   **Tip:**
   
   To edit an existing variable, right-click it in the Variables list and select **Inspect**. To delete a variable, right-click it and select **Delete**.

   After you have defined a variable, you can use it in a data filter or in a column expression. See Defining Data Security Filters and Creating Derived Attributes for details.

---

**Securing Access to Objects in the Model**

Model objects (tables and columns) are visible to all Oracle BI Cloud Service users by default. If you want to control who has access to objects in the model, then you can set show and hide permissions on individual fact tables, dimension tables, and columns.

For example, you can restrict access to certain Revenue columns so that only authorized users can view them.

To secure access to objects using permissions:

1. In Data Modeler, lock the model for editing.

2. Edit the fact table, dimension table, or column whose access you want to secure.

3. Select the Permissions tab.

4. To control access to the object, click **Add** and select the appropriate role.
Alternatively, in the left pane, click **Roles**. Then, drag and drop a role to the Permissions list. To add multiple roles, use Shift + click or Ctrl + click to make your selections before you drag and drop.

5. Specify whether this object is visible in the analyses that are used by users with that role by selecting either **Visible** or **Hidden**.

   **Tip:**
   Data model objects always display to users with the BI Data Model Author role. You cannot hide objects from other data modelers.

6. To remove roles from the Permissions list, do one of the following:
   - Right-click a role and select **Remove**.
   - Select **Remove** from the Actions menu for that role.
   - Select multiple roles using Shift + click or Ctrl + click, then select **Remove Selected** from the Permissions Action menu.
   - Remove all roles by selecting **Remove All** from the Permissions Action menu.

   **Tip:**
   You cannot remove the Everyone role.

7. Click **Done**.

**About Permission Inheritance**

When multiple application roles act on a user or role with conflicting security attributes, the user or role is granted the least restrictive security attribute. Also, any explicit permissions acting on a user take precedence over any permissions on the same objects granted to that user through application roles.

**Tip:**
If you deny access to a table, access to all columns in that table is implicitly denied as well.
Securing Access to Data

You can define data filters for fact tables, dimension tables, and columns that provide row-level security for data model objects. For example, you can create a filter that restricts access to the Products table so that only certain brands are visible to users assigned to a particular role.

To set data filters for data model objects:

1. In Data Modeler, lock the model for editing.
2. Edit the fact table, dimension table, or column you want to secure.
3. Select the Data Filters tab.
4. Add a role to the Data Filters list by doing one of the following:
   - Click Add and select the appropriate role.
   - In the left pane, click Roles. Then, drag and drop a role to the Data Filters list.
5. Enter an expression to specify which data is accessible for that role. Either enter the expression directly, or click Full Editor to display the Expression Editor.

   For information, see Creating Expressions in the Expression Editor.

   You can use a variable in a data filter expression. See Defining Variables for details.

6. Select Enable to specify whether the filter is enabled for that role.
7. To remove filters from the Data Filters list, do one of the following:
   - Right-click a filter and select Remove.
   - Select Remove from the Actions menu for that filter.
   - Select multiple filters using Shift-click or Ctrl-click, then select Remove Selected from the Data Filters Action menu.

   - Remove all filters by selecting Remove All from the Data Filters Action menu.
8. Click Done.
Part IV

Managing Oracle Business Intelligence Cloud Service

This part explains how to manage Oracle Business Intelligence Cloud Service.

Chapters:

- Managing What Users Can See and Do
- Backing Up and Restoring
- Performing Administration Tasks
Administrators can manage what other users are allowed to see and do when using Oracle Business Intelligence Cloud Service.

**Topics:**

- Typical Workflow for Managing What Users See and Do
- About Users and Roles
- About Application Roles
- Configuring What Users Can See and Do
- Functionality Enabled by Application Roles

### Typical Workflow for Managing What Users See and Do

Here are the common tasks to start managing what users can see and do in Oracle BI Cloud Service.

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<tr>
<th>Task</th>
<th>Description</th>
<th>More Information</th>
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<td>Understand application roles</td>
<td>Learn about the predefined application roles.</td>
<td>About Application Roles</td>
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<tr>
<td>Assign members and actions to</td>
<td>Select which users or roles are members of an application role. Define</td>
<td>Assigning Members and Actions to Application Roles</td>
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<tr>
<td>application roles</td>
<td>parent application roles.</td>
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<tr>
<td>Assign application roles to users</td>
<td>Assign a single user to multiple application roles. See the roles and</td>
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<tr>
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<tr>
<td>roles</td>
<td>belong to a role and the application roles assigned to a role.</td>
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</tr>
<tr>
<td>Add your own application roles</td>
<td>Create your own application roles, and add members.</td>
<td>Adding Your Own Application Roles</td>
</tr>
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</table>
About Users and Roles

Identity domain administrators manage user accounts and assign roles for an identity domain through the My Services Security page for Oracle Cloud.

The identity domain controls the authentication and authorization of users who can sign in to Oracle BI Cloud Service and other Oracle Cloud services. For more information, see Managing Users and Roles in Getting Started with Oracle Cloud.

Within Oracle BI Cloud Service, administrators can view users and roles that are configured for the identity domain and give them application roles specific to Oracle BI Cloud Service. It is these application roles that control what users can see and do in Oracle BI Cloud Service. See also, About Application Roles.

When Oracle Cloud services are provisioned in an identity domain, several predefined roles and user accounts are available through My Services. For more information, see Roles and User Accounts Predefined in My Services in Getting Started with Oracle Cloud.

<table>
<thead>
<tr>
<th>Predefined Roles</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenant/AdminGroup</td>
<td>Identity Domain Administrator Users within the organization that manage users and roles for an identity domain.</td>
</tr>
<tr>
<td>&lt;biservicename&gt;.BICloudServiceAdministrators</td>
<td>&lt;biservicename&gt;.BICloudServiceAdministrators Users within the organization that administer Oracle BI Cloud Service.</td>
</tr>
<tr>
<td>&lt;databaseServiceName&gt;.db_administrator</td>
<td>&lt;databaseServiceName&gt;.db_administrator Users within the organization that administer the database available with Oracle BI Cloud Service.</td>
</tr>
<tr>
<td>&lt;databaseServiceName&gt;.db_developer</td>
<td>&lt;databaseServiceName&gt;.db_developer Users within the organization that have the role of database developer for the database available with Oracle BI Cloud Service.</td>
</tr>
<tr>
<td>&lt;databaseServiceName&gt;.db_user</td>
<td>&lt;databaseServiceName&gt;.db_user Users within the organization that have the role of database user for the database available with Oracle BI Cloud Service.</td>
</tr>
</tbody>
</table>

About Application Roles

An application role comprises a set of privileges that determine what users can see and do after signing in to Oracle BI Cloud Service. It’s the administrator’s job to assign people to one or more application role.

There are two types of application role:

<table>
<thead>
<tr>
<th>Type of Application Role</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Predefined</td>
<td>Include a fixed set of privileges.</td>
</tr>
<tr>
<td>Custom</td>
<td>Include one or more predefined application roles.</td>
</tr>
</tbody>
</table>
Application Roles Predefined in Oracle BI Cloud Service

Oracle BI Cloud Service provides several predefined application roles to get you started. In many cases, these predefined application roles are all that you need.

**Tip:**
You can also create your own application roles. See Adding Your Own Application Roles.

<table>
<thead>
<tr>
<th>Predefined Application Role</th>
<th>Description</th>
<th>Default Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIServiceAdministrator</td>
<td>Allows users to administer Oracle BI Cloud Service and delegate privileges to others.</td>
<td>Identity Domain Administrator (User Role)</td>
</tr>
<tr>
<td>BIDataModelAuthor</td>
<td>Allows users to manage the data model in Oracle BI Cloud Service. Also allows users to upload data from files using Data Loader.</td>
<td>BIServiceAdministrator (Application Role)</td>
</tr>
<tr>
<td>BIDataLoadAuthor</td>
<td>Allows users to load data using Oracle BI Cloud Service REST API and Oracle BI Cloud Service Data Sync.</td>
<td>BIServiceAdministrator (Application Role)</td>
</tr>
<tr>
<td>BIContentAuthor</td>
<td>Allows users to create analyses and dashboards in Oracle BI Cloud Service.</td>
<td>BIDataModelAuthor (Application Role)</td>
</tr>
<tr>
<td>BIAdvancedContentAuthor</td>
<td>Allows users to perform more advanced content management tasks, such as add data sources for analyses and dashboards, and export dashboards.</td>
<td>BIServiceAdministrator (Application Role)</td>
</tr>
<tr>
<td>BIDiscoveryContentAuthor</td>
<td>Allows users to visualize and explore data using Visual Analyzer, and add data sources for visualizations.</td>
<td>BIAdvancedContentAuthor (Application Role)</td>
</tr>
<tr>
<td>BIConsumer</td>
<td>Allows users to view and run analyses in Oracle BI Cloud Service. Use this application role to control who has access to the service.</td>
<td>BIContentAuthor (Application Role)</td>
</tr>
</tbody>
</table>
For details about the functionality enabled by each of these predefined application roles, see Functionality Enabled by Application Roles.

You cannot delete predefined application roles or remove default memberships.

Each application role can have users, roles, or other application roles as members. This means that a user who is a member of one application role might indirectly be a member of other application roles.

For example, a member of the BIServiceAdministrator application role inherits membership of other application roles, such as BIDataModelAuthor and BIConsumer. Any user that is a member of BIServiceAdministrator can do and see everything that these other application roles can do and see. Therefore you do not need to add a new user (for example, John) to all these application roles. You can simply add the user to the BIServiceAdministrator application role.

Configuring What Users Can See and Do

Administrators assign application roles to determine what other users can see and do in Oracle BI Cloud Service.

Video

Topics:

- Getting Started with Application Role Management
- Assigning Members and Actions to Application Roles
- Why is Membership of the BI Service Administrator Application Role Important?
- Assigning Application Roles to Users
- Assigning Application Roles to User Roles
- Adding Your Own Application Roles
- Deleting Application Roles

Getting Started with Application Role Management

You configure what users see and do in Oracle BI Cloud Service using the Application Role Management page. This page presents the data in 3 different views:

<table>
<thead>
<tr>
<th>Application Role Management Page</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users tab</td>
<td>Shows users from the identity domain associated with your service. You can’t add or remove users through the Users tab but you can assign them to application roles in Oracle BI Cloud Service.</td>
</tr>
</tbody>
</table>

| Roles tab                        | Shows roles from the identity domain associated with your service. You can’t add or remove roles through the Roles tab but you can assign them to application roles in Oracle BI Cloud Service. From the Roles tab you can also see who belongs to each role. |

|
Assigning Members and Actions to Application Roles

Application roles determine what users are allowed to see and do in Oracle BI Cloud Service. It’s the administrator’s job to assign appropriate application roles to everyone using the service and to manage the privileges of each application role.

Assign individuals (users) and groups of users (roles) from your identity domain to become members of an application role in Oracle BI Cloud Service. You can assign other application roles to be members too. See also About Application Roles.

Remember:

- Members inherit the privileges of an application role.
- Application roles inherit privileges from their parent (application roles).

To select members for an application role or change parent privileges:

1. Open the Console.
2. Click Users and Roles.
3. Click the Application Roles tab.
4. To display all available application roles, leave the Search field blank and Show Members: All.
   To filter the list by name, enter all or part of an application role name in the Search filter and press Enter. The search is case-insensitive, and searches both name and display name.
5. Look in the Members area to see who belongs to each application role:
The number of users, roles, and application roles that are members is displayed on the page. Click a number, such as 5 in this image, to see those members in more detail (either users, roles or application roles).

6. To add new members or remove members from an application role:
   
a. Click Members.

b. Select either users, roles, or application roles from the Type box and click Search to show the current members.

c. Use the shuttle controls to move members between the Available and All Selected list.

Some application roles aren't eligible to be members and these are grayed. For example, you can't select a parent application role to be a member.

---

**Note:**

Users marked “absent” no longer have an account in your identity domain. To remove absent users, use the shuttle control to move the user from the All selected users list to the Available users list.

---

d. Click OK.

7. To see whether an application role, such as Sales Analyst, inherits privileges from other application roles:
   
a. Click the action menu.

b. Select Manage Application Roles.

Inherited privileges are displayed in the Selected Application Roles pane.

In this example, the Sales Analyst application role inherits privileges from BI Content Author and BI Advanced Content Author. When you assign someone
the Sales Analyst application role, you authorize them to perform actions allowed by both these application roles. See Features and Functionality Enabled by Application Roles.

8. To add or remove privileges:
   a. Click Search to display all available application roles. Alternatively, enter all or part of an application role name and click Search.
   b. Use the shuttle controls to move application roles between the Available Application Roles list and the Selected Application Roles list.
      You can’t select application roles that are grayed out. Application roles are grayed out so you can’t create a circular membership tree.
   c. Click OK.

Why Is Membership of the BI Service Administrator Application Role Important?

You must be a member of the BI Service Administrator application role to use the Console. If you remove your own membership from the BI Service Administrator application role, then you see a warning message because there must always be at least one user who has this application role.

If you remove your own membership, you can continue to use the Console in the current session but you can’t use the Console in the future. To continue to use the Console, you must reinstate your membership during the current session.

No Users With the BI Service Administrator Application Role?

If no one has access to the Console, ask your identity domain administrator to add you or another user to the <serviceInstanceName>.BICloudServiceAdministrator role through My Services Security. This role is a member of the predefined application role BI Service Administrator and enables access to the Console.

Assigning Application Roles to Users

The Users page lists all the users who can sign in to Oracle BI Cloud Service. The list of names comes directly from the identity domain associated with your service. It’s the administrator’s job to assign users to appropriate application roles in Oracle BI Cloud Service.

---

**Note:** You can’t add users to the identity domain through Oracle BI Cloud Service. Use My Services to manage user accounts for the identity domain.

---

To assign one or more application roles to a user:

1. Open the Console.
2. Click Users and Roles.
3. Click the Users tab.
4. To show everyone, leave the **Search** field blank and click **Show Members: All**.

To filter the list by name, enter all or part of a user name in the **Search** filter and press enter. The search is case-insensitive, and searches both name and display name.

5. To see what application roles are assigned to a user:
   
   a. Select the user.

   b. Click the action menu and select **Manage Application Roles**.

   The user’s current application role assignments are displayed in the **Selected Application Roles** pane.

   For example, this image shows a user called Ed Ferguson assigned with the Sales Analysts application role.

6. To assign additional application roles or remove current assignments:

   a. Show available application roles. Click **Search** to display all the application roles.

   Alternatively, filter the list by **Name** and click **Search**.
b. Use the shuttle controls to move application roles between the Available Application Roles list and the Selected Application Roles list.

To find out what actions each application role allows, see Features and Functionality Enabled by Application Roles.

c. Click OK.

Assigning Application Roles to Multiple Users Through Roles

The Roles page shows you all the roles that people signing in to Oracle BI Cloud Service can belong to. The list of roles comes directly from the identity domain associated with your service. It’s often quicker to assign privileges in Oracle BI Cloud Service to multiple users through their predefined identity domain roles, than it is to assign privileges to users one by one.

Note: You can’t add roles to the identity domain through Oracle BI Cloud Service. Use My Services to manage user accounts and roles for your identity domain.

You can assign application roles from the Roles page. You can also see who belongs to each role.

To manage application role assignments by role:

1. Open the Console.
2. Click Users and Roles.
3. Click the Roles tab.

4. Look in the Members area to see who belongs to each role:

The number of users and roles that are members are displayed on the page. Click a number, such as 1 in this image, to see the members in more detail.

5. To display all available roles, leave the Search field blank and Show Members: All.

To filter the list by name, enter all or part of a role name in the Search filter and press enter. The search is case-insensitive, and searches both name and display name.
Alternatively, use the Show Members filter to list roles who are members of a particular application role or belong to another role.

6. To see the current application roles assignments:
   a. Select the role.
   b. Click the action menu and select Manage Application Roles.
   
   Current application role assignments display in the Selected Application Roles pane.

7. To assign additional application roles or remove them:
   a. Click Search to display all available application roles.
      Alternatively, enter all or part of an application role name and click Search.
   b. Use the shuttle controls to move application roles between the Available Application Roles list and the Selected Application Roles list.
      To find out what actions each application role allows, see Features and Functionality Enabled by Application Roles.
   c. Click OK.

Adding Your Own Application Roles

Oracle BI Cloud Service provides a set of predefined application roles. You can also create application roles of your own to suit your business.

For example, you can create an application role that allows users to view folders and reports or an application role that restricts access to specific parts of the data model.

To create an application role and add members:

1. Open the Console.
2. Click Users and Roles.
3. Click the Application Roles tab.
4. Click Add.

5. Enter a name and describe the application role. Click Save.
   Initially, new application roles don’t have any privileges or any members.
6. Add privileges to the new application role:
   
a. Click the action menu.

   b. Select Manage Application Roles.

   c. Click Search.

   d. Move all the application roles you want this application role to inherit to the Selected Application Roles pane, and click OK.

See also Features and Functionality Enabled by Application Roles.

7. Add members to the application role:
   
a. Click the action menu.

   b. Select Manage Members.

   c. Select the members (users, roles or application roles) that you want assigned to this application role and move them to the Selected pane on the right.

   d. Click OK.

See also Assigning Members and Actions to Application Roles.

Deleting Application Roles

You can delete application roles that you created but no longer need.

To delete an application role:

1. Go to Application Role Management:
   
a. Open the Console.

   b. Click Users and Roles.

   c. Click the Application Roles tab.

2. Navigate to the application role you want to delete.

3. Click the action menu for the application role you want to delete and select Remove.
4. Click OK.

Functionality Enabled by Application Roles

Application roles determine what you can see and do in Oracle BI Cloud Service. This topic describes what you are allowed to see and do with the predefined application roles. Information is organized in two ways:

- Application role by functionality
- Functionality by application role

Application Role by Functionality

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<tr>
<td>Access</td>
<td>Access to Data Modeler</td>
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This topic describes how to back up and restore the data model, catalog content, and application roles using a file called a snapshot.

Topics:
- Typical Workflow for Backing Up and Restoring
- About Snapshots
- Taking Snapshots and Restoring Information
- Downloading, Uploading, and Migrating Snapshots

## Typical Workflow for Backing Up and Restoring

Here are the common tasks to back up and restore the system using snapshots.

<table>
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<tr>
<th>Task</th>
<th>Description</th>
<th>More Information</th>
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</thead>
<tbody>
<tr>
<td>Take a snapshot</td>
<td>Capture the data model, catalog, and application roles in Oracle BI Cloud Service at a point in time.</td>
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<td>Migrate snapshot data</td>
<td>Migrate data models, catalog content, and application roles.</td>
<td>Migrating Snapshot Data</td>
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## About Snapshots

A snapshot captures the state of your Oracle BI Cloud Service environment at a point in time and includes the data model, catalog content, and application roles.

<table>
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<tr>
<th>Artifacts Saved In a Snapshot</th>
<th>Description</th>
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<tbody>
<tr>
<td>Data model</td>
<td>A snapshot of the data model created using Data Modeler.</td>
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</table>
Artifacts Saved In a Snapshot | Description
--- | ---
Catalog | A snapshot of the catalog that contains things saved for future use (such as reports and dashboards).
Application roles | A snapshot of the application role definitions defined for your Oracle BI Cloud Service.

You can download a snapshot to a file system and upload a saved snapshot from a file system (of the same service that created the snapshot). This feature is useful if you want to move data from a development or test environment to a production Oracle BI Cloud Service.

You can keep up to 10 snapshots online but download as many as you want.

**Note:** Oracle BI Cloud Service automatically takes a snapshot when someone publishes changes to the data model. We keep the 5 most recent snapshots in case you unexpectedly need to revert to an earlier model version. The minimum interval between system generated snapshots is one hour.

## Taking Snapshots and Restoring Information

You can take a snapshot of your Oracle BI Cloud Service at any time.

**Topics:**

- Taking a Snapshot
- Restoring from a Snapshot
- Editing Snapshot Descriptions
- Deleting Snapshots

### Taking a Snapshot

Administrators can take a snapshot of Oracle BI Cloud Service at any time.

To take a snapshot:

1. Open the Console.
2. Click Snapshots and Models.
3. Click New Snapshot.
4. Enter a short description for the snapshot to help you remember later why you took it.
   
   For example, why you created the snapshot and what it contains.
5. Click OK.

The latest data model, catalog, and application role definitions are saved in a snapshot and a message displays at the top right hand side of the page.

**Restoring from a Snapshot**

If something goes wrong because of a change to the data model, catalog, or application roles, it’s easy to restore Oracle BI Cloud Service to a previous working state from a snapshot.

---

**Note:**

Restoring from a snapshot overwrites the data model, catalog, and application roles (if selected for restore) to a previous state and any user sessions are terminated.

---

To restore from a snapshot:

1. Open the Console.
2. Click Snapshots and Models.
3. Select the snapshot that you want to use to restore your Oracle BI Cloud Service.
4. Click Manage Snapshot.
5. Click Restore to return Oracle BI Cloud Service to the state when this snapshot was taken.
6. In the Restore Snapshot dialog box, select all the elements you want to restore. You can select from data model, catalog, and application roles.

For example, you may not want to include application roles if you are restoring a snapshot taken from a pre-production service, to a production service. Pre-production roles often have different members to the production service. If so, deselect **Application Roles** before clicking Restore.
7. Click **Restore**.

   A warning message displays because restoring a snapshot can be very disruptive.

8. Click **Yes** to restore the selected snapshot, or click **No** to abandon the restore.

### Editing Snapshot Descriptions

You can add or update descriptions for any snapshot.

To edit a snapshot description:

1. Open the Console.
2. Click **Snapshots and Models**.
3. Select the snapshot you want to edit.
4. Click **Manage Snapshot**.

5. Click **Edit** to update the description.
6. Update the description, and click **OK**.

### Deleting Snapshots

From time to time, delete snapshots that you do not need.

To delete a snapshot:

1. Open the Console.
2. Click **Snapshots and Models**.
3. Select the snapshot that you want to delete.
4. Click **Manage Snapshot**.

5. Click **Delete** to delete the snapshot.

   A message displays at the top right hand side of the page. If you change your mind, click **Undo**.
Downloading, Uploading, and Migrating Snapshots

Download and upload features enable you to save snapshots of your Oracle BI Cloud Service to your local file system, and upload them to the Cloud. Use these features to back up and restore service data and to migrate data from one Oracle BI Cloud Service environment to another.

Topics:

- Downloading Snapshots
- Uploading Snapshots
- Migrating Snapshot Data

Downloading Snapshots

Use the Download option in the Snapshots tab to save a snapshot to your local file system. For example, you can locally store and manage snapshots taken of your Oracle BI Cloud Service.

If you haven’t taken the snapshot yet, you’ll need to do that first. See Taking a Snapshot.

To download a snapshot:

1. Open the Console.
2. Click Snapshots and Models.
3. Select the snapshot that you want to download.
4. Click Manage Snapshot.
5. Click Download.
6. Enter and confirm a new password for this snapshot. The password must contain at least 8 characters.
   
   You must remember this password, because you enter it again during the upload process.
7. Click OK.
What happens next depends on your browser. In Internet Explorer, for example, you browse the Save As dialog, and click **Save** to save the snapshot in the selected location.

The snapshot downloads as an Oracle Business Intelligence archive file (.bar). Oracle BI Cloud Service artifacts (data model, catalog, and application roles) are included in the archive.

### Uploading Snapshots

You upload a snapshot of Oracle BI Cloud Service using the Snapshots tab in the Service Console. For example, you may upload a snapshot when moving artifacts created in a test environment to a production environment.

When you upload a snapshot, artifacts stored inside the snapshot are not immediately available in your Oracle BI Cloud Service. After upload, your snapshot displays in the snapshot list. When you are ready to do so, you can overwrite the current data model, catalog, or application roles with those stored in the snapshot. See **Restoring from a Snapshot**.

To upload a snapshot:

1. Open the Console.
2. Click **Snapshots and Models**.
3. Click **Upload Snapshot**.
4. Use **Browse** to locate the snapshot that you want to upload.
   - Choose the Oracle Business Intelligence archive file (.bar) that contains your snapshot.
5. Enter the snapshot password.
   - You set the password during the download process.
6. Click **OK**.

The uploaded snapshot is displayed in the list of saved snapshots. Follow steps in **Restoring from a Snapshot** to restore the snapshot that you just uploaded.

### Migrating Snapshot Data

You can migrate the data model, catalog content, and application roles created in one Oracle BI Cloud Service environment to another, using snapshots. For example, you may want to move pre-production data to a production service.

To migrate snapshot data to another Oracle BI Cloud Service:

1. Download the snapshot that you want to migrate to your local file system. See **Downloading Snapshots**.
2. Sign in to the target Oracle BI Cloud Service, and upload the snapshot.
   See Uploading Snapshots.

3. Select the newly uploaded snapshot from the list of saved snapshots.
   Follow the steps in Restoring from a Snapshot to migrate the data model, catalog,
   or application roles saved in the snapshot to the target Oracle BI Cloud Service.
Performing Administration Tasks

This topic describes tasks performed by administrators managing Oracle BI Cloud Service.

Topics:
- Typical Workflow for Performing Administration Tasks
- Understanding Administration Tools
- Changing the Database Connection
- Uploading Data Models from a File (.rpd)
- Configuring How Data is Displayed on Maps
- Editing Background Maps
- Managing Session Information in Oracle BI Cloud Service
- Executing Test SQL Queries
- Monitoring Metrics for Oracle BI Cloud Service

Typical Workflow for Performing Administration Tasks

Here are the common tasks for administration.

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage what users see and do</td>
<td>Configure what users see and do in Oracle BI Cloud Service using the Application Role Management page.</td>
<td>Managing What Users Can See and Do</td>
</tr>
<tr>
<td>Back up and restore content</td>
<td>Back up and restore the data model, catalog content, and application roles using a file called a snapshot.</td>
<td>Backing Up and Restoring</td>
</tr>
<tr>
<td>Change the database connection</td>
<td>Connect Oracle BI Cloud Service to a different cloud database.</td>
<td>Changing the Database Connection</td>
</tr>
<tr>
<td>Manage maps</td>
<td>Manage map layers and background maps</td>
<td>Configuring How Data Is Displayed on Maps and Editing Background Maps</td>
</tr>
<tr>
<td>Manage session information</td>
<td>Monitor who is signed in and troubleshoot issues with analyses by analyzing the SQL queries and logs.</td>
<td>Managing Session Information in Oracle BI Cloud Service</td>
</tr>
</tbody>
</table>
Understanding Administration Tools

You administer Oracle BI Cloud Service from the Console (Oracle BI Cloud Service) and My Services (Oracle Cloud).

<table>
<thead>
<tr>
<th>Administration Tool</th>
<th>Description and How to Access</th>
</tr>
</thead>
</table>
| Oracle BI Cloud Service - Console | Use the Console to manage user permissions, back up your information, and change the database connection for Oracle BI Cloud Service.  
See who is currently signed in, manage map layers and background maps, and diagnose issues with SQL queries.  
See Managing What Users Can See and Do, Backing Up and Restoring, Changing the Database Connection, Configuring How Data Is Displayed on Maps, Editing Background Maps, Managing Data Files, Managing Session Information in Oracle BI Cloud Service, and Executing Test SQL Queries. |
| Oracle Cloud - My Services  | Use My Services to manage user accounts and monitor usage metrics.  
See Managing Users and Roles in Getting Started with Oracle Cloud and Monitoring Metrics for Oracle BI Cloud Service.                                                                                                                                                                                                                                                                                                                                                     |

You must have the BI Service Administrator role to perform all the administration tasks outlined here.

Changing the Database Connection

Change database connection information for Oracle BI Cloud Service if you want to build data models and analyze data stored in a different Oracle Database Cloud Service.

When you integrate Oracle BI Cloud Service with a different database service instance, existing content such as model objects, reports, and dashboards continue to work provided that all the required source objects are available in the new database instance.

See also How Does Oracle BI Cloud Service Integrate with Oracle Database Cloud Service?

To change and test the database connection:

1. Open the Console.
2. Click Connections.
3. Select Use a different cloud database to connect Oracle BI Cloud Service to an Oracle Database Cloud - Database as a Service instance.
Tip: The option Use the database included with your service connects Oracle BI Cloud Service to the Oracle Database Cloud - Database Schema Service packaged with your service.

4. Enter database connection information.

The target database must be Oracle Database Cloud - Database as a Service. Ask the database administrator to provide the connection information.

Note: You don’t need to enter database information on the Connection tab if you’ve chosen to upload data models built with Oracle BI Enterprise Edition. All the connection information is defined in the data model file (.rpd) that you upload to Oracle BI Cloud Service. See About Uploading Data Models to the Cloud.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host</td>
<td>Address of the database server or the host’s name.</td>
</tr>
<tr>
<td>Port</td>
<td>Port number on which the database server is listening for incoming connections.</td>
</tr>
<tr>
<td>SID</td>
<td>Name of the Oracle database instance.</td>
</tr>
<tr>
<td>Connect as</td>
<td>Name of a database user.</td>
</tr>
<tr>
<td>Password</td>
<td>User’s password to access the database.</td>
</tr>
</tbody>
</table>

5. Click Test to verify the connection.

6. Click Save Connection information to save your settings.

Uploading Data Models from a File (.rpd)

Administrators can upload data models built with Oracle BI Enterprise Edition to Oracle BI Cloud Service. After uploading a data model file (.rpd) to the cloud, content authors can build reports in the usual way.

Tutorial

Topics

• About Uploading Data Models to the Cloud

About Uploading Data Models to the Cloud

If you’ve modeled your business data with Oracle BI Enterprise Edition, then you don’t need to start from scratch in Oracle BI Cloud Service. Simply upload your data model file (.rpd) to Oracle BI Cloud Service and start exploring your data through visualizations, analyses, and dashboards.

Oracle BI Cloud Service lets you upload a data model file (.rpd) with:

• One or more data models
• Connections to one or more instances of Oracle Database Cloud - Database as a Service

You’ll need to validate your data model file and configure database connection details in Oracle BI Enterprise Edition.

Note: At the moment, you can’t upload presentation catalog items created in Oracle BI Enterprise Edition to Oracle BI Cloud Service. This feature is coming soon.

Getting Your Data Model File Ready for the Cloud

Take some time to ready your data model file (.rpd) for the cloud:

• Verify that you’re using Oracle BI Enterprise Edition 11.1.1.6 or later

• Validate the data model file
  Run consistency checks using Consistency Check Manager in Oracle BI Administration Tool.

• Verify that the data model file includes connection details to an Oracle Cloud database instance
  Review connection pool settings from Oracle BI Administration Tool:
    – Data source name must point to the Oracle Database Cloud - Database as a Service where the data is stored.
    – Call interface must be Oracle Call Interface (OCI).

If your data model file connects to multiple Oracle Database Cloud - Database as a Service instances, check connection pool settings one-by-one.

When the data model file (.rpd) is ready, you can upload it to Oracle BI Cloud Service. Before doing so, back up your current data model in case you need to restore this version. See Uploading Data Models to the Cloud.

During the upload, existing data model information in Oracle BI Cloud Service is deleted and replaced with content from the uploaded file. Data models uploaded from the file become available to content authors through the Subject Areas pane.
**Editing Data Models Uploaded to the Cloud**

You can’t edit data models created with Oracle BI Enterprise Edition through Oracle BI Cloud Service. Data Modeler is disabled when you upload data models to Oracle BI Cloud Service from a .rpd file.

If you want to improve or update the model, make your updates in Oracle BI Administration Tool, re-run consistency checks, and upload the data model file again. Each time that you upload a data model, you delete and replace the existing model with the newly uploaded content.

**Tip:** Model changes, such as deleting columns from the model, can affect existing content. Take time to check existing analyses and dashboards after uploading model updates.

**Uploading Data Models to the Cloud**

Administrators can upload data models built with Oracle BI Enterprise Edition to Oracle BI Cloud Service. After migrating data models to the cloud, content authors can visualize data in the usual way.

When you upload data models from Oracle BI Enterprise Edition, you delete existing data model information in Oracle BI Cloud Service and replace it with content in the data model file (.rpd). The data models you upload become available to content authors through the Subject Areas pane.

To upload data models created with Oracle BI Enterprise Edition to the cloud:

1. Verify the data model file (.rpd) and database connections.
   
   See About Uploading Data Models to the Cloud.

2. In Oracle BI Cloud Service, open the Console.


4. Take a snapshot of the current data model in case you need to restore this version.
   
   See Taking a Snapshot.

5. Click Replace Data Model.

6. Click Browse and select the data model file (.rpd) that you want to upload.

7. Enter the password for the file.

8. Click OK.

9. Go to the Home page, click Analyses then Create Analysis to see the data models in Oracle BI Cloud Service.

   Data models that you uploaded from the file are displayed in the Select Subject Areas pane.

10. Optionally, if the data model file that you uploaded defines permissions and data filters, create matching application roles in Oracle BI Cloud Service for the data security to work in the cloud.

    a. Create application roles with exactly the same names as those defined in Oracle BI Administration Tool.
See Adding Your Own Application Roles.

b. Assign users (and user roles) to the application roles as required.

See Assigning Application Roles to Users and Assigning Application Roles to User Roles.

Configuring How Data Is Displayed on Maps

As the administrator, you define how data columns modeled in Oracle BI Cloud Service display on maps. Once you have configured the map data, users can visualize data through map views.

**Tutorial**

Map views allow users to display data on maps in different formats and to interact with data. Oracle BI Cloud Service is configured with Oracle MapViewer, spatial boundary data, hosted maps, Oracle Database, and optionally Oracle Spatial. As an administrator, you must configure the metadata that defines the mapping between Oracle BI data and spatial data.

To configure how data is displayed on map views:

1. On the Home page, click **Console** and **Manage Map Data**.
2. Click the **Layers** tab.
3. Click the **Import Layers** button.
4. In the Import Layers dialog, select the connection in the **Look in** field and the layers that are needed for zooming and drilling. Click **OK**.
5. Back on the Layers tab, select a layer and click the **Edit Layer** button. In the Edit Layer dialog, associate layers with columns so that users can display data in the map view.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Specifies the name of the layer that is displayed to users who work with map views.</td>
</tr>
<tr>
<td>Location</td>
<td>Specifies which background map the layer originates from. Click <strong>Location</strong> to select a different layer.</td>
</tr>
<tr>
<td>Description</td>
<td>Specifies the description of the map layer. This description is displayed when users are editing map views and they hover over the layer name in the Map Formats area.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Layer Key                 | Specifies the column of spatial data that you can associate with data for Oracle BI Cloud Service. Each column value corresponds to a "shape" that originates from the background map. For example, a MY_CITIES layer might have a layer key called CITY. The default value is a "best guess". Select the appropriate column from the list. There are various reasons why a country such as Mexico might be drawn as a white area on a map:  
  • The column has a null value for the country of Mexico, but a shape exists for Mexico in the spatial column.  
  • The column has a value for the country of Mexico, but no shape exists for Mexico in the spatial column.  
  • The column has a value for the country of Mexico and the shape exists for Mexico in the spatial column, but the names are mismatched. The data columns in Oracle BI Cloud Service might have the value MEX and the spatial column might have MXC. |
| BI Key Delimiter          | Available only when multiple columns are specified for one key. Specifies a single ASCII character (such as a comma or underscore) to function as a delimiter for combining the data columns in Oracle BI Cloud Service that form a key. |
| Geometry Type             | Specifies whether the layer is a polygon, point, or line geometry layer. The type that you select affects the formatting that users can apply to the layer. |
| BI Key Columns Area       | Specifies the columns of data in Oracle BI Cloud Service that you want to associate with the layer. You can have multiple columns associated with a single layer. You can select multiple columns from one subject area or from multiple subject areas. The columns and delimiter that you select must exactly match the name of the Layer Key value. Suppose the Layer Key value is STATE_CITY. You must select the STATE and CITY BI data columns and specify the underscore character in the BI Key Delimiter field. Use the various options in this area:  
  • Add — Displays the list of available subject areas. Select a subject area and select all the data columns that you want to associate with the layer.  
  • Delete — Deletes the selected key column.  
  • Edit — Lets you edit the data columns associated with a layer.  
  When a content designer creates a map view, a default main map is selected as the basis for that map view. If at least one data column from the analysis is associated with a layer that is associated with a main map, then that main map is selected by default. |
| Show Qualified Names      | Specifies whether to display the fully qualified name of the column in the BI Key Columns Area or simply the column name. |

You use this dialog to associate layers with BI data. If you use a specific column in multiple subject areas, then you must associate it with a layer for each subject area.
If the association between a column and a layer is incorrect, then the layer cannot be displayed correctly on the map.

**Note:** Spatial features such as shape definitions are managed by database administrators for your service. If a shape geometry definition does not exist for a particular column value, then the shape cannot be shown on the map and might inhibit user interactions on the map.

6. Click **OK** to close the dialog.

7. Click the Background Maps tab, then click the **Import Background Maps** button.

8. In the Import Background Maps dialog, select the connection in the **Look in** field and the main maps to use, then click **OK**.

   The connection that you select for the main map can be different from the connection for the layers or images.

![Import Background Maps dialog](image)

9. See **Editing Background Maps** for the steps required to prepare the background maps.

10. Optionally, click the Images tab, then click the **Import Images** button if you want to use images as a format on maps.

11. In the Import Images dialog, select the connection in the **Look in** field and the images to use, then click **OK**.

After you’ve added background maps and map layers, Oracle BI Cloud Service can use the information to create a static image for a map. The static image is displayed to content designers and users who work with map views. For information on how designers and users interact with map views, see **Editing Map Views**.
Editing Background Maps

You edit background maps to ensure that users have a seamless experience with map views.

A background map is a non-interactive map that serves as a base for the map view. It might display a satellite image or a map with roads. The background map specifies the order of layers on the map view.

The ordering of map layers is very important. You must pay close attention to ensure that users have a seamless experience while navigating on the map (that is, drilling and zooming). In the Edit Background Map dialog, you assign each layer a minimum and maximum zoom range. Given that the map zoom slider can slide only from bottom to top vertically, the layers with lower minimum zoom levels are placed at the bottom of the slider. Ensure that the layer grid on the Interactive BI Layers section of the dialog follows a similar pattern, so that you place layers with lower minimum zoom levels at the bottom of the list.

Layer ordering becomes irrelevant when the zoom ranges of layers do not intersect on the scale. Ordering becomes very important when layers have a common minimum and maximum zoom range. Use care to ensure that detailed layers are not hidden by the aggregated layers during drilling or zooming operations.

To edit a background map:

1. Display the Manage Map Data page and import layers, as described in Configuring How Data Is Displayed on Maps.

2. On the Background Maps tab, select a map, then click the Edit Background Map button to display the Edit Background Map dialog.

3. Specify the name and description of the map, which is displayed as a tooltip for the map when selecting a map from the list, when editing the map view.

4. The Location field displays the location of the background map in the data source. Click Location button to change to a different map. If you select a background map that includes a different number of zoom levels, then the zoom levels are automatically adjusted for the layers that are associated with the map by scaling their ranges.

5. Click the Add Layers button to display a list of the layers that have been imported on the Layers tab, then select the layers to add to the map. This button is unavailable when all layers from the Layers tab have been added to the background map.

   When you add a layer that is part of the map definition, the layer displays at its default zoom levels. If the layer is not part of the map definition, then specify the zoom levels yourself.

   The layers are listed from bottom to top, in terms of how they are applied to the map. A sample order is Countries, States, Cities. The lower level layers generally have the lower zoom levels. For example, if you have a States layer and a Cities layer, then include lower zoom levels for State than City.
6. Click the **Sort Layers By Zoom Level** button to list the layers in ascending or descending order based on visibility on the map. This button is unavailable when layers are listed in the proper order.

The sort order that is specified here does not affect the order in which layers are applied on the map. Instead, the sorting order affects the zoom levels. For example, the States layer might have zoom levels 1 through 3 and the Cities layer has zoom levels 4 through 9. The lower layers have the lower zoom level numbers. The zoom levels that you specify correspond to the tick marks on the zoom slider on the map.

You can include both layers that have been associated with a BI column by using the Edit Layer dialog and layers that have not been associated. Ensure that BI layers are ordered higher than non-BI layers. If a non-BI layer is ordered higher than any BI layers, then the non-BI layer is displayed on top of the lower BI layers on the map, which prevents the BI layers from being interactive.

7. Click the **Turn On Layer Visibility** or **Turn Off Layer Visibility** button to control the visibility of layers on the map. Use the buttons to indicate whether the layer is visible in the Preview map in this dialog only. The layer is still visible on a map view. You can modify the zoom levels for a layer with a visibility turned off.

8. Click a cell under a zoom level for a layer to affect the zoom level:

   - If you click a blue cell that is between other blue cells, then you see a popup menu with **Clear Before** and **Clear After** buttons, which allow you to change the zoom level in either direction. For example, if you click the cell for zoom level 4 and click the eraser on the right, then all cells to the right are cleared for that zoom level.

   - If you click a blue cell that at the end of a line of blue cells, then the cell turns white to indicate that it is no longer part of that zoom level.

   - If you click a white cell, then you increase the zoom level on either side of the existing blue cells. For example, suppose cells 4 through 6 are colored blue to reflect the zoom level. If you click in cell 2, then the zoom level becomes 2 through 6.

If you do not set any zoom levels for a layer, then that layer does not display on the map.
9. Click the action icon beside the layer name to display a menu from which you can make various selections:

- **Delete** — Removes the layer from this background map. The layer continues to be available on the Layers tab and can be added to this area again.

- **Move Up** or **Move Down** — Moves the layer up or down so you can specify the order in which layers are applied to the map.

- **Reset to Default Visibility** — Resets the current visibility range for this layer as defined in the underlying map definition. If this layer is not natively associated with the map, then this option is disabled for that layer.

10. Use the yellow border that surrounds the column of boxes for a zoom level to determine which zoom level is currently displayed in the map area.

11. Use the panning and zooming controls to specify how the map is displayed to users. If you hover over the zoom slider, then you see tooltips that specify the names of the layers that are currently associated with that zoom level.

12. Click **OK**.

### Managing Session Information in Oracle BI Cloud Service

You can see information about users who are signed to Oracle BI Cloud Service from the Manage Session page.

**Topics:**

- Monitoring Users Who Are Signed In
- Analyzing SQL Queries and Logs

### Monitoring Users Who Are Signed In

You can see how many users are signed in to Oracle BI Cloud Service and view detailed information about each user from the Manage Session page.

To monitor users who are signed in:

1. Open the Console.

2. Click **Sessions and Query Cache**.

   The Sessions section at the top of the page shows how many users are currently signed in (Total Number of Sessions).

   The table provides details about the users who are signed in to Oracle BI Cloud Service:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User ID</td>
<td>The name that the user entered when they signed in.</td>
</tr>
<tr>
<td>Session ID</td>
<td>A unique identifier assigned by Oracle BI Cloud Service for each user session.</td>
</tr>
<tr>
<td>Browser Info</td>
<td>Information about the browser from which the user signed on.</td>
</tr>
</tbody>
</table>
Field | Description
--- | ---
Logged On | The time stamp when the user signed in.
Last Access | The time stamp of the last activity for this user on Oracle BI Cloud Service. This can be any kind of activity, such as switching from one dashboard page to another.

3. To monitor a particular user, select **Filter Cursors by Session**.

Information for this user displays in the Cursor Cache table. See **Analyzing SQL Queries and Logs**.

Click **Clear Filter** to show information for all users.

4. To change how messages are logged for a particular user, select a **Log Level** from the list.

By default, logging is disabled.

**Analyzing SQL Queries and Logs**

You can view SQL query requests made by users from the Manage Session page.

To examine SQL queries and logs relating to user activity:

1. Open the Console.

2. Click **Sessions and Query Cache**.

The Cursor Cache section enables you to monitor and troubleshoot activity logs for users currently signed in to Oracle BI Cloud Service.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>A unique internal identifier that is assigned to each entry.</td>
</tr>
<tr>
<td>User</td>
<td>The name of the user who ran the analysis and last placed it into the cache.</td>
</tr>
<tr>
<td>Refs</td>
<td>The number of references to this entry since it was placed into the cache.</td>
</tr>
</tbody>
</table>
| Status | The status of the analysis that is using this cache entry:  
  - **Starting** — The analysis is starting to run.  
  - **Waiting on Parent** — A view in the analysis is waiting for the Oracle BI Server to finish returning the data for the query.  
  - **Running** — The analysis is currently running.  
  - **Finished** — The analysis has finished.  
  - **Queued** — The system is waiting for a thread to become available so the analysis can be processed.  
  - **Canceling** — The application is in the process of canceling the analysis.  
  - **Error** — An error occurred during the processing or running of the analysis. Look in the Statement column for information about the error. |
| Time | The time taken to process and run the analysis, displayed in one-second increments. A value of 0s (zero seconds) indicates that the analysis took under 1 second to complete. |
### Executing Test SQL Queries

Administrators can enter a SQL statement directly to underlying data sources. This feature is useful for testing purposes. Results are not formatted, and you cannot save SQL statements that you issue directly.

Not all SQL functions and procedures are supported, such as the `NQSSetSessionVariables()` procedure.

To execute test SQL statements:

1. Open the Console.
2. Click **Issue SQL**.
3. Enter the SQL statement.
4. Change the **Logging Level** if required.
   - Each user receives a default logging level. Select **Default** in this box to use your default level.
5. Specify whether to run the query against cached data.
   - Deselect **Use Oracle BI Presentation Services Cache** to specify that you do not want the query to use cached data. In general, avoid deselecting this box as disabling the cache has potential performance degradation issues.
6. Click **Issue SQL**.

**Monitoring Metrics for Oracle BI Cloud Service**

Administrators can view status and track usage metrics for Oracle BI Cloud Service from My Services.

From My Services you can see whether Oracle BI Cloud Service and its associated Oracle Database Cloud Service are available and working as expected (Up). See also, *How Does Oracle BI Cloud Service Integrate with Oracle Database Cloud Service?*

You can also track how many people are using Oracle BI Cloud Service by their role:

- **BI Consumers This Month** — Reports how many of the people who signed in to Oracle BI Cloud Service during the current calendar month can view and run analyses (have the BI Consumer application role).

- **BI Authors This Month** — Reports how many of the people who signed in to Oracle BI Cloud Service during the current calendar month can create analyses and dashboards (have the BI Content Author application role) or perform advanced content management tasks, such as exporting dashboards (have the BI Advance Content Author application role).

- **BI Author Modelers This Month** — Reports how many of the people who signed in to Oracle BI Cloud Service during the current calendar month can model data and load data using Data Loader (have the BI Data Model Author application role).

- **BI Admins This Month** — Reports how many of the people who signed in to Oracle BI Cloud Service during the current calendar month can administer Oracle BI Cloud Service and delegate privileges to others (have the BI Service Administrator application role).

For more information, see Viewing Service Details in My Services in *Getting Started with Oracle Cloud.*
This part provides reference information for Oracle BI Cloud Service.

**Appendices:**

- Terminology
- Frequently Asked Questions
- Troubleshooting
- Expression Editor Reference
- Accessibility
Here are some Oracle BI Cloud Service terms that are used in this book.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>action</td>
<td>An action enables you to navigate to related content or a web page. You can include actions in analyses and dashboard pages. For example, you can use an action in the Brand Revenue analysis to enable sales consultants to navigate to an Opportunity Detail web site.</td>
</tr>
<tr>
<td>action link</td>
<td>An action link enables you to embed a link to an action in an analysis or dashboard page, that, when clicked, runs an associated action. For example, you can embed an action link in the Brand Revenue analysis to enable sales consultants to navigate to an Opportunity Detail web site.</td>
</tr>
<tr>
<td>analysis</td>
<td>An analysis provides answers to business questions by querying against your organization's data. Analyses enable you to explore and interact with information by visually presenting data in tables, graphs, pivot tables, and to save, organize, and share the results of analyses. For example, you can create a Brand Revenue analysis that shows data in views on a Sales Performance dashboard. You can share this analysis with co-workers, clients, and business partners.</td>
</tr>
<tr>
<td>application role</td>
<td>An application role comprises a set of privileges that determine what users can see and do in Oracle BI Cloud Service. In Oracle BI Cloud Service, you associate users or roles configured in your identity domain with one or more application roles. The users and roles inherit their privileges in Oracle BI Cloud Service from these application roles.</td>
</tr>
<tr>
<td>attribute</td>
<td>Attributes are member-based data items that can be used as simple categories or arranged as hierarchies with levels. Contrast an attribute with a measure.</td>
</tr>
<tr>
<td>briefing book</td>
<td>You can store a static snapshot of dashboard pages or individual analyses in one or more briefing books. You can also configure a briefing book to refresh data when accessed. For example, as a sales representative, you can use a briefing book to collect a snapshot of a Sales Performance analysis each quarter.</td>
</tr>
<tr>
<td>calculated item</td>
<td>A calculated item shows you a calculation between members, which is represented as a single member. A calculated item is useful when you want to view and manipulate a set of members as a single entity. For example, as a sales analyst, you can create a member in the Fulfillment by Quarter analysis that shows the average revenue for the Game Station and Plasma Television members.</td>
</tr>
<tr>
<td>calculated measure</td>
<td>In the data model, calculated measures are columns in tables that are derived from other measures and based on expressions. For example, a calculated measure called Unit Price might be based on the expression Revenue / Billed Units.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>canvas</td>
<td>The location for visualizations in a Visual Analyzer project.</td>
</tr>
<tr>
<td>catalog</td>
<td>The catalog contains things that you or somebody else has defined and saved for future use (such as projects, analyses, and dashboards). You can search the catalog to find something that you want to work with or change. For example, you might want to edit an analysis in a shared folder in the catalog. Permissions control the access and sharing of items in the catalog.</td>
</tr>
<tr>
<td>Console</td>
<td>The Console provides various management options for Oracle BI Cloud Service. Administrators can manage user permissions, back up and restore content, change the database connection and perform other administrative duties from the Console. Business intelligence consumers can manage data files that they loaded for ad-hoc analysis.</td>
</tr>
<tr>
<td>column</td>
<td>Similar to database columns, Oracle BI Cloud Service has the concept of a column. In Oracle BI Cloud Service, columns are used in different contexts. A column in an analysis is based on a column, a derived attribute, or a calculated measure that was defined in Data Modeler. Columns in Data Modeler, in turn, are based on source columns in Oracle Database Cloud Service. In an analysis or project, columns indicate the pieces of data that you want to display. You can use columns, along with filters (and selection steps in analyses), to determine what analyses and projects contain. Columns have names that indicate to you the types of information that they contain. For example, you can use columns named Account and Contact to display information in a visualization. In visualizations, such as a pivot table and trellis, columns are vertical arrangements of data. For example, a pivot table can include a column of Revenue data.</td>
</tr>
<tr>
<td>dashboard</td>
<td>A dashboard shows information that is relevant to you and consists of one or more pages. Each page can present information in different ways, such as graphs, tables, and images. For example, as a sales representative, you can use a dashboard to see graphs of products sold in your territory.</td>
</tr>
<tr>
<td>Data Loader</td>
<td>A tool that enables you to upload data from files to Oracle Database Cloud - Database Schema Service packaged with Oracle BI Cloud Service. Your data can be uploaded from text files (TXT and CSV) or Microsoft Excel spreadsheets (XLS and XLSX). The data that you upload can be used in a data model that can then be exposed as a subject area in Oracle BI Cloud Service.</td>
</tr>
<tr>
<td>Data Modeler</td>
<td>Data Modeler is a component that enables you to model data in Oracle BI Cloud Service. The data model that you create is exposed as a subject area that you can use when building reports and dashboards. Use Data Modeler to add source tables and views to the model, specify joins, create hierarchies to support drilling, and perform other data modeling tasks.</td>
</tr>
<tr>
<td>derived attribute</td>
<td>In the data model, derived attributes are columns in dimension tables that are based on expressions. For example, a derived attribute called Full Address might combine information from the columns Street Address, City, State, and Postal Code.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>dimension table</td>
<td>In the data model, dimension tables contain values that represent the business entities that you measure. A dimension table contains the columns that represent your dimensional attributes, such as places, offices, people, and products. For example, you might want to report dimensions such as Sales by Product Category for the Current Month.</td>
</tr>
<tr>
<td>fact table</td>
<td>In the data model, fact tables contain the numeric data that you use to measure business performance. A fact table contains numeric values such as revenue, number of units sold, and number of people hired.</td>
</tr>
<tr>
<td>filter</td>
<td>Filters are the criteria that you apply to attribute and measure columns to limit the results that are displayed when an analysis is run. You can create inline or named filters. When you save a filter inside an individual content object, that object is saved &quot;inline.&quot; You can save filters, groups, and calculated items inline. In addition to saving these objects inline, you can create individual named filters in the catalog that you can reuse in any analysis, dashboard, or dashboard page. For example, as a sales consultant, you can filter the results that are shown in an existing analysis to see revenue for only those brands for which you are responsible.</td>
</tr>
<tr>
<td>group</td>
<td>A group (also known as a &quot;saved selection&quot; in certain products) enables you to define the members of a column, as a list of members or a set of selection steps that generate a list of members. For example, as a sales analyst, you can review how much revenue was generated for mobile devices and compare that number to other product types. You can create a group called Mobile Devices for the Product column that includes Flip Phones and Smart Phones.</td>
</tr>
<tr>
<td>hierarchy</td>
<td>In the data model, hierarchies show relationships among groups of attribute columns in a dimension table. For example, days comprise months and months comprise quarters. Hierarchies enable drilling in analyses.</td>
</tr>
<tr>
<td>identity domain</td>
<td>The identity domain is the user information that provides authentication into Oracle BI Cloud Service. The identity domain also defines roles that groups of users can be members of.</td>
</tr>
<tr>
<td>join</td>
<td>In the data model, joins indicate relationships between one fact table and one dimension table. Every fact table must be joined to at least one dimension table, and the reverse.</td>
</tr>
<tr>
<td>level</td>
<td>In the data model, levels are components of hierarchies that either roll up or are rolled up from other levels. Hierarchies typically begin with a total level, then have child levels, working down to the lowest level. All levels, except the total level, must have at least one column.</td>
</tr>
<tr>
<td>measure</td>
<td>A measure is a column in a table that has an aggregation rule defined or is based on an expression that uses other measure columns. For example, you might want to measure business performance by Revenue and Units. Measures are calculated from data sources at query time. Contrast a measure with an attribute.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Oracle BI Cloud Service Data Sync</td>
<td>A wizard-driven utility that enables you to upload on-premises relational sources or CSV files to Oracle Database Cloud Service. This tool synchronizes on-premises data with Oracle Database Cloud Service using the REST API. You can use this tool for both initial and incremental data loads, as well as run, monitor, and schedule data loads.</td>
</tr>
<tr>
<td>Presentation Services</td>
<td>The collective term for features in Oracle BI Cloud Service that enable you to present business intelligence data. These features include analyses, dashboards and a catalog to present the content.</td>
</tr>
<tr>
<td>project</td>
<td>The container for Visual Analyzer data elements and visualizations.</td>
</tr>
<tr>
<td>prompt</td>
<td>Prompts are a type of filter that enable you to build and specify data values, or to choose specific data values to provide result sets for analyses included on a dashboard or dashboard page. A prompt expands or refines the existing dashboard and analysis filters. For example, you can use a prompt for Year to specify the year for which you want to see data in an analysis.</td>
</tr>
<tr>
<td>REST API</td>
<td>You can programmatically create, manage, and load schemas, tables, and data into Oracle BI Cloud Service using the Oracle BI Cloud Service REST API. You can also use the Oracle BI Cloud Service REST API if you want to define or customize your own data loading API. Oracle BI Cloud Service also provides a Data Modeler REST API so you can programmatically interact with the data model.</td>
</tr>
<tr>
<td>selection step</td>
<td>As you specify which data members to include in an analysis, you create selections of data from the data source. Each selection specifies the criteria for a set of members for a particular column, such as Product or Geography, and consists of one or more steps. A step is where you specify an instruction that affects the selection, such as add Product members whose values contain the text &quot;ABC.&quot; The order in which steps are performed affects the selection of data. Each of your steps acts incrementally on the results from previous steps, rather than acting on all the members for that column. For example, you can create a step to specify criteria for a set of members in a Sales Office column, which contains the members &quot;Boston,&quot; &quot;New York,&quot; and &quot;San Francisco.&quot;</td>
</tr>
<tr>
<td>snapshot</td>
<td>Snapshots enable you to capture and later restore Oracle BI Cloud Service content at a point in time. A snapshot can include information about the data model, the catalog, and application roles.</td>
</tr>
<tr>
<td>source view</td>
<td>In the data model, source views are saved queries of the data in the database. You can define source views that combine columns from multiple source tables into a single virtual table. You can create source views to consolidate snowflake sources that have dimension attributes in multiple tables.</td>
</tr>
<tr>
<td>SQL Developer</td>
<td>Oracle SQL Developer is an integrated, transparent, and seamless bulk-data loading facility with full object browsing capabilities. This Java-based tool runs on a client machine and accesses your Oracle BI Cloud Service through a set of RESTful Web Service calls that allow you to access and load data and data structures into Oracle BI Cloud Service.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SQL Workshop</td>
<td>You can develop and deploy web applications for desktops and mobile devices using SQL Workshop, which is part of Oracle Application Express (Oracle APEX). You use a web browser to develop SQL or PL/SQL scripts that can then be used to execute queries against objects in Oracle Database Cloud Service, create and maintain indices, drop unneeded objects, and so on.</td>
</tr>
<tr>
<td>table</td>
<td>Similar to database tables, Oracle BI Cloud Service has the concept of a table and uses it in various contexts. When you model data, you create a dimension table or a fact table that includes source columns from one or more source tables in Oracle Database Cloud Service. When you build an analysis, you can create a user-defined table view to display the data.</td>
</tr>
</tbody>
</table>
| time dimension     | In the data model, time dimensions enable time-series functions. These functions enable comparisons with previous time periods, enabling you to analyze data that spans multiple time periods. A time dimension is a group of the following related model objects:  
  - A time source table in the database that is populated with time data  
  - A time dimension table in the data model that is based on the time source table  
  - A time hierarchy that defines the relationships between different time periods |
| variable           | In the data model, variables dynamically calculate and store values so that you can use those values in expressions. You can use variables in column expressions or in data filters. |
| view               | A view is a visualization that helps communicate an outcome. A view enables you to look at results of analyses in meaningful, intuitive ways. You can add a variety of views to the results, such as graphs and pivot tables, that enable drilling down to more detailed information, explanatory text, a list of filters that were used to limit the results, and more. For example, you can analyze trends for the Sales Forecast analysis by creating a trellis view. |
| Visual Analyzer    | A tool that enables you to explore analytics data visually and on an individual basis. |
Frequently Asked Questions

This reference provides answers to common questions asked by administrators and business intelligence analysts responsible for loading and modeling data Oracle BI Cloud Service.

Topics:

• Top FAQs for Data Loading
  – Can I verify that Data Loader has loaded the data as expected?
  – Can I modify the data after it is uploaded?
  – What methods are available to load data to Oracle Database Cloud Service?
  – Can I use the REST API to load data to Oracle Database Cloud Service?
  – Can I drop tables that are no longer needed?
  – Can I load non-UTF8 data?
  – How do I upload data that includes date formats other than MMDDYYYY?

• Top FAQs for Data Modeling
  – Can I use the same data for different analyses?
  – After adding new columns to my source table, can I include the new columns in my data model?
  – In what situations should I create model objects based on source views?
  – Can I include columns from a different source table or view in my existing dimension table when it is based directly on a source table?
  – Can I include columns from a different source table in my existing dimension table when it is based on a source view?
  – Can I create a source view that is based on another source view?
  – Can I migrate my data model from one Oracle BI Cloud Service environment to another?

• Top FAQs for Managing Oracle BI Cloud Service
  – How do I upgrade my Oracle BI Cloud Service?
  – Can I track how many users sign in to Oracle BI Cloud Service?
  – Can I see how many users are currently signed in to Oracle BI Cloud Service?
Top FAQs for Data Loading

The top FAQs for loading data to curated sources are identified in this topic.

Can I verify that Data Loader has loaded the data as expected?
Yes. You can view load history on the Home page in Data Loader. In addition, Oracle Database Cloud - Database Schema Service provides utilities, including Oracle Application Express SQL Workshop, to validate data in tables.

Can I modify the data after it is uploaded?
Yes. You can use the Oracle Application Express SQL Workshop utility to perform general database tasks for data loaded into Oracle Database Cloud Service.

What methods are available to load data to Oracle Database Cloud Service?
You can use various methods for loading data into Oracle Database Cloud Service. These methods depend on the type of source data that you want to load (for example, relational tables or CSV files). You can:

- Load your data from files directly by using the web-based Data Loader. See Loading Data from Files for more information.
- Load data from relational tables. See Loading Data from Relational Tables for more information.
- Load data from relational tables (for example, an Oracle database). See Loading Relational Tables Using SQL Developer.
- Use programmatic methods, such as PL/SQL scripts or the REST API to automate data loading. See Automating Loading Data Using Programmatic Methods for additional information.

See Uploading Your Data to the Cloud.

Can I use the REST API to load data to Oracle Database Cloud Service?
Yes. You can define or customize your own API and programatically load on-premises data to Oracle Database Cloud Service. The REST API is optimized for loading large volumes of data (thousands to millions) from one or more sources. See Automating Loading Data Using Programmatic Methods for additional information.

Can I drop tables that are no longer needed?
Yes. You can use Oracle Application Express SQL Workshop to drop tables in Oracle Database Cloud Service.

Can I load non-UTF8 data?
No. Currently, Data Loader supports UTF8 characters in data files.
How do I upload data that includes date formats other than MMDDYYYY?

Data Loader loads data in MMDDYYYY date format. To upload data with date formats other than MMDDYYYY, use “Data Workshop” utilities in Oracle Application Express SQL Workshop.

Top FAQs for Data Modeling

The top FAQs for data modeling are identified in this topic.

Can I use the same data for different analyses?

Yes. You can create source views that expose the same source columns in different contexts. You use views to include the same source objects in multiple dimensions. For example, to use time data for both the Order Date and Ship Date dimensions, create two views based on the time source table, time_order_date_v and time_ship_date_v. The views can then be used as sources for the Order Date and Ship Date dimensions.

After adding new columns to my source table, can I include the new columns in my data model?

Yes. You can include newly added source columns. To include the new columns, select Synchronize with Database from the Actions menu for the appropriate fact table or dimension table in the Data Model. Then, in the messages list, select the message item describing the new columns and select Sync-up selected from the Message Actions menu.

In what situations should I create model objects based on source views?

Always create a source view when you think that you might want to perform subsequent changes, such as extending model objects, creating filters, and adding calculations. Creating a model based on source views provides greater flexibility than using source tables directly.

Can I include columns from a different source table or view in my existing dimension table when it is based directly on a source table?

Yes. It’s easy to add columns from another source table or view to an existing dimension table. To do this, drag and drop the table or view on to your existing dimension table. See Adding Columns from Another Source to a Dimension Table.

Can I include columns from a different source table in my existing dimension table when it is based on a source view?

Yes. There are two ways you can do this. You can drag and drop the table on to the dimension table to include the columns. Alternatively, edit the view to include the new source columns, and synchronize your dimension table with your changes to the database. Synchronization identifies new columns in the view and adds them to your dimension table.

Can I create a source view that is based on another source view?

Yes. To do this, drag and drop the source view to the Columns area of the Overview tab when creating the view, or select a source view from the Add Columns dialog as your source.

For example, assume that you have both time and time_fiscal source tables. You created a view called time_v that combines time and time_fiscal. You want to create
multiple dimensions that are based on time data, such as Order Day and Ship Day. You first create the Order Day dimension based on time_v, and then you create a separate view on top of time_v to create Ship Day. (Note that another option is to create a parallel view called ship_day_v that also combines time and time_fiscal.)

Can I migrate my data model from one Oracle BI Cloud Service environment to another?
Yes. To do this, take a snapshot of your Oracle BI Cloud Service and migrate it to the new environment. See Backing Up and Restoring for more information.

Top FAQs for Managing Oracle BI Cloud Service
The top FAQs for managing Oracle BI Cloud Service are identified in this topic.

How do I upgrade my Oracle BI Cloud Service?
Everyone who subscribes to Oracle BI Cloud Service receives automatic upgrades as soon as new versions become available. You don't need to request an upgrade or take any actions yourself. To find out about recent new features and enhancements, see What's New?

Can I track how many users sign in to Oracle BI Cloud Service?
Yes. Administrators for Oracle BI Cloud Service can monitor how many users sign in to the service. Click Business Intelligence or Database from the Platform Services tab in the Oracle Cloud My Services page. See Viewing Service Details in My Services in Getting Started with Oracle Cloud for more information.

Can I see how many users are currently signed in to Oracle BI Cloud Service?
Yes. Display the Home page for Oracle BI Cloud Service, click Console, and then click Sessions and Query Cache. See also Monitoring Users Who Are Signed In.

Can I see the SQL generated by an analysis and analyze the log?
Yes. Display the Home page for Oracle BI Cloud Service, click Console, and then click Sessions and Query Cache. See also Analyzing SQL Queries and Logs.

What happens to all my content if I terminate my subscription to Oracle BI Cloud Service?
When you terminate your subscription to Oracle BI Cloud Service, Oracle takes a snapshot of the latest data model, catalog content, and application roles. The snapshot is sent to you in a password-protected Oracle Business Intelligence archive (.bar) file.

If you subscribe to Oracle BI Cloud Service in the future, you can import content from this archive file. The password that you need to upload the archive file to another service is IdentityDomainName_ServiceName.

See Uploading Snapshots and Restoring from a Snapshot.
Troubleshooting

This topic describes common problems that you might encounter preparing data in Oracle Business Intelligence Cloud Service and explains how to solve them.

Topics:

• Troubleshooting General Issues
  – I can’t sign in to Oracle BI Cloud Service
  – I’m having trouble resetting my password
  – I can’t access certain options from the Home page of Oracle BI Cloud Service
  – I see a performance decrease when using Mozilla Firefox
  – I’m having issues with the new look Oracle BI Cloud Service. Can I switch to the previous style?

• Troubleshooting Data Loading Issues
  – I’m trying to load data but Data Loader stopped responding
  – Data in my file is not being read properly
  – Data was uploaded with many errors
  – Formulas in my Excel spreadsheet are loading instead of the values

• Troubleshooting Data Modeling Issues
  – I can’t see any tables or views in Data Modeler
  – I can’t see the left pane in Data Modeler
  – I can’t edit any objects in Data Modeler
  – I can’t lock the data model
  – I can’t publish the data model
  – Why must I use the SQL Query tab to edit a join or filter for a view?
  – I see the message: Cluster error-No active server node found

• Troubleshooting Administration Issues
  – I can’t find the Administration menu
  – I can’t access options in the Console
Troubleshooting General Issues

This topic describes common problems that you might encounter when working with Oracle BI Cloud Service and explains how to solve them.

I can't sign in to Oracle BI Cloud Service

You’re likely trying to sign in using the incorrect credentials. You must sign in to Oracle BI Cloud Service using the Oracle Cloud Identity Domain credentials that were mailed to you from Oracle or provided by your administrator. You can’t sign in to Oracle BI Cloud Service using your account credentials for Oracle.com.

I'm having trouble resetting my password

When you sign up to use Oracle BI Cloud Service, you get an e-mail with a temporary password. Be careful if you copy and paste this password. If you accidentally include a blank space at the start or end of it when copying, then the password won’t be recognized when you paste it in. Make sure that you paste only the password without any blank spaces.

I can't access certain options from the Home page of Oracle BI Cloud Service

Check with your administrator to ensure that you have the correct permissions to access the options that you need.

I see a performance decrease when using Mozilla Firefox

If you use Mozilla Firefox and notice a decrease in the performance of the cloud service, then ensure that the Remember History option is enabled. When Firefox is set to not remember the history of visited pages, then web content caching is also disabled, which greatly affects the performance of the service. See Firefox documentation for details on setting this option.

I'm having issues with the new look Oracle BI Cloud Service. Can I switch to the previous style?

The new look and feel of Oracle BI Cloud Service provides a seamless and integrated experience. If you’re having trouble finding your way around, explore the Academy. Familiarize yourself with the new design through videos and tutorials and find answers to your questions on Oracle Help Center.

Contact your administrator if you want to temporarily switch back to the previous style of Oracle BI Cloud Service. Administrators can switch everyone back to the old style by clicking Switch to old home page in the Console. Everyone sees the old look the next time they sign in.

Administrators can switch on the new look at any time by clicking Administration, then Try new home page on the Home page.
Troubleshooting Data Loading Issues
This topic describes common problems that you might encounter when loading data to curated sources and explains how to solve them.

I’m trying to load data but Data Loader stopped responding
You might be loading a file that is beyond the expected limits of Data Loader. For more information, see Uploading Your Data to the Cloud.

Use Oracle SQL Developer rather than Data Loader for loading very large amounts of data. As a guideline, use Oracle SQL Developer for input files greater than 500,000 rows. For more information, see Loading Relational Tables Using SQL Developer.

Data in my file is not being read properly
Verify that the data records in the file that you are loading are separated by a delimiter that Data Loader supports such as comma, tab, or pipe. If the file includes the proper delimiter, then verify that you specified the appropriate delimiter on the Select Data page of Data Loader.

Data was uploaded with many errors
Go to the Home page, click Load, and locate the column labeled Not Loaded Records for your particular upload to see why some records failed to load properly. After correcting the errors, click Reload records to upload the records.

Formulas in my Excel spreadsheet are loading instead of the values
Remove the formula or replace the formula with data values from the Microsoft Excel spreadsheet, and reload the records that were in error.

Troubleshooting Data Modeling Issues
This topic describes common problems that you might encounter when modeling data and explains how to solve them.

I can’t see any tables or views in Data Modeler
If you start Data Modeler and see no tables or views, then one of the following has occurred:

• There aren’t any tables in the database connected to your service. Use Data Loader, Oracle BI Cloud Service Data Sync, Oracle BI Cloud Service REST API or SQL Developer to create tables. See also Uploading Your Data to the Cloud.

• Data Modeler does not show the latest database objects. To see the latest objects, refresh the Database pane in Data Modeler.

I can’t see the left pane in Data Modeler
The left pane in Data Modeler is collapsed. To display the left pane, click the Restore Pane icon displayed on the left of the page.
I can’t edit any objects in Data Modeler
You must always lock the data model before making any changes. Click **Lock to Edit** to lock the data model.

I can’t lock the data model
Check whether someone else locked the data model. If you’re an administrator, then you can override the lock. Otherwise, wait until the lock is released. For more information, see *Overriding Locks* in Locking the Data Model.

I can’t publish the data model
Check whether you have Data Modeler open in multiple browser tabs or multiple browser windows. If you do, close any additional browser tabs and windows running Data Modeler, and try publishing the model again. If you still get a publishing error, then restart the browser.

Why must I use the SQL Query tab to edit a join or filter for a view?
The message "**Please use SQL Query tab to edit Joins/Filters**" is displayed when you click the Joins tab or the Filters tab in the view editor for one of the following reasons:

- **Oracle BI Cloud Service can’t parse the SQL query for the database view**
  If you use only the Overview, Joins, and Filters tabs to edit a database view, then Oracle BI Cloud Service constructs a simple SQL query for you. If you decide to edit the SQL manually through the SQL Query tab, then simple updates are reflected back in the Overview, Join, and Filters tabs so you can use these tabs to further edit the view later on. If, however, you have used the SQL Query tab to make more advanced code changes, then you can’t use the Overview, Joins or Filters tabs to further edit the view because Oracle BI Cloud Service can’t verify your updates. For example, if you include:
    - SQL aggregation functions, GROUP BY clause, HAVING clause
    - ORDER BY clause
    - OR keyword in WHERE clause
    - UNION clause

- **Oracle BI Cloud Service can’t access the database view**
  If the problem persists, report the issue to your administrator. Your administrator can investigate connection issues relating to your database service.

I see the message: Cluster error-No active server node found
The instance of Oracle BI Cloud Service might be down or the database might be locked. If the problem persists, then report the issue to an administrator.
Troubleshooting Administration Issues

This topic describes common problems that you might encounter when performing administration tasks and explains how to solve them.

I can’t find the Administration menu

In the latest Oracle BI Cloud Service, administrative options are available through the Console. To access options previously available under the Administration menu, go to the Home page and click Console.

I can’t access options in the Console

If you see an "unauthorized message" when you click an option in the Console, you probably don’t have the BI Service Administrator application role. You must have the BI Service Administrator application role to access some Console options: Users and Roles, Snapshots and Models, Sessions and Query Cache, Connections, Issue SQL, Manage Map Data, Settings

Ask an administrator to verify your permissions. See Assigning Application Roles to Users.
This topic describes the expression elements that you can use in the Expression Editor in Data Modeler.

**Topics:**
- Data Model Objects
- SQL Operators
- Conditional Expressions
- Functions
- Constants
- Types
- Variables

**Data Model Objects**
You can use data model objects in expressions, like time levels, dimension columns, and fact columns.

To reference a data model object, use the syntax:

"Fact/Dimension Table Name"."Column Name"

For example: "Order Metrics"."Booked Amount" - "Order Metrics"."Fulfilled Amount"

The Expression Elements section includes only items that are relevant for your task, so not all fact tables and dimension tables might be listed. Similarly, time hierarchies are included only if the Time fact table is joined to the current table.

**SQL Operators**
SQL operators are used to specify comparisons between expressions.

You can use various types of SQL operators.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BETWEEN</td>
<td>Determines if a value is between two non-inclusive bounds. For example: &quot;COSTS&quot;.&quot;UNIT_COST&quot; BETWEEN 100.0 AND 5000.0 BETWEEN can be preceded with NOT to negate the condition.</td>
</tr>
<tr>
<td>IN</td>
<td>Determines if a value is present in a set of values. For example: &quot;COSTS&quot;.&quot;UNIT_COST&quot; IN(200, 600, 'A')</td>
</tr>
<tr>
<td>Operator</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| IS NULL  | Determines if a value is null. For example: 
"PRODUCTS"."PROD_NAME" IS NULL |
| LIKE     | Determines if a value matches all or part of a string. Often used with wildcards to indicate any character string match of zero or more characters (%) or any single character match (_). For example: 
"PRODUCTS"."PROD_NAME" LIKE 'prod%' |

**Conditional Expressions**

You use conditional expressions to create expressions that convert values.

The conditional expressions described in this section are building blocks for creating expressions that convert a value from one form to another.

**Note:**

- In CASE statements, AND has precedence over OR
- Strings must be in single quotes

<table>
<thead>
<tr>
<th>Expression</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CASE (If)</td>
<td>CASE</td>
<td>Evaluates each WHEN condition and if satisfied, assigns the value in the corresponding THEN expression. If none of the WHEN conditions are satisfied, it assigns the default value specified in the ELSE expression. If no ELSE expression is specified, the system automatically adds an ELSE NULL.</td>
</tr>
<tr>
<td></td>
<td>WHEN score-par &lt; 0 THEN 'Under Par'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WHEN score-par = 0 THEN 'Par'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WHEN score-par = 1 THEN 'Bogey'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WHEN score-par = 2 THEN 'Double Bogey'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ELSE 'Triple Bogey or Worse'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>END</td>
<td></td>
</tr>
<tr>
<td>CASE (Switch)</td>
<td>CASE Score-par</td>
<td>Also referred to as CASE (Lookup). The value of the first expression is examined, then the WHEN expressions. If the first expression matches any WHEN expression, it assigns the value in the corresponding THEN expression. If none of the WHEN expressions match, it assigns the default value specified in the ELSE expression. If no ELSE expression is specified, the system automatically adds an ELSE NULL.</td>
</tr>
<tr>
<td></td>
<td>WHEN -5 THEN 'Birdie on Par 6'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WHEN -4 THEN 'Must be Tiger'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WHEN -3 THEN 'Three under par'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WHEN -2 THEN 'Two under par'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WHEN -1 THEN 'Birdie'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WHEN 0 THEN 'Par'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WHEN 1 THEN 'Bogey'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WHEN 2 THEN 'Double Bogey'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ELSE 'Triple Bogey or Worse'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>END</td>
<td></td>
</tr>
</tbody>
</table>
Functions

There are various types of functions that you can use in expressions.

Topics:
- Aggregate Functions
- Calendar Functions
- Conversion Functions
- Display Functions
- Evaluate Functions
- Mathematical Functions
- String Functions
- System Functions
- Time Series Functions

Aggregate Functions

Aggregate functions perform operations on multiple values to create summary results.

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg</td>
<td>Avg(Sales)</td>
<td>Calculates the average (mean) of a numeric set of values.</td>
</tr>
<tr>
<td>Count</td>
<td>Count(Products)</td>
<td>Determines the number of items with a non-null value.</td>
</tr>
<tr>
<td>First</td>
<td>First(Sales)</td>
<td>Selects the first non-null returned value of the expression argument.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The First function operates at the most detailed level specified in your</td>
</tr>
<tr>
<td></td>
<td></td>
<td>explicitly defined dimension.</td>
</tr>
<tr>
<td>Last</td>
<td>Last(Sales)</td>
<td>Selects the last non-null returned value of the expression.</td>
</tr>
<tr>
<td>Max</td>
<td>Max(Revenue)</td>
<td>Calculates the maximum value (highest numeric value) of the rows satisfying</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the numeric expression argument.</td>
</tr>
<tr>
<td>Median</td>
<td>Median(Sales)</td>
<td>Calculates the median (middle) value of the rows satisfying the numeric</td>
</tr>
<tr>
<td></td>
<td></td>
<td>expression argument. When there are an even number of rows, the median is</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the mean of the two middle rows. This function always returns a double.</td>
</tr>
<tr>
<td>Min</td>
<td>Min(Revenue)</td>
<td>Calculates the minimum value (lowest numeric value) of the rows satisfying</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the numeric expression argument.</td>
</tr>
<tr>
<td>StdDev</td>
<td>StdDev(Sales)</td>
<td>Returns the standard deviation for a set of values. The return type is</td>
</tr>
<tr>
<td></td>
<td>StdDev(DISTINCT Sales)</td>
<td>always a double.</td>
</tr>
<tr>
<td>StdDev_Pop</td>
<td>StdDev_Pop(Sales)</td>
<td>Returns the standard deviation for a set of values using the computational</td>
</tr>
<tr>
<td></td>
<td>StdDev_Pop(DISTINCT Sales)</td>
<td>formula for population variance and standard deviation.</td>
</tr>
<tr>
<td>Sum</td>
<td>Sum(Revenue)</td>
<td>Calculates the sum obtained by adding up all values satisfying the numeric</td>
</tr>
<tr>
<td></td>
<td></td>
<td>expression argument.</td>
</tr>
</tbody>
</table>
## Calendar Functions

Calendar functions manipulate data of the data types `DATE` and `DATETIME` based on a calendar year.

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current_Date</strong></td>
<td><code>Current_Date</code></td>
<td>Returns the current date.</td>
</tr>
</tbody>
</table>
| **Current_Time**  | `Current_Time(3)`     | Returns the current time to the specified number of digits of precision, for example: HH:MM:SS.SSS  
If no argument is specified, the function returns the default precision. |
<p>| <strong>Current_TimeStamp</strong> | <code>Current_TimeStamp(3)</code> | Returns the current date/timestamp to the specified number of digits of precision. |
| <strong>DayName</strong>       | <code>DayName(Order_Date)</code> | Returns the name of the day of the week for a specified date expression.     |
| <strong>DayOfMonth</strong>    | <code>DayOfMonth(Order_Date)</code> | Returns the number corresponding to the day of the month for a specified date expression. |
| <strong>DayOfWeek</strong>     | <code>DayOfWeek(Order_Date)</code> | Returns a number between 1 and 7 corresponding to the day of the week for a specified date expression. For example, 1 always corresponds to Sunday, 2 corresponds to Monday, and so on through to Saturday which returns 7. |
| <strong>DayOfYear</strong>     | <code>DayOfYear(Order_Date)</code> | Returns the number (between 1 and 366) corresponding to the day of the year for a specified date expression. |
| <strong>Day_Of_Quarter</strong> | <code>Day_Of_Quarter(Order_Date)</code> | Returns the number (between 1 and 92) corresponding to the day of the quarter for the specified date expression. |
| <strong>Hour</strong>          | <code>Hour(Order_Time)</code>    | Returns a number (between 0 and 23) corresponding to the hour for a specified time expression. For example, 0 corresponds to 12 a.m. and 23 corresponds to 11 p.m. |
| <strong>Minute</strong>        | <code>Minute(Order_Time)</code>  | Returns a number (between 0 and 59) corresponding to the minute for a specified time expression. |
| <strong>Month</strong>         | <code>Month(Order_Time)</code>   | Returns the number (between 1 and 12) corresponding to the month for a specified date expression. |
| <strong>MonthName</strong>     | <code>MonthName(Order_Time)</code> | Returns the name of the month for a specified date expression.               |
| <strong>Month_Of_Quarter</strong> | <code>Month_Of_Quarter(Order_Date)</code> | Returns the number (between 1 and 3) corresponding to the month in the quarter for a specified date expression. |
| <strong>Now</strong>           | <code>Now()</code>               | Returns the current timestamp. The <code>Now</code> function is equivalent to the <code>Current_TimeStamp</code> function. |</p>
<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quarter_of_Year</td>
<td>Quarter_of_Year(Order_Date)</td>
<td>Returns the number (between 1 and 4) corresponding to the quarter of the year for a specified date expression.</td>
</tr>
<tr>
<td>Second</td>
<td>Second(Order_Time)</td>
<td>Returns the number (between 0 and 59) corresponding to the seconds for a specified time expression.</td>
</tr>
<tr>
<td>TimeStampAdd</td>
<td>TimeStampAdd(SQL_TSI_MONTH, 12, Time.&quot;Order Date&quot;)</td>
<td>Adds a specified number of intervals to a timestamp, and returns a single timestamp. Interval options are: SQL_TSI_SECOND, SQL_TSI_MINUTE, SQL_TSI_HOUR, SQL_TSI_DAY, SQL_TSI_WEEK, SQL_TSI_MONTH, SQL_TSI_QUARTER, SQL_TSI_YEAR</td>
</tr>
<tr>
<td>TimeStampDiff</td>
<td>TimeStampDiff(SQL_TSI_MONTH, Time.&quot;Order Date&quot;, CURRENT_DATE)</td>
<td>Returns the total number of specified intervals between two timestamps. Use the same intervals as TimeStampAdd.</td>
</tr>
<tr>
<td>Week_of_Quarter</td>
<td>Week_of_Quarter(Order_Date)</td>
<td>Returns a number (between 1 and 13) corresponding to the week of the quarter for the specified date expression.</td>
</tr>
<tr>
<td>Week_of_Year</td>
<td>Week_of_Year(Order_Date)</td>
<td>Returns a number (between 1 and 53) corresponding to the week of the year for the specified date expression.</td>
</tr>
<tr>
<td>Year</td>
<td>Year(Order_Date)</td>
<td>Returns the year for the specified date expression.</td>
</tr>
</tbody>
</table>

**Conversion Functions**

Conversion functions convert a value from one form to another.

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast</td>
<td>Cast(hiredate AS CHAR(40)) FROM employee</td>
<td>Changes the data type of an expression or a null literal to another data type. For example, you can cast a customer_name (a data type of Char or Varchar) or birthdate (a datetime literal). Use Cast to change to a Date data type. Do not use ToDate.</td>
</tr>
<tr>
<td>IfNull</td>
<td>IfNull(Sales, 0)</td>
<td>Tests if an expression evaluates to a null value, and if it does, assigns the specified value to the expression.</td>
</tr>
<tr>
<td>IndexCol</td>
<td>SELECT IndexCol(VALUEOF (NQ_SESSION.GEOGRAPHY_LEVEL), Country, State, City), Revenue FROM Sales</td>
<td>Uses external information to return the appropriate column for the signed-in user to see.</td>
</tr>
</tbody>
</table>
## Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NullIf</td>
<td>SELECT e.last_name, NULLIF(e.job_id, j.job_id) &quot;Old Job ID&quot; FROM employees e, job_history j WHERE e.employee_id = j.employee_id ORDER BY last_name, &quot;Old Job ID&quot;;</td>
<td>Compares two expressions. If they are equal, then the function returns null. If they are not equal, then the function returns the first expression. You cannot specify the literal NULL for the first expression.</td>
</tr>
<tr>
<td>To_DateTime</td>
<td>SELECT To_DateTime ('2009-03-0301:01:00', 'yyyy-mm-dd hh:mi:ss') FROM sales</td>
<td>Converts string literals of dateTime format to a DateTime data type.</td>
</tr>
</tbody>
</table>

### Display Functions

Display functions operate on the result set of a query.

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BottomN</td>
<td>BottomN(Sales, 10)</td>
<td>Returns the $n$ lowest values of expression, ranked from lowest to highest.</td>
</tr>
<tr>
<td>Filter</td>
<td>Filter(Sales USING Product = 'widgit')</td>
<td>Computes the expression using the given preaggregate filter.</td>
</tr>
<tr>
<td>Mavg</td>
<td>Mavg(Sales, 10)</td>
<td>Calculates a moving average (mean) for the last $n$ rows of data in the result set, inclusive of the current row.</td>
</tr>
<tr>
<td>Msum</td>
<td>SELECT Month, Revenue, Msum(Revenue, 3) as 3_MO_SUM FROM Sales</td>
<td>Calculates a moving sum for the last $n$ rows of data, inclusive of the current row. The sum for the first row is equal to the numeric expression for the first row. The sum for the second row is calculated by taking the sum of the first two rows of data, and so on. When the $n$th row is reached, the sum is calculated based on the last $n$ rows of data.</td>
</tr>
<tr>
<td>NTile</td>
<td>Ntile(Sales, 100)</td>
<td>Determines the rank of a value in terms of a user-specified range. It returns integers to represent any range of ranks. The example shows a range from 1 to 100, with the lowest sale = 1 and the highest sale = 100.</td>
</tr>
<tr>
<td>Percentile</td>
<td>Percentile(Sales)</td>
<td>Calculates a percent rank for each value satisfying the numeric expression argument. The percentile rank ranges are from 0 (1st percentile) to 1 (100th percentile), inclusive.</td>
</tr>
<tr>
<td>Rank</td>
<td>Rank(Sales)</td>
<td>Calculates the rank for each value satisfying the numeric expression argument. The highest number is assigned a rank of 1, and each successive rank is assigned the next consecutive integer (2, 3, 4,...). If certain values are equal, they are assigned the same rank (for example, 1, 1, 1, 4, 5, 5, 7,...).</td>
</tr>
<tr>
<td>Rcount</td>
<td>SELECT month, profit, Rcount(profit) FROM sales WHERE profit &gt; 200</td>
<td>Takes a set of records as input and counts the number of records encountered so far.</td>
</tr>
<tr>
<td>Function</td>
<td>Example</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>Rmax</td>
<td>SELECT month, profit, Rmax(profit) FROM sales</td>
<td>Takes a set of records as input and shows the maximum value based on records encountered so far. The specified data type must be one that can be ordered.</td>
</tr>
<tr>
<td>Rmin</td>
<td>SELECT month, profit, Rmin(profit) FROM sales</td>
<td>Takes a set of records as input and shows the minimum value based on records encountered so far. The specified data type must be one that can be ordered.</td>
</tr>
<tr>
<td>Rsum</td>
<td>SELECT month, revenue, Rsum(revenue) as RUNNING_SUM FROM sales</td>
<td>Calculates a running sum based on records encountered so far. The sum for the first row is equal to the numeric expression for the first row. The sum for the second row is calculated by taking the sum of the first two rows of data, and so on.</td>
</tr>
<tr>
<td>TopN</td>
<td>TopN(Sales, 10)</td>
<td>Returns the n highest values of expression, ranked from highest to lowest.</td>
</tr>
</tbody>
</table>

### Evaluate Functions

Evaluate functions are database functions that can be used to pass through expressions to get advanced calculations.

Embedded database functions can require one or more columns. These columns are referenced by %1 ... %N within the function. The actual columns must be listed after the function.

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluate</td>
<td>SELECT EVALUATE('instr(%1, %2)', address, 'Foster City') FROM employees</td>
<td>Passes the specified database function with optional referenced columns as parameters to the database for evaluation.</td>
</tr>
<tr>
<td>Evaluate_Aggr</td>
<td>EVALUATE_AGG('REGR_SLOPE(%1, %2)', sales.quantity, market.marketkey)</td>
<td>Passes the specified database function with optional referenced columns as parameters to the database for evaluation. This function is intended for aggregate functions with a GROUP BY clause.</td>
</tr>
</tbody>
</table>

### Mathematical Functions

The mathematical functions described in this section perform mathematical operations.

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abs</td>
<td>Abs(Profit)</td>
<td>Calculates the absolute value of a numeric expression.</td>
</tr>
<tr>
<td>Acos</td>
<td>Acos(1)</td>
<td>Calculates the arc cosine of a numeric expression.</td>
</tr>
<tr>
<td>Asin</td>
<td>Asin(1)</td>
<td>Calculates the arc sine of a numeric expression.</td>
</tr>
<tr>
<td>Atan</td>
<td>Atan(1)</td>
<td>Calculates the arc tangent of a numeric expression.</td>
</tr>
<tr>
<td>Atan2</td>
<td>Atan2(1, 2)</td>
<td>Calculates the arc tangent of y/x, where y is the first numeric expression and x is the second numeric expression.</td>
</tr>
<tr>
<td>Function</td>
<td>Example</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>Ceiling</td>
<td>Ceiling(Profit)</td>
<td>Rounds a noninteger numeric expression to the next highest integer. If the numeric expression evaluates to an integer, the CEILING function returns that integer.</td>
</tr>
<tr>
<td>Cos</td>
<td>Cos(1)</td>
<td>Calculates the cosine of a numeric expression.</td>
</tr>
<tr>
<td>Cot</td>
<td>Cot(1)</td>
<td>Calculates the cotangent of a numeric expression.</td>
</tr>
<tr>
<td>Degrees</td>
<td>Degrees(1)</td>
<td>Converts an expression from radians to degrees.</td>
</tr>
<tr>
<td>Exp</td>
<td>Exp(4)</td>
<td>Sends the value to the power specified.</td>
</tr>
<tr>
<td>ExtractBit</td>
<td>Int ExtractBit(1, 5)</td>
<td>Retrieves a bit at a particular position in an integer. It returns an integer of either 0 or 1 corresponding to the position of the bit.</td>
</tr>
<tr>
<td>Floor</td>
<td>Floor(Profit)</td>
<td>Rounds a noninteger numeric expression to the next lowest integer. If the numeric expression evaluates to an integer, the FLOOR function returns that integer.</td>
</tr>
<tr>
<td>Log</td>
<td>Log(1)</td>
<td>Calculates the natural logarithm of an expression.</td>
</tr>
<tr>
<td>Log10</td>
<td>Log10(1)</td>
<td>Calculates the base 10 logarithm of an expression.</td>
</tr>
<tr>
<td>Mod</td>
<td>Mod(10, 3)</td>
<td>Divides the first numeric expression by the second numeric expression and returns the remainder portion of the quotient.</td>
</tr>
<tr>
<td>Pi</td>
<td>Pi()</td>
<td>Returns the constant value of pi.</td>
</tr>
<tr>
<td>Power</td>
<td>Power(Profit, 2)</td>
<td>Takes the first numeric expression and raises it to the power specified in the second numeric expression.</td>
</tr>
<tr>
<td>Radians</td>
<td>Radians(30)</td>
<td>Converts an expression from degrees to radians.</td>
</tr>
<tr>
<td>Rand</td>
<td>Rand()</td>
<td>Returns a pseudo-random number between 0 and 1.</td>
</tr>
<tr>
<td>RandFromSee d</td>
<td>Rand(2)</td>
<td>Returns a pseudo-random number based on a seed value. For a given seed value, the same set of random numbers are generated.</td>
</tr>
<tr>
<td>Round</td>
<td>Round(2.166000, 2)</td>
<td>Rounds a numeric expression to ( n ) digits of precision.</td>
</tr>
</tbody>
</table>
| Sign     | Sign(Profit) | This function returns the following:  
  \- 1 if the numeric expression evaluates to a positive number  
  \- -1 if the numeric expression evaluates to a negative number  
  \- 0 if the numeric expression evaluates to zero |
| Sin      | Sin(1)  | Calculates the sine of a numeric expression. |
| Sqrt     | Sqrt(7) | Calculates the square root of the numeric expression argument. The numeric expression must evaluate to a nonnegative number. |
| Tan      | Tan(1)  | Calculates the tangent of a numeric expression. |
| Truncate | Truncate(45.12345, 2) | Truncates a decimal number to return a specified number of places from the decimal point. |
## String Functions

String functions perform various character manipulations. They operate on character strings.

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascii</td>
<td><code>Ascii('a')</code></td>
<td>Converts a single character string to its corresponding ASCII code. If the ASCII code evaluates to multiple characters, the ASCII code corresponding to the first character in the expression is returned.</td>
</tr>
<tr>
<td>Bit_Length</td>
<td><code>Bit_Length('abcdef')</code></td>
<td>Returns the length, in bits, of a specified string. Each Unicode character is 2 bytes in length (equal to 16 bits).</td>
</tr>
<tr>
<td>Char</td>
<td><code>Char(35)</code></td>
<td>Converts a numeric value between 0 and 255 to the character value corresponding to the ASCII code.</td>
</tr>
<tr>
<td>Char_Length</td>
<td><code>Char_Length(Customer_Name)</code></td>
<td>Returns the length, in number of characters, of a specified string. Leading and trailing blanks are not counted in the length of the string.</td>
</tr>
<tr>
<td>Concat</td>
<td><code>SELECT DISTINCT Concat ('abc', 'def') FROM employee</code></td>
<td>Concatenates two character strings.</td>
</tr>
<tr>
<td>Insert</td>
<td><code>SELECT Insert('123456', 2, 3, 'abcd') FROM table</code></td>
<td>Inserts a specified character string into a specified location in another character string.</td>
</tr>
<tr>
<td>Left</td>
<td><code>SELECT Left('123456', 3) FROM table</code></td>
<td>Returns a specified number of characters from the left of a string.</td>
</tr>
<tr>
<td>Length</td>
<td><code>Length(Customer_Name)</code></td>
<td>Returns the length, in number of characters, of a specified string. The length is returned excluding any trailing blank characters.</td>
</tr>
<tr>
<td>Locate</td>
<td><code>Locate('d' 'abcdef')</code></td>
<td>Returns the numeric position of a character string in another character string. If the character string is not found in the string being searched, the function returns a value of 0.</td>
</tr>
<tr>
<td>LocateN</td>
<td><code>Locate('d' 'abcdef', 3)</code></td>
<td>Like Locate, returns the numeric position of a character string in another character string. LocateN includes an integer argument that enables you to specify a starting position to begin the search.</td>
</tr>
<tr>
<td>Lower</td>
<td><code>Lower(Customer_Name)</code></td>
<td>Converts a character string to lowercase.</td>
</tr>
<tr>
<td>Octet_Length</td>
<td><code>Octet_Length('abcdef')</code></td>
<td>Returns the number of bytes of a specified string.</td>
</tr>
<tr>
<td>Position</td>
<td><code>Position('d', 'abcdef')</code></td>
<td>Returns the numeric position of <code>strExpr1</code> in a character expression. If <code>strExpr1</code> is not found, the function returns 0.</td>
</tr>
<tr>
<td>Repeat</td>
<td><code>Repeat('abc', 4)</code></td>
<td>Repeats a specified expression n times.</td>
</tr>
<tr>
<td>Replace</td>
<td><code>Replace('abcd1234', '123', 'zz')</code></td>
<td>Replaces one or more characters from a specified character expression with one or more other characters.</td>
</tr>
<tr>
<td>Right</td>
<td><code>SELECT Right('123456', 3) FROM table</code></td>
<td>Returns a specified number of characters from the right of a string.</td>
</tr>
</tbody>
</table>
### Function

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space</td>
<td>Space(2)</td>
<td>Inserts blank spaces.</td>
</tr>
<tr>
<td>Substring</td>
<td>Substring('abcdef' FROM 2)</td>
<td>Creates a new string starting from a fixed number of characters into the original string.</td>
</tr>
<tr>
<td>SubstringN</td>
<td>Substring('abcdef' FROM 2 FOR 3)</td>
<td>Like Substring, creates a new string starting from a fixed number of characters into the original string. SubstringN includes an integer argument that enables you to specify the length of the new string, in number of characters.</td>
</tr>
<tr>
<td>TrimBoth</td>
<td>Trim(BOTH '_' FROM '<em>abcdef</em>')</td>
<td>Strips specified leading and trailing characters from a character string.</td>
</tr>
<tr>
<td>TrimLeading</td>
<td>Trim(LEADING '_' FROM '_abcdef')</td>
<td>Strips specified leading characters from a character string.</td>
</tr>
<tr>
<td>TrimTrailing</td>
<td>Trim(TRAILING '<em>' FROM 'abcdef</em>')</td>
<td>Strips specified trailing characters from a character string.</td>
</tr>
<tr>
<td>Upper</td>
<td>Upper(Customer_Name)</td>
<td>Converts a character string to uppercase.</td>
</tr>
</tbody>
</table>

### System Functions

The **USER** system function returns values relating to the session.

It returns the user name you signed in with.

### Time Series Functions

Time series functions are aggregate functions that operate on time dimensions.

The time dimension members must be at or below the level of the function. Because of this, one or more columns that uniquely identify members at or below the given level must be projected in the query.

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ago</td>
<td>SELECT Year_ID, Ago(sales, year, 1)</td>
<td>Calculates the aggregated value of a measure from the current time to a specified time period in the past. For example, <strong>AGO</strong> can produce sales for every month of the current quarter and the corresponding quarter-ago sales.</td>
</tr>
<tr>
<td>Periodrolling</td>
<td>SELECT Month_ID, Periodrolling (monthly_sales, -1, 1)</td>
<td>Computes the aggregate of a measure over the period starting $x$ units of time and ending $y$ units of time from the current time. For example, <strong>PERIODROLLING</strong> can compute sales for a period that starts at a quarter before and ends at a quarter after the current quarter.</td>
</tr>
<tr>
<td>ToDate</td>
<td>SELECT Year_ID, Month_ID, ToDate (sales, year)</td>
<td>Aggregates a measure from the beginning of a specified time period to the currently displayed time. For example, this function can calculate Year to Date sales.</td>
</tr>
</tbody>
</table>

### Constants

You can use constants in expressions.

Available constants include Date, Time, and Timestamp. See also **Current_Date**, **Current_Time**, and **Current_TimeStamp**.
### Types

You can use data types, such as CHAR, INT, and NUMERIC in expressions.

For example, you use types when creating CAST expressions that change the data type of an expression or a null literal to another data type.

### Variables

Variables are used in expressions.

You can use a variable in an expression. See Defining Variables for details.
This section provides information on accessibility features for Oracle BI Cloud Service.

Topics:

• About Accessibility Features
• Changing to Accessibility Mode

About Accessibility Features

The accessibility features in Oracle BI Cloud Service aim to make navigating and using the service easier for persons with disabilities and for the aging population. The accessibility features support the use of standards-based assistive-technology hardware and software (such as Freedom Scientific JAWS).

The accessibility features are grouped into these general categories:

• Features used by third-party assistive-technology products. These features center on providing a user interface that consists of standard HTML elements that can be easily interpreted by third-party assistive technology products.

• Accessibility mode, as described in Changing to Accessibility Mode.

• Content design capabilities that make it possible for content creators to create content that supports users with accessibility needs. While Oracle BI Cloud Service provides an accessibility mode that offers many features automatically, you as the designer must create content that meets the accessibility requirements of your user community.

Changing to Accessibility Mode

Accessibility mode makes the user interface more compatible with screen readers. Only features supported for users with disabilities are visible.

To enable accessibility mode:

1. Select My Account from the drop down list next to your user name.
2. Press Tab to select the Preferences tab.
3. Press Tab to navigate through the fields on the tab until you read the Accessibility Mode options near the bottom of the dialog.
4. Use the arrow keys to select the On option.
5. Press Enter to save your changes and close the dialog.
6. Refresh the page to see it in accessibility mode.
Note:
The Accessibility Mode setting on the Preferences tab applies to Presentation Services, Data Loader, Data Modeler, and the Console.

In accessibility mode:

- The Home page does not contain links for performing most editing functions, such as editing dashboards.

- Graphs and map views are not displayed. They are converted to one or more annotated tables.

- Tables and pivot tables are displayed with internal annotations that enable screen readers to describe the contents of cells. Refer to your assistive-technology documentation for table navigation shortcuts.

- You cannot use a mouse to modify the layout of a table or pivot table.

- Performance tiles, heat matrices, and treemaps are displayed as pivot tables.

- The upper-left corner of each section on a dashboard page contains a collapse icon. This is true even if the section is marked as not collapsible in the Dashboard builder. The icon is the first element that receives focus when using a keyboard to navigate on a dashboard page.

- The Page Options button on a dashboard page is not available.

- If a dashboard page is refreshed, then the location of the focus is not preserved. You must press Tab to navigate through the focusable items.

- Trellis views displayed on dashboards are converted to pivot table views. Attribute columns of the inner graph are not included. Measure values are aggregated to the new grain of the pivot table views.