

# Oracle® Fusion Middleware

## User's Guide for Oracle Data Visualization



12c (12.2.1.4.0)

E91572-02

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The Oracle logo, consisting of a solid red square with the word "ORACLE" in white, uppercase, sans-serif font centered within it.

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Oracle Fusion Middleware User's Guide for Oracle Data Visualization, 12c (12.2.1.4.0)

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# Preface

## Topics:

Learn how to use Oracle Data Visualization to explore and analyze your data.

- [Audience](#)
- [Related Resources](#)
- [Conventions](#)

## Audience

*Users Guide for Oracle Data Visualization* is intended for business users who plan to use Oracle Data Visualization to upload and blend data for analysis, explore data within visualizations, and work with their favorite projects.

## Documentation Accessibility

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

### Access to Oracle Support

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

## Related Resources

See the Oracle Business Intelligence documentation library for a list of related Oracle Business Intelligence documents.

In addition:

- Go to the Oracle Learning Library for Oracle Business Intelligence-related online training resources.
- Go to the Product Information Center support note (Article ID 1267009.1) on My Oracle Support at <https://support.oracle.com>.

## Conventions

The following text conventions are used in this document:

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

# New Features for Oracle Data Visualization Users

Learn about the latest additions to the application.

This preface contains the following topics:

- [New Features for Oracle BI EE 12c \(12.2.1\)](#)
- [New Features for Oracle BI EE 12c \(12.2.1.1\)](#)
- [New Features for Oracle BI EE 12c \(12.2.1.2\)](#)
- [New Features for Oracle BI EE 12c \(12.2.1.3\)](#)
- [New Features for Oracle BI EE 12c \(12.2.1.4\)](#)

## New Features for Oracle BI EE 12c (12.2.1)

This topic describes new features in Oracle Data Visualization. The new features include:

- [Visualize Data in Oracle Applications](#)
- [Modify Uploaded Data Sources](#)
- [Use New and Enhanced Visualization Types](#)
- [Customize Your Color Schemes](#)
- [Move Filter Panels in Projects](#)
- [Data Wrangling — Update Data Sources After Upload](#)
- [New Ways to Present Data Visualizations](#)

### **Visualize Data in Oracle Applications**

You can use analyses and logical SQL statements from existing Oracle applications as data sources for projects. See [Connecting to Oracle Applications Data Sources](#).

### **Modify Uploaded Data Sources**

You can modify uploaded data sources including editing columns, and creating new ones for use in projects. See [Modifying Uploaded Data Sets](#).

### **Use New and Enhanced Visualization Types**

Visualize data using donut charts and see data series trends using a trend line. You can also link to URLs and insights in tiles, images, and text boxes, and use Chrome for Windows or Android to dictate descriptions. See [Adjusting Visualization Properties](#).

**Customize Your Color Schemes**

Create custom color palettes and apply color to data elements in specific ways. See [Assigning Color to Visualize Data](#).

**Move Filter Panels in Projects**

Detach and reattach the filter panel to increase canvas space for exploring data in visualizations. See [Moving Filter Panels](#).

**Data Wrangling — Update Data Sources After Upload**

Make updates to existing data sources including editing columns, and creating new ones for use in projects. See [Modifying Uploaded Data Sets](#).

**New Ways to Present Data Visualizations**

The following visualizations were added:

Donut charts – Similar to pie charts

Tile views – Performance tiles present a distilled analysis of data

Text boxes – Annotate your data with text

See [Changing Visualization Types](#).

## New Features for Oracle BI EE 12c (12.2.1.1)

This topic describes new features in Oracle Data Visualization. The new features include:

- [Visualize Data in Databases](#)
- [Size of Data Files to Upload](#)
- [Change Data Blending](#)

**Visualize Data in Databases**

You can use data from databases as data sources for projects. See [Connecting to Database Data Sources](#).

**Size of Data Files to Upload**

You can now upload data files up to 50 MB in size. See [About Adding a Spreadsheet as a Data Set](#).

**Change Data Blending**

You can change the way that the system automatically blends the data from two data sources. See [Changing Data Blending](#).

## New Features for Oracle BI EE 12c (12.2.1.2)

There are no new Oracle Data Visualization features for this release.

## New Features for Oracle BI EE 12c (12.2.1.3)

There are no new Oracle Data Visualization features for this release.

## New Features for Oracle BI EE 12c (12.2.1.4)

This topic describes new features in Oracle Data Visualization. The new features include:

- [Connect to More Databases](#)
- [Data Flow Enhancements](#)
- [Improved Narration and Storytelling Features](#)
- [Include Links to Related Content in Your Project](#)
- [Numeric Values in File-Based Data Sources Uploaded as Measures](#)
- [More Display Formatting Options for Numbers and Dates](#)
- [New Properties Area in the Data Panel](#)
- [Improved Sharing](#)
- [More Options to Copy, Paste, and Duplicate](#)
- [Add Unrelated Data Sets to the Same Project](#)
- [Date and Time Intelligence](#)
- [Data Warning Indicator](#)
- [Background Maps](#)
- [Coloring Maps Using Attribute Column Values](#)
- [Brand New Home Page](#)

### **Connect to More Databases**

You can connect to several data sources:

- [Oracle Data Warehouse Cloud Service](#)
- [Oracle Big Data Cloud Service](#)
- [Oracle Talent Management Cloud](#)

See [Connecting to Database Data Sources](#).

### **Data Flow Enhancements**

- Merge the rows from two data sets. See [Merging Rows in a Data Flow](#).
- Create bins from a measure. See [Creating a Binning Column](#).
- Use binning attributes to group your data. See [Creating a Group](#).
- Use cumulative aggregate functions to group your data. See [Adding Cumulative Values to a Data Flow](#).
- Use filters to restrict your data. See [Adding Filters to a Data Flow](#).

- Build data sets from a predefined sequence. See [Creating a Sequence](#).

### Improved Narration and Storytelling Features

When you use the improved narrate feature it makes presenting your data stories even easier. See [Building Stories](#).

### Include Links to Related Content in Your Project

Enhance visualizations by offering links to related content under a handy **Data Actions** menu. See [Working with Data Actions](#).

### Numeric Values in File-Based Data Sources Uploaded as Measures

When you upload a file-based data source, columns containing numeric values are imported as measures with the Number data type.


### More Display Formatting Options for Numbers and Dates

You can select from a wide range of number and date formats to choose the best display format for data in your visualizations. See [Adjusting the Display Format of Date or Time Columns](#).

### New Properties Area in the Data Panel

For quick and easy access, the properties of objects you select are displayed in the Data Panel. See [Adjusting Visualization Properties](#).

### Improved Sharing

Use the  to share a visualization, canvas, or story with others, as a file, a printed page, and on cloud.

You can also share a project or folder only in DVA format, as a file, and on cloud.

See [Importing and Sharing](#).

### More Options to Copy, Paste, and Duplicate

It's often quicker to copy visualizations than starting from scratch. You can paste within the same canvas and between canvases in the same project.

Use the duplicate option to make copies of an object within the same canvas or to duplicate the entire canvas.

See [Adjusting the Canvas Layout](#).


### Add Unrelated Data Sets to the Same Project

Your projects can contain visualizations from multiple, unrelated data sets; that is, the data sets don't have to be joined.

### Date and Time Intelligence

You can seamlessly transition through different levels of time hierarchies or granularities with ease.

### Data Warning Indicator

Warning signs  indicate possible issues with your data. If you don't want to see any warnings in your projects you can hide them. Warnings never display in printed or shared output. See [Visualization Data Warning Notification](#).

### Background Maps

Use background maps to enhance your geographical visualizations. See [Enhancing Visualizations with Map Backgrounds](#).

### Coloring Maps Using Attribute Column Values

You can use color features to interpret the measure columns and attribute values in projects that include map visualizations. See [Interpreting Data Measure and Attribute Values by Color in Map Visualizations](#).

### Brand New Home Page

Improved design that's simple to navigate and easy to use. Personalize your home page to suit the way you want to work.

# 1

## Getting Started with Data Visualization

This topic helps you understand Data Visualization.

### Topics

- [About Oracle Data Visualization](#)
- [What is the Data Visualization Home Page?](#)
- [Getting Started with Samples](#)

## About Oracle Data Visualization

You can use Oracle Data Visualization to explore analytical data visually and on an individual basis.

Oracle Data Visualization makes it easy to visualize your data so you can focus on exploring interesting data patterns. Just upload data files or connect to Oracle Applications or a database, select the elements that you're interested in, and let Oracle Data Visualization find the best way to visualize it. Choose from a variety of visualizations to look at data in a specific way.

Oracle Data Visualization benefits include:

- A personal, single-user application.
- Offline availability.
- Completely private analysis.
- Full control of data source connections.
- Direct access to on-premises data sources.
- Lightweight single-file download.
- No remote server infrastructure.
- No administration tasks.

## What is the Data Visualization Home Page?

You can use the Data Visualization home page to create, edit, or view Data Visualization projects, dashboards, or analyses.

In Oracle BI EE the Visual Analyzer Home Page is also called the **New Home Page**. You can toggle from the Data Visualization home page to the Oracle BI EE home page, which is also called the Oracle Business Intelligence Home page, by clicking **Open Classic Home**. Use the Classic Home page to create other business intelligence objects such as alerts, prompts, and Oracle Business Intelligence Publisher reports. See *What is the Oracle BI EE Home Page?* in *User's Guide for Oracle Business Intelligence Enterprise Edition*



The home page is the location from where you begin your data visualization tasks. The following sections outline the tasks you can perform.

### Creating and Using Data Sets

The **Data** area contains the data, connections, data flows, and sequences that you can use to create visualizations. A data source can be either a subject area or another data source. You can create data sets by uploading an Excel file or by building a connection to Oracle BI Applications or to a database. See [Adding Data Sources for Analyzing and Exploring Data](#).

### Finding Projects

The Projects area provides several categories to help you quickly locate stored visualization projects. Use **My Folders** or **Shared Folders** to browse. Or click **Projects**, and **Favorites**, to quickly locate a project that you recently viewed.

### Searching for Projects

You can use keywords to search for projects. Type a search term in the **Search Projects** field and click the magnifying glass icon to see a list of projects that match your search criteria, and click on a row of the dropdown window in the **Sort By** section to select what to sort by. See [Searching for Saved Projects and Visualizations](#).

### Visualizing Data with BI Ask

You can use BI Ask to quickly combine existing data objects into a visualization. Type a search term in the **What are you interested in?** field to see a list of objects that match your search criteria, and click on a row with a data attribute icon (located in the **Visualize data using** section of the dropdown window) to start building your visualization. See [Visualizing Data with BI Ask](#).

### Creating Objects

You can create a variety of objects from the home page's **Create** area:

- **Project** as described in [Typical Workflow for Visualizing Data](#)
- **Data Set**, and **Connection** as described in [Typical Workflow for Adding Data Sources](#)
- **Data Flow** as described in [Using Data Flows to Create Curated Data Sets](#)

### Getting More Information

You can learn more about the home page functions by clicking **Academy** to access additional information sources to help you work with Oracle BI Data Visualization.

## Getting Started with Samples

Use the samples to discover how to create and work with visualizations, and to learn best practices.

Because these samples use business functions such as trending, binning, forecasting, and clustering, you can use them as a quick reference when you create your own visualization.

The sample data set is based on Sales Orders data and contains meaningful dimensions, distributions, examples of data wrangling, calculated columns, and more.

You can optionally download the samples during installation. If you didn't download the samples during installation, then you can still get them by uninstalling and then reinstalling Oracle Data Visualization Desktop. Your personal data isn't deleted if you uninstall and reinstall Oracle Data Visualization Desktop .

# 2

## Exploring and Analyzing Data in Visualization Canvases

This topic describes the many ways that you can explore and analyze your data in visualization canvases.



### Topics:

- [Typical Workflow for Visualizing Data](#)
- [Creating a Visualization Project and Adding Data](#)
- [Adding Data from Data Sets to Visualization Canvases](#)
- [Adding Advanced Analytics to Visualization Canvases](#)
- [Creating Calculated Data Elements in a Data Set](#)
- [Undoing and Redoing Edits](#)
- [Refreshing Visualization Content](#)
- [Adjusting the Visualization Canvas Layout](#)
- [Changing Visualization Types](#)
- [Adjusting Visualization Properties](#)
- [Assigning Color to Visualize Data](#)
- [Formatting Numeric Data Properties](#)
- [Applying Map Layers and Backgrounds to Enhance Visualizations](#)
- [Sorting and Selecting Data in Visualization Canvases](#)
- [About Warnings for Data Issues in Visualizations](#)

### Typical Workflow for Visualizing Data

Here are the common tasks for exploring your data.

Task	Description	More Information
Create a project and add data sets to it	Create a new data visualization project and select one or more data sets to the project.	<a href="#">Creating a Visualization Project and Adding Data</a>
Add data elements	Add data elements (for example, data columns or calculations) from the selected data set to the visualizations on the Prepare canvas.	<a href="#">Adding Data from Data Sets to Visualization Canvases</a>

Task	Description	More Information
Adjust the canvas layout	Add, remove, and rearrange visualizations.	<a href="#">Adjusting the Visualization Canvas Layout</a>
Filter content	Specify how many results and which items to include in the visualizations.	<a href="#">Creating and Applying Filters for Visualizing Data</a>
Set visualization interaction properties	Define how you want visualizations affect each other.	<a href="#">How Visualizations and Filters Interact</a>
Build stories	Capture your notes (insights) about visualizations within a story to revisit later, include in a presentation, or share with a team member.	<a href="#">Building Stories</a>

## Creating a Visualization Project and Adding Data

Projects contain visualizations that help you explore your content in productive and meaningful ways. When you create a project you select one or more data sets containing the data that you want to explore. Data sets contain data from subject areas, Oracle Applications, databases, or uploaded data files such as spreadsheets.

1. Create or open a data visualization project that you want to add the data set to.
  - To create a new project, go to the Home Page, click **Create**, then click **Project** to display the Add Data Set dialog.
  - Alternatively, go to the Projects page and locate an existing project. You can also locate an existing project by using the Home page search or by browsing the project thumbnails shown on the Home page. Click the project's **Actions** menu, then click **Open**.
2. If you're creating a new project, in the Add Data Set dialog select the data sets that you want to analyze, and then click **Add to Project**.
3. To visualize data from another data set in the same project, in the Data Elements pane click **Add**, and then select **Add Data Set**.

When you have more than one data set in a project, click **Data Sets** in the properties pane to change the default data blending options. See [Changing Data Blending](#).

4. Drag the data elements that you want to visualize from the Data Elements pane onto the Visualize canvas, and start building your project. See [Adding Data from Data Sets to Visualization Canvases](#).

## Adding Data from Data Sets to Visualization Canvases

There are various ways that you can add data elements such as columns and calculations to your visualizations.

### Topics:

- [Adding Data to Blank Canvases](#)
- [About Adding Data to the Visualization Grammar Pane](#)

- [About Adding Data to the Visualization Assignments Pane](#)

## Adding Data to Blank Canvases

You can add data elements directly from the Data Elements pane to a blank canvas.

You must create a project or open an existing project and add one or more data sets to the project before you can add data elements to a blank canvas. See [Creating a Visualization Project and Adding Data](#).

1. Confirm that you're working in the Visualize canvas.
2. Drag one or more data elements to the blank canvas or between visualizations on the canvas.

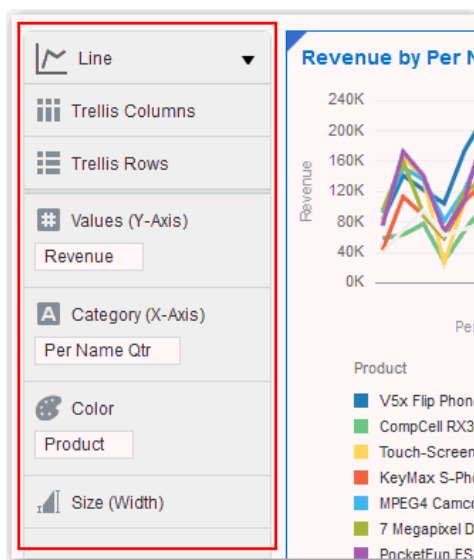
A visualization is automatically created and the best visualization type and layout are selected.

For example, if you add time and product attributes and a revenue measure to a blank canvas, the data elements are placed in the best locations and the Line visualization type is selected.

If there are visualizations already on the canvas, then you can drag and drop data elements between them.

## About Adding Data to the Visualization Grammar Pane

After you have selected the data sets for your project, you can begin to add data elements such as measures and attributes to visualizations. You can select compatible data elements from the data sets and drop them onto the Visualization Grammar Pane in the Visualize canvas. Based on your selections, visualizations are created on the canvas. The Visualization Grammar Pane contains sections such as Columns, Rows, Values, and Category.



You must create a project or open an existing project and add one or more data sets to the project before you can add data elements to the Visualization Grammar Pane. See [Creating a Visualization Project and Adding Data](#). You can only drop data elements based on attribute and type onto a specific Visualization Grammar Pane section.

Confirm that you're working in the Visualize canvas. Use one of the following methods to add data elements to the Visualization Grammar Pane:

- Drag and drop one or more data elements from the Data Elements pane to the Visualization Grammar Pane in the Visualize canvas.  
The data elements are automatically positioned, and if necessary the visualization changes to optimize its layout.
- Double-click data elements in the Data Elements pane to add them to the Visualize canvas.
- Replace a data element by dragging it from the Data Elements pane and dropping it over an existing data element.
- Swap data elements by dragging a data element already inside the Visualize canvas and dropping it over another data element.
- Reorder data elements in the Visualization Grammar Pane section (for example, Columns, Rows, Values) to optimize the visualization, if you have multiple data elements in the Visualization Grammar Pane section.
- Remove a data element by selecting a data element in the Visualization Grammar Pane, and click X.

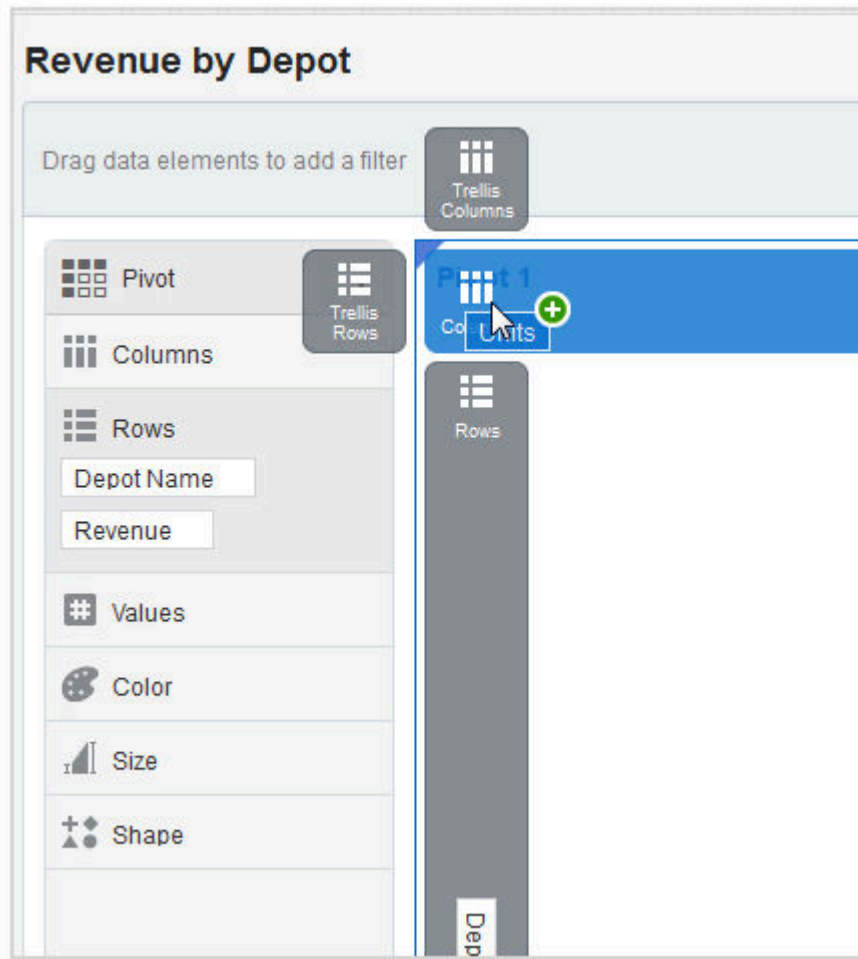
## About Adding Data to the Visualization Assignments Pane

You can use the visualization Assignment pane to help you position data elements in the optimal locations for exploring content.

You must create a project or open an existing project and add one or more data sets to the project before you can add data elements to the visualization Assignment pane. See [Creating a Visualization Project and Adding Data](#).

Confirm that you're working in the Visualize canvas. Use one of the following methods to add data elements to Visualization Assignments Pane

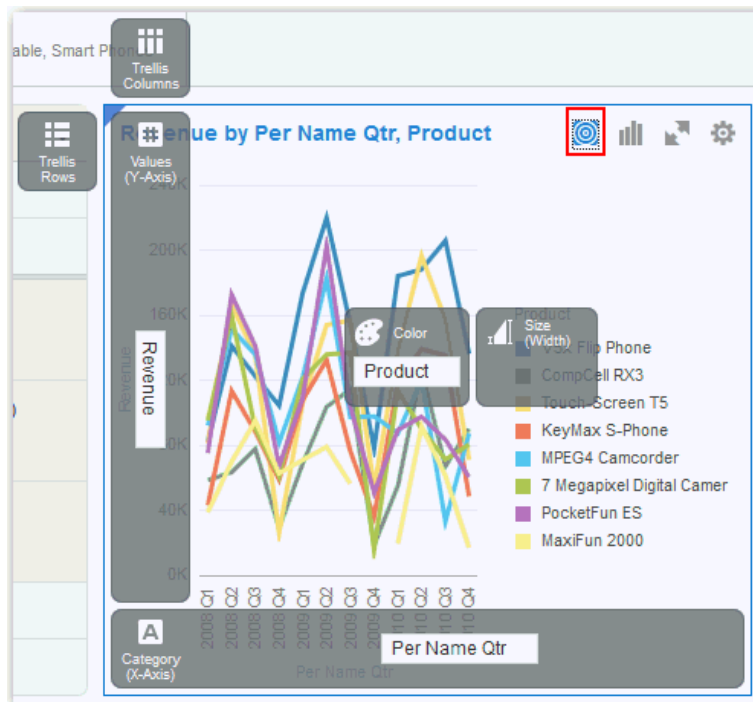
- When you drag and drop a data element to a visualization (but not to a specific drop target), you'll see a blue outline around the recommended Assignments (for example Rows, Columns) in the visualization. In addition, you can identify any valid visualization Assignment because you'll see a green plus sign icon appear next to your data element. The sections in the visualization Assignment pane are the same as the Visualization Grammar Pane.



After you drop data elements into the visualization Assignment pane or when you move your cursor outside of the visualization, the Assignment pane disappears.

- To display the Assignment pane again, on the visualization toolbar, click **Show Assignments**.

You can also do this to keep the visualization Assignment pane in place while you work.



## Adding Advanced Analytics to Visualization Canvases

Advanced analytics are statistical functions that you apply to enhance the data displayed in visualizations. Examples of advanced analytics functions are Clusters, Outliers, and Trend Lines.

As well as the **Analytics** menu options available in the user interface, you can also use analytics functions to create your own calculated columns that reference statistical scripts. See Evaluate\_Script in [Analytics Functions](#).

You can easily apply advanced analytics functions to a project to augment its visualizations. For example, you can use advanced analytics to highlight outliers or overlay trendlines.

### Prerequisites

Before you can use analytic functions in Data Visualization, you must create a project or visualization to which you can apply one or more analytic functions.

### Using Analytic Functions

1. To display the available analytic functions, click the **Analytics** icon in the Data Panel.
2. To edit analytics for a visualization object such as a chart, highlight the visualization on the Visualize canvas, and in the properties pane click the **Analytics** tab.
3. Apply a function to the chart by:
  - **Drag and drop** – Click an analytic function from the **Analytics** tab menu and drag it to the Visualize canvas.



- **Right-click** – Right-click anywhere on a visualization, and select an analytic function from the menu.

## Creating Calculated Data Elements in a Data Set

You can create a new data element (typically a measure) to add to your visualization. For example, you can create a new measure called Profit that uses the Revenue and Discount Amount measures.

1. Navigate to the bottom of the Data Elements pane, right-click **My Calculations**, and click **Add Calculation** to open the New Calculation dialog.

In projects with multiple data sets:

- Not-joined data sets are separated by a line. In the data elements **Menu**, click **Data Diagram** to see joined and not-joined data sets.
  - **My Calculations** is provided for each set of joined and not-joined data sets. Right-click **My Calculations** of a data set that you want to create a calculated data element for.
2. In the expression builder pane, compose and edit an expression. See [About Composing Expressions](#) and [Expression Editor Reference](#).

### Note:

You can't drag and drop a column into the expression builder pane unless the column is joined to the data set. If you try to do so, you see an error message.

3. Click **Validate**.
4. Specify a name, then click **Save**.

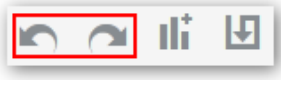
Note the following:

- **Calculated data elements** – Stored in the data set and not in the project. Ensure that you create the calculation in the proper data set or joined data set.
- **Projects with multiple data sets (joined and not-joined)** – The My Calculations folder is available for each set of joined and not-joined data sets. The new calculated element is added to the My Calculations folder of the data sets (joined and non-joined) that you created the calculation for.
- **Projects with a single data set** – The single My Calculations folder is available, and the new calculated element is added to it.

## Undoing and Redoing Edits

You can quickly undo your last action and then redo it if you change your mind. For example, you can try a different visualization type when you don't like the one you've just selected, or you can go back to where you were before you drilled into the data. These options are especially useful as you experiment with different visualizations. You can also undo all edits made since you last saved a project.

- To undo or redo an edit, go to the project or data set toolbar, click the **Undo Last Edit** or the **Redo Last Edit** button.



You can only use these options if you have not saved the project since making the changes.

#### **Note:**

In some cases you can't undo and then redo an edit. For example, if you're working in the Create Data Set page to create a data set from an Oracle Application, select an analysis to use as a data set, and click **Undo Last Edit** to remove the analysis. However, if you then click **Redo Last Edit** the analysis does not return the data set.

- To undo all edits that you made to a project since you last saved it, on the project toolbar click **Canvas Settings** and select **Revert**.

## Refreshing Visualization Content

To see if newer data is available for your project, you can refresh the data and metadata.

- On the project toolbar click **Canvas Settings** and select **Refresh Data**. This action clears the data cache and reruns queries that retrieve the latest data from the data sets. This data is then displayed on the canvas.
- Click **Canvas Settings** on the project toolbar and select **Refresh Metadata and Report**.

This action refreshes the data and any project metadata that has changed since you started working in it. For example, a column is added to the subject area used by the project. You use this menu to bring the new column into the project.

## Adjusting the Visualization Canvas Layout

You can adjust the look and feel of visualizations on the Visualize canvas to make them more visually attractive.

You can copy a visualization and paste it within or between canvases in a project. You can also duplicate canvases and visualizations to create multiple copies of them. After copying and pasting or duplicating, you can modify the visualization by changing the data elements, selecting a different visualization type, resizing it, and so on. See [Keyboard Shortcuts for Data Visualization](#).

Option	Location	Description
Canvas Properties	Canvas Settings menu or Canvas tab Menu	Change the name, layout, width, and height of the canvas in the Canvas Properties dialog. Use the <b>Synchronize Visualizations</b> setting to specify how the visualizations on your canvas interact. See <a href="#">How Visualizations and Filters Interact</a> .
Add Canvas	Canvas tabs bar	Add a new canvas to the project. You can right-click and drag a canvas to a different position on the canvas tabs bar.

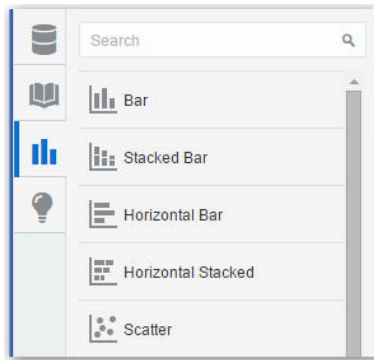
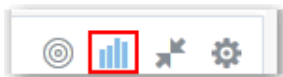
Option	Location	Description
Rename	Canvas tab Menu	Rename a selected canvas.
Duplicate Canvas	Canvas tab Menu or right-click a canvas tab	Add a copy of a selected canvas to the project's row of canvas tabs.
Clear Canvas	Canvas tab Menu or right-click a canvas tab	Clear all the visualizations on the canvas.
Delete Canvas	Canvas tab Menu or right-click a canvas tab	Delete a specific canvas of a project.
Duplicate Visual	Visualization Menu or right-click a visualization	Add a copy of a selected visualization to the canvas.
Copy Visual	Visualization Menu or right-click a visualization	Copy a visualization on the canvas.
Paste Visual	Visualization Menu, or right-click a visualization or blank canvas	Paste a copied visualization into the current canvas or another canvas.
Delete Visual	Visualization Menu or right-click a visualization	Delete a visualization from the canvas.
Canvas Layout	Visualization Menu, or right-click a visualization or blank canvas	<p>Select one of the following:</p> <ul style="list-style-type: none"> <li>• <b>Freeform</b> – If you select Freeform, you can perform the following functions: <ul style="list-style-type: none"> <li>– Click <b>Select All Visualizations</b> to select all the visualizations on a canvas, and then copy them.</li> <li>– Select one of the following <b>Order Visualization</b> options: Bring to Front, Bring Forward, Send Backward, Send to Back to move a visualization on a canvas with multiple visualizations.</li> <li>– Rearrange a visualization on the canvas. Drag and drop the visualization to the location (the space between visualizations) where you want it to be placed. The target drop area is displayed with a blue outline.</li> <li>– Resize a visualization by dragging its edges to the appropriate dimensions.</li> </ul> </li> <li>• <b>Autofit</b> – Auto-arrange or correctly align the visualizations on a canvas with multiple visualizations.</li> </ul>

## Changing Visualization Types

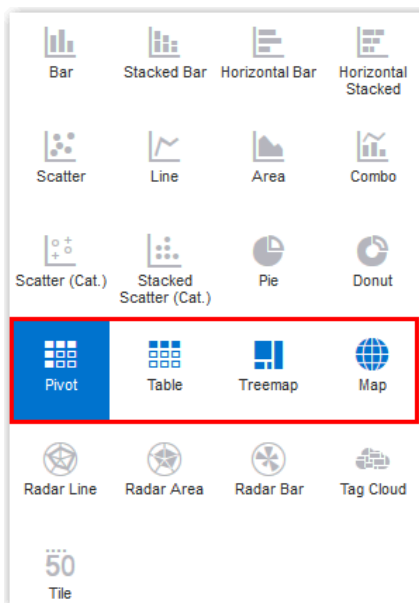
You can change visualization types to best suit the data you're exploring.

When you create a project and add a visualization, Data Visualization chooses the most appropriate visualization type based on the data elements you selected. After a visualization type is added, dragging additional data elements to it won't change the visualization type automatically. If you want to use a different visualization type, then you need to select it from the visualization type menu.

1. Confirm that you're working in the Visualize canvas. Select a visualization on the canvas, and on the visualization toolbar, click **Change Visualization Type**.



2. Select a visualization type. For example, change the visualization type from Pivot to Treemap.



When you change the visualization type, the data elements are moved to matching drop target names. If an equivalent drop target doesn't exist for the new visualization type, then the data elements are moved to a Visualization Grammar

Pane section labeled **Unused**. You can then move them to the Visualization Grammar Pane section you prefer.

## Adjusting Visualization Properties

You can change the visualization properties such as legend, type, axis values and labels, data values, and analytics.

1. Go to the Visualize or Narrate canvas and select the visualization whose properties you want to change. The visualization properties are displayed in the properties pane.

Both common and type specific properties of data elements or visualization are displayed. The properties you can edit are displayed in tabs and depend on the type of visualization or data element you're handling.

### Note:

To change color settings or add actions to a project, click **Canvas Settings**, then select **Project Properties**. See [Assigning Color to Visualize Data](#), and [Using Data Actions to Connect to Canvases and External URLs](#).

2. In the properties pane tabs, adjust the visualization properties as needed:

Properties Pane Tab	Description
General	Format title, type, legend, selection effect, and customize descriptions.
Axis	Set horizontal and vertical value axis labels and start and end axis values.
Data Sets	Override the way the system automatically blends data from two data sets.
Edge Labels	Show or hide row or column totals and wrap label text.
Action	Add URLs or links to insights in Tile, Image, and Text Box visualizations. If you use Chrome for Windows or Android, the Description text field displays a <b>Dictate</b> button (microphone) that you can use to record an audio description.
Style	Set the background and border color for Text visualizations.
Values	Specify data value display options including the aggregation method such as sum or average, and number formatting such as percent or currency. You can specify the format for each individual value data element in the visualization, for example, aggregation method, currency, data or number format.
Analytics	Add reference lines, trend lines, and bands to display at the minimum or maximum values of a measure included in the visualization.

## Assigning Color to Visualize Data

This topic covers how you can work with color to enhance visualizations.

You can work with color to make visualizations more attractive, dynamic, and informative. You can color a series of measure values (for example, Sales or Forecasted Sales) or a series of attribute values (for example, Product and Brand).

The **Visualize** canvas has a Color section in the Visualization Grammar Pane where you can put a measure column, attribute column, or set of attributes columns. Note how the canvas assigns color to the columns that are included in the Color section:

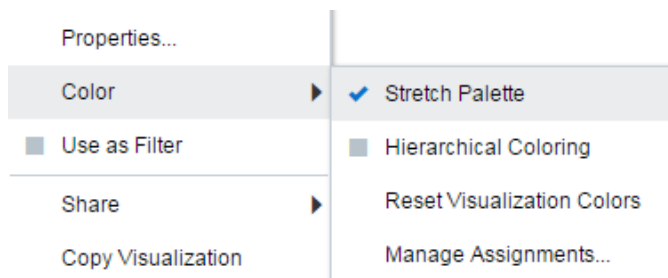
- When a measure is in the Color section, then you can select different measure range types (for example, single color, two color, and three color) and specify advanced measure range options (for example, reverse, number of steps, and midpoint).
- When you have one attribute in the Color section, then the stretch palette is used by default. Color palettes contain a set number of colors (for example, 12 colors), and those colors repeat in the visualization. The stretch palette extends the colors in the palette so that each value has a unique color shade.
- If you have multiple attributes in the Color section, then the hierarchical palette is used by default, but you can choose to use the stretch palette, instead. The hierarchical palette assigns colors to groups of related values. For example, if the attributes in the Color section are Product and Brand and you have selected Hierarchical Palette, then in your visualization, each brand has its own color, and within that color, each product has its own shade.

## Managing Color Settings

Use the Visualize canvas to modify the visualization's color. Your color choices are shared across all visualizations on the canvas, so if you change the series or data point color in one visualization, then it appears on the other visualizations.

### Accessing Color Options

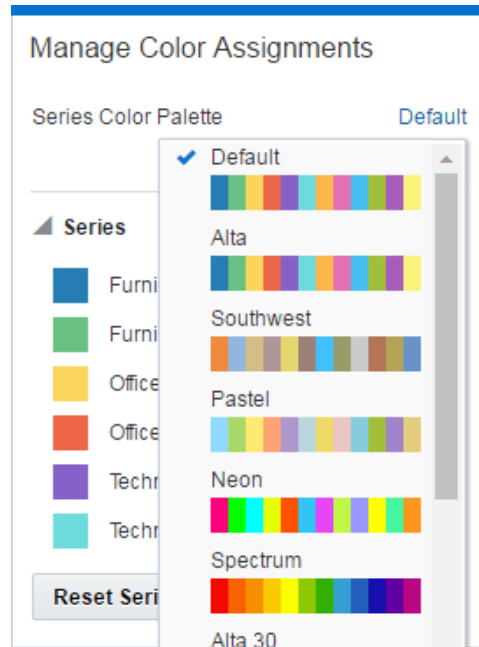
- To edit color options for the whole project, click **Canvas Settings**, then **Project Properties**, and use the **General** tab to edit the color series or continuous coloring.
- To edit color options for a visualization, highlight the visualization and in the visualization's toolbar, click **Menu**, then select **Color**. The available color options depend on how the measures and attributes are set up in your visualization.



## Changing the Color Palette

Data Visualization includes several color palettes. Each palette contains 12 colors, but you can use the color stretching option to expand the colors in the visualization.

1. If your project contains multiple visualizations, click the visualization that you want to change the color palette for. In the visualization's toolbar, click **Menu**, select **Color**, and then select **Manage Assignments**. The Manage Color Assignments dialog is displayed.
2. Locate the **Series Color Palette** and click the color palette that's currently used in the visualization (for example, Default or Alta).

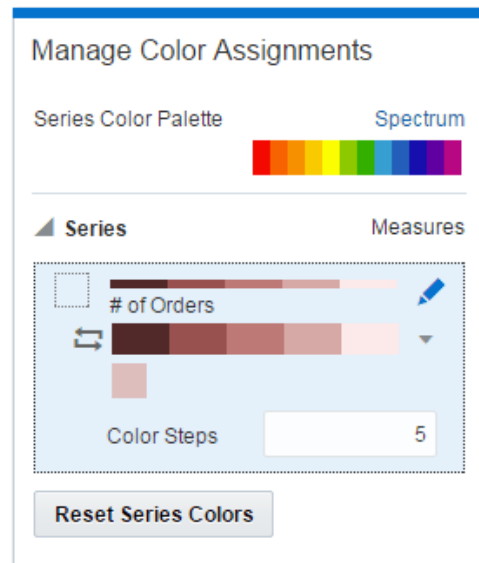


3. From the list, select the color palette that you want to apply to the visualization.

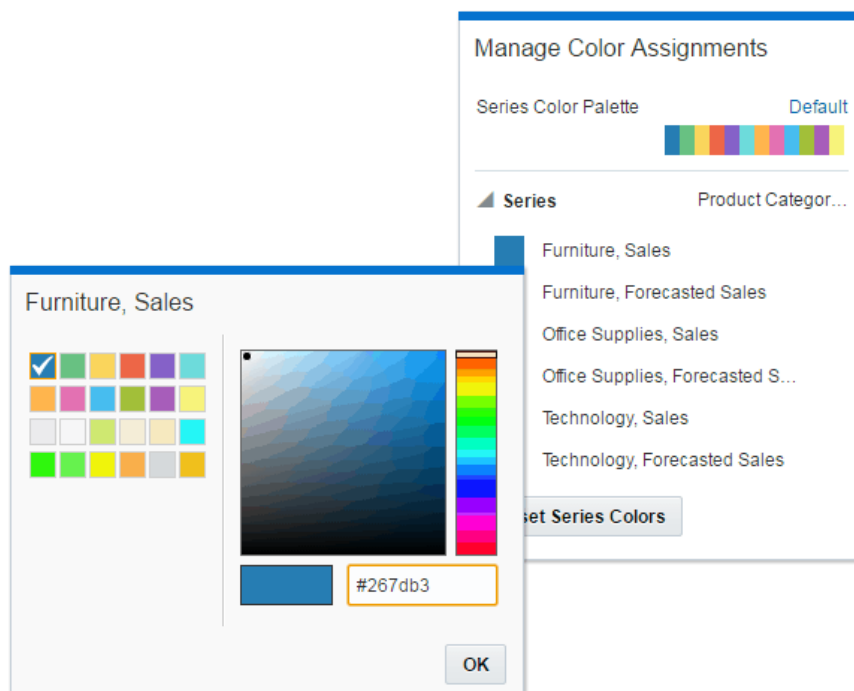
## Managing Color Assignments

Instead of using the palette's default colors, you can use the Manage Color Assignments feature to choose specific colors to fine-tune the look of your visualizations.

1. If your project contains multiple visualizations, click the visualization that you want to manage the colors for. In the visualization's toolbar, click **Menu**, select **Color**, and then select **Manage Assignments**. The Manage Color Assignments dialog is displayed.
2. If you're working with a measure column, you can do the following:
  - Click the box containing the color assigned to the measure. From the color picker dialog, select the color that you want to assign to the measure. Click **OK**.
  - Specify how you want the color range to be displayed for the measure (for example, reverse the color range, pick a different color range, and specify how many shades you want in the color range).



3. If you're working with an attribute column, then click the box containing the color assignment that you want to change. From the color picker dialog, select the color that you want to assign to the value. Click **OK**.



### Resetting Colors

You can experiment with visualization colors and then easily revert to the visualization's original colors.

- If your project contains multiple visualizations, click the visualization that you want to reset the colors for. In the visualization's toolbar, click **Menu**, select **Color**, and then select **Reset Visualization Colors**.



### Applying or Removing the Stretch Palette

Color palettes have a set number of colors, and if your visualization contains more values than the number of color values, then the palette colors are repeated. Use the Stretch Palette option to expand the number of colors in the palette. Stretch coloring adds light and dark shades of the palette colors to give each value a unique color. For some visualizations, stretch coloring is used by default.

- If your project contains multiple visualizations, click the visualization that you want to adjust the stretch palette from. In the visualization's toolbar, click **Menu**, select **Color**, and then select **Stretch Palette** to turn this option on or off.

### Applying a Repeating Color Palette

In some cases, you might want to use a repeating color palette in your visualization. If your visualization contains more values than colors in the palette, then the colors are reused and aren't unique.

- In the Visualize canvas, click **Color** and click **Stretch Palette** to turn this option off.

## Formatting Numeric Data Properties

You can format numeric data in your visualizations using a wide range of ready-to-use formats. For example, you might change an aggregation type from Sum to Average.

1. Open the project or the data set that includes the numeric column that you want to format, and go to the Visualize canvas.
2. In the Data Panel, click **Data Elements**, and select the numeric column that you want to format.

You use the properties pane to format the element.

3. To format a single numeric data element, select the element in the Data Elements list, and use the **General** or **Number Format** tabs in the properties pane to format the element.

For example, to change how a number is aggregated, use the `Aggregation` option on the **General** tab. Or, to change the default format, use the `Number Format` option on the **Number Format** tab.

4. To format numeric values in a visualization, for example in a table visualization, select the visualization in the main canvas, and use the **General** or **Values** tab options in the properties pane to format the numeric values.

For example, to change how a number is aggregated, click the element to expand the formatting options, and use the `Aggregation Method` option on the **Values** tab. Or, to change the default format, use the `Number Format` option on the **Values** tab.

5. If you're working in Prepare canvas, select a column header to display formatting options for that column in the properties pane.

# Applying Map Layers and Backgrounds to Enhance Visualizations

You can add and maintain custom map layers to enhance map visualizations.

## Topics:

- [Enhancing Visualizations with Map Backgrounds](#)
- [Using Color to Interpret Data Values in Map Visualizations](#)
- [Adding Custom Map Layers](#)
- [Updating Custom Map Layers](#)
- [Making Maps Available to Users](#)

## Enhancing Visualizations with Map Backgrounds

You can use map backgrounds to enhance visualizations in a project.

1. Create or open the data visualization project where you want to include a map background.  
Confirm that you're working in the Visualize canvas.
2. To select a map-related column from the project and render it in a map view, do one of the following:
  - In the Data Elements pane right-click the column, click **Pick Visualizations**, and select **Map**.
  - Drag and drop the column from the Data Elements pane to the blank canvas or between visualizations on the canvas. You can also double-click the column to add it to the canvas.
    - On the visualization toolbar, click **Change Visualization Type**. Alternatively, in the Data Elements pane right-click the column, and click **Pick Visualizations**.
    - Select **Map**.
3. In the properties pane, click **Map**.
4. Specify the visualization properties:

---

Property	Description
Zoom Control	Enable or disable zoom control.
Scale	Select a scale, such as mile.

---

Property	Description
Background Map	Select a map background. If you want to see the list of available map backgrounds, click <b>Manage Map Backgrounds</b> to display the Map Background tab.

 **Note:**

You can also open the Console page, click **Maps**, and select the Map Backgrounds tab to see the available backgrounds list.

Map Layer	Select a layer, such as Asian countries.
-----------	--

5. Click **Save**.

## Using Color to Interpret Data Values in Map Visualizations

You can use color features to interpret the measure columns and attribute values in projects that include map visualizations.

1. Create or open the project with a map visualization where you want to interpret specific columns and values by color.

Confirm that you're working in the Visualize canvas.

2. Select a measure column or attribute from the project and render it in a map view, doing one of the following:
  - In the Data Elements pane, right-click the column or attribute, click **Pick Visualizations**, and select **Map**.
  - Drag and drop the columns or attributes from the Data Elements pane to the blank canvas or between visualizations on the canvas. You can also double-click the columns or attributes to add them to the canvas.
    - On the visualization toolbar, click **Change Visualization Type**.  
Alternatively, in the Data Elements pane, right-click the column or attribute, and click **Pick Visualizations**.
    - Select **Map**.
3. Drag and drop one or multiple measure columns or attributes in the following map color sections of the Visualization Grammar Pane:

Section	Description
Color (Map Shape)	Change the color in the map visualization (for example, Regions, State) based on the values.
Color (Bubble)	Display color bubbles in specific geographic locations in the map visualization based on the values.
Size (Bubble)	Change color bubble size based on the measure column values. To change the size of the color bubble you have to drag and drop measure columns only. The size shows the aggregated measure for a specific geographic location in a map visualization.
Trellis Columns / Rows	Compare multiple map visualizations based on the column values using filters.

In the map visualization, you can also use the following color features to interpret measure columns and attribute values:

- **Legend** – If the measure column or attribute has multiple values, then the legend is displayed. It defines the value of the various colors.
- **Tooltip** – Hover the mouse pointer over a color bubble to see the values in a tooltip. If there are multiple values, then a **Plus (+)** symbol is displayed.

## Adding Custom Map Layers

You can add custom map layers to use in map visualizations.

You add a custom map layer to Data Visualization using a geometric data file with the .json extension that conforms to GeoJSON schema <https://en.wikipedia.org/wiki/GeoJSON>. You then use the custom map layer to view geometric map data in a project. For example, you might add a Mexico\_States.json file to enable you to visualize geometric data in a map of Mexico States.

When creating a custom map layer, you must select layer keys that correspond with data columns that you want to analyze in a map visualization. For example, if you want to analyze Mexican States data on a map visualization, you might start by adding a custom map layer for Mexican States, and select HASC code layer key from the Mexican\_States.json file. Here is an extract from the Mexican\_States.json file that shows some of the geometric data for the Baja California state.

```

},
{
  "type": "Feature",
  "properties": {
    "adml_code": "MEX-2706",
    "OBJECTID_1": 745,
    "diss_me": 2706,
    "adml_cod_1": "MEX-2706",
    "iso_3166_2": "MX-",
    "wikipedia": "",
    "iso_a2": "MX",
    "adm0_sr": 6,
    "name": "Baja California",
    "name_alt": "",
    "name_local": "",
    "type": "Estado",
    "type_en": "State",
    "code_local": "",
    "code_hasc": "MX.BN",
    "note": ""
  }
}

```

If you wanted to use the Mexican\_States.json file, the layer keys that you select must match columns that you want to analyze from the Mexican States Data tables. For example, if you know there is a data cell for the Mexican state Baja California then select the corresponding name field in the JSON file to display state names in the Map visualization. When you create a project and select column (such as State, and HASC), then Mexican states are displayed on the map. When you hover the mouse pointer over a state, the HASC code (such as MX BN) for each state is displayed on the map.

1. Open the Console page and click **Maps** to display the Map Layers page.

The Map Layers page contains a Custom Map Layers section and a System Map Layers section. The Custom Map Layers section displays the custom map layers that you maintain.

 **Note:**

You can disable or enable both a System Map Layer and a Custom Map Layer, but you can't add or delete a System Map Layer.

2. To add a custom map layer, click **Add Custom Layer** or drag and drop a JSON file from File Explorer to the Custom Maps area.
3. Browse the Open dialog, and select a JSON file (for example, Mexico\_States.json).

The JSON file must be a GeoJSON file that conforms to the standard specified in <https://en.wikipedia.org/wiki/GeoJSON>.

 **Note:**

Custom layers with Line String geometry type isn't fully supported. The Color (Bubble) and Size (Bubble) fields in map visualization grammar are not applicable in the case of line geometries.

4. Click **Open** to display the Map Layer dialog.
5. Enter a **Name** and an optional **Description**.
6. Select the layer keys that you want to use from the Layer Keys list.

The layer keys are a set of property attributes for each map feature, such as different codes for each state in Mexico. The layer keys originate from the JSON file. Where possible, select only the layer keys that correspond with your data.

7. Click **Add** to add the selected layer keys to your custom map layer.

A progress indicator shows that the map layers are being saved, and a success message is displayed when the process is complete and the layer is added.

## Updating Custom Map Layers

You can maintain custom map layers that you have added to Data Visualization.

1. Open the Console page and click **Maps** to display the Map Layers page.

The Map Layers page contains a Custom Map Layers section and a System Map Layers section. The Custom Map Layers section displays the custom map layers that you maintain.

2. Right-click the map layer, click **Options**, and then take the appropriate action:

- To view or make changes to the map layer settings, select **Inspect**. The Map Layer dialog is displayed where you can update the **Name**, **Description**, or the **Layer Keys** used in this layer. See [Adding Custom Map Layers](#).

- To upload the JSON file again, select **Reload**.

- To save the JSON file locally, select **Download**.

- To delete the custom map layer, select **Delete**.

You can disable or enable a System Map Layer and a Custom Map Layer, but you can't add or delete a System Map Layer.

3. Click the map layer to enable or disable it. For example, if you want to exclude India States on the map, click the layer to disable it and remove it from searches.
4. To switch from using one map layer to another:
  - a. Select the desired columns from the project and select **Map** as the visualization.
  - b. In the Properties pane, select the **Map** tab to display the map properties.
  - c. Click the current **Map Layer** for example Mexican States.  
This displays a list of available custom map layers that you can choose from.
  - d. Click the map layer that you want to use to match your data points.

## Making Maps Available to Users

For visualization projects, administrators make maps available to end users or hide them from end users.

You can include or exclude a map from users.

1. On the Home page, click **Console**.
2. Click **Maps**.
3. Use the **Include** option to make a map layer available to end users or hide it from end users.

You can hide or display custom map and system map layers.

## Sorting and Selecting Data in Visualization Canvases

While adding filters to visualizations helps you narrow your focus on certain aspects of your data, you can take a variety of other analytic actions to explore your data (for example, drilling, sorting, and selecting). When you take any of these analytic actions, the filters are automatically applied for you.

Select a visualization to display its properties in the properties pane. Here are some of the analytic actions that you can perform:

- Use **Sort** to sort attributes in a visualization, such as product names from A to Z. If you're working with a table view, then the system always sorts the left column first. In some cases where specific values display in the left column, you can't sort the center column. For example, if the left column is Product and the center column is Product Type, then you can't sort the Product Type column. To work around this issue, swap the positions of the columns and try to sort again.
- Use **Drill** to drill to a data element and drill through hierarchies in data elements, such as drilling to weeks within a quarter. You can also drill asymmetrically using multiple data elements. For example, you can select two separate year members that are columns in a pivot table, and drill into those members to see the details.
- Use **Drill to [Attribute Name]** to directly drill to a specific attribute within a visualization.
- Use **Keep Selected** to keep only the selected members and remove all others from the visualization and its linked visualizations. For example, you can keep the sales that are generated by a specific sales associate.

- Use **Remove Selected** to remove selected members from the visualization and its linked visualizations. For example, you can remove the Eastern and Western regions from the selection.
- Use **Add Reference Line or Band** to add a reference line to highlight an important fact depicted in the visualization, such as a minimum or maximum value. For example, you might add a reference line across the visualization at the height of the maximum Revenue amount. You also might add a reference band to more clearly depict where the minimum and maximum Revenue amounts fall on the Revenue axis.

### [Adjusting Visualization Properties](#)

## About Warnings for Data Issues in Visualizations

You see a data warning icon when the full set of data associated with a visualization isn't rendered or retrieved properly. If the full set of data can't be rendered or retrieved properly, then the visualization displays as much data as it can as per the fixed limit, and the remaining data or values are truncated or not displayed.

The warning icon (an exclamation mark icon) is displayed in two locations:

- Next to the title of a visualization that has a data issue.

When you hover over the warning icon, you see a message that includes text such as the following:

```
Data sampling was applied due to the large quantity of data.  
Please filter your data. The limit of 500 categories was  
exceeded.
```

You see the warning icon associated with the visualization until the data issue is resolved. The warning icon is displayed only in the visualization Canvas; it's not displayed in Presentation Mode.

- On the Canvas tabs bar if any visualization on the Canvas page has the data warning.

By default, visualization warning icons aren't displayed; You can show or hide the warning icon beside the title of the visualization by clicking the icon on the Canvas tabs bar. The warning icon is only displayed if a Canvas includes a visualization with a data issue. If a visualization with a data issue is in multiple canvases, you see the icon in all those canvases.

# 3

## Creating and Applying Filters for Visualizing Data

This topic describes how you can use filters to find and focus on the data you want to explore.

### Topics:

- [Typical Workflow for Creating and Applying Filters](#)
- [About Filters and Filter Types](#)
- [How Visualizations and Filters Interact](#)
- [About Automatically Applied Filters](#)
- [Creating Filters on a Project](#)
- [Creating Filters on a Visualization](#)
- [Moving Filter Panels](#)
- [Applying Range Filters](#)
- [Applying Top or Bottom N Filters](#)
- [Applying List Filters](#)
- [Applying Date Filters](#)
- [Building Expression Filters](#)

### Typical Workflow for Creating and Applying Filters

Here are the common tasks for creating and applying filters to projects, visualizations, and canvases.

Task	Description	More Information
Choose the appropriate filter type	Filter types (Range, Top / Bottom N filter, List, Date, and Expression) are specific to either a project, visualization, or canvas.	<a href="#">Applying Range Filters</a> <a href="#">Applying Top or Bottom N Filters</a> <a href="#">Applying List Filters</a> <a href="#">Applying Date Filters</a>
Create filters on projects and visualizations	Create filters on a project or visualization to limit the data displayed and focus on a specific section or category.	<a href="#">Creating Filters on a Project</a> <a href="#">Creating Filters on a Visualization</a>
Build and use expression filters	You can build and use expression filters to define more complex filters using SQL expressions.	<a href="#">Building Expression Filters</a>
Set visualization interaction properties	Define how you want visualizations to affect each other.	<a href="#">How Visualizations and Filters Interact</a>



## About Filters and Filter Types

Filters reduce the amount of data shown in visualizations, canvases, and projects.

The Range, List, Date, and Expression filter types are specific to either a visualization, canvas, or project. Filter types are automatically determined based on the data elements you choose as filters.

- **Range filters:** Generated for data elements that are number data types and that have an aggregation rule set to something other than none. Range filters are applied to data elements that are measures, and that limit data to a range of contiguous values, such as revenue of \$100,000 to \$500,000. Or you can create a range filter that excludes (as opposed to includes) a contiguous range of values. Such exclusive filters limit data to noncontiguous ranges (for example, revenue less than \$100,000 or greater than \$500,000). See [Applying Range Filters](#).
- **List filters:** Applied to data elements that are text data types and number data types that aren't aggregatable. See [Applying List Filters](#).
- **Date filters:** Use calendar controls to adjust time or date selections. You can either select a single contiguous range of dates, or you can use a date range filter to exclude dates within the specified range. See [Applying Date Filters](#).
- **Expression filters:** Let you define more complex filters using SQL expressions. See [Building Expression Filters](#).

## How Visualizations and Filters Interact

There are several ways that filters can interact with visualizations in a project. For example, filters might interact differently with visualizations depending on the number of data sets, whether the data sets are joined, and what the filters are applied to.

### Topics:

- [How Data Sets Interact with Filters](#)
- [How the Number of Data Sets Interact with Filters in a Project](#)
- [Synchronizing Visualizations in a Project](#)

### How Data Sets Interact with Filters

Various factors affect the interaction of data sets and filters in projects:

- The number of data sets within a project.
- The data sets that are joined (connected) or not-joined (for a project with multiple data sets).
- The data elements (columns) that are matched between joined data sets.

You can use the Data Diagram in the Prepare canvas of a project to:

- See joined and not-joined data sets.
- Join or connect multiple data sets by matching the data elements in the data sets.
- Disconnect the data sets by removing matched data elements.

## How the Number of Data Sets Interact with Filters in a Project

You can add filters to the filter bar or to individual visualizations in a project.

Number of Project Data Sets	Filter Interaction
Single Data Set	<ul style="list-style-type: none"> <li>• If you add filters to the filter bar, they apply to all visualizations in the project.</li> <li>• If you add a filter to a visualization, it is applied after filters on the filter bar are applied.</li> <li>• If you add multiple filters, then by default the filters restrict each other based on the values that you select.</li> </ul>
Multiple Data Sets	<ul style="list-style-type: none"> <li>• If you add filters to the filter bar:           <ul style="list-style-type: none"> <li>– The filters apply to all the visualizations using the joined data sets. For visualizations using the not-joined data sets, you must add a separate filter to each data set.</li> <li>– You can't specify data elements of a data set as a filter of other data sets, if the two data sets aren't joined.</li> <li>– If a data element of a data set is specified as a filter, but doesn't match the joined data sets, then the filter applies only to the visualization of that particular data set, and does not apply to other visualizations of joined or not-joined data sets.</li> <li>– You can select <b>Pin to All Canvases</b> of a filter, to apply a filter to all canvases in the project.</li> </ul> </li> <li>• Hover the mouse pointer over a filter name to see the visualization to which the filter is applied. Any visualizations that don't use the data element of the filter are grayed out.</li> <li>• If you add filters to visualizations:           <ul style="list-style-type: none"> <li>– If you specify a filter on an individual visualization, that filter applies to that visualization after the filters on the filter bar are applied.</li> <li>– If you select the <b>Use as Filter</b> option and select the data points that are used as a filter in the visualization, then filters are generated in the other visualizations of joined data sets and matched data elements.</li> </ul> </li> </ul>

You can use the **Limit Values By** options to remove or limit how the filters in the filter bar restrict each other.

## Synchronizing Visualizations in a Project

You use the **Synchronize Visualizations** setting to specify how the visualizations on your canvas interact. By default, visualizations are linked for automatic synchronization. You can deselect **Synchronize Visualizations** to unlink your visualizations and turn automatic synchronization off.

When **Synchronize Visualizations** is on (selected), then all filters on the filter bar and actions that create filters (such as Drill) apply to:

- All the visualizations in a project with a single data set.
- All the visualizations of joined data sets with multiple data sets.

If a data element from a data set is specified as a filter but isn't matched with the joined data sets, then the filter only applies to the visualization of the data set that it was specified for.

 **Note:**

- When you hover the mouse pointer over a visualization to see the filters applied to the visualization, any filter that isn't applied to the visualization is grayed out.
- Any visualization-level filters are applied only to the visualization.
- When **Synchronize Visualizations** is off (deselected), then analytic actions such as Drill affect the visualization to which you applied the action.

The analytic actions such as **Drill** affect only the visualization to which you applied the action.

## About Automatically Applied Filters

By default, the filters in the filter bar and filter drop target are automatically applied. However, you can turn this behavior off if you want to manually apply the filters.

When the **Auto-Apply Filters** is selected in the filter bar menu, the selections you make in the filter bar or filter drop target are immediately applied to the visualizations. When **Auto-Apply Filters** is off or deselected, the selections you make in the filter bar or filter drop target aren't applied to the canvas until you click the **Apply** button in the list filter panel.

## Creating Filters on a Project

You can add filters to limit the data that's displayed in the visualizations on the canvases in your project.

If your project contains multiple data sets and some aren't joined, then there are restrictions for how you can use filters. Any visualization that doesn't use the data element of the filter is grayed out. See [How Visualizations and Filters Interact](#).

Instead of or in addition to adding filters to the project or to an individual canvas, you can add filters to an individual visualization. See [Creating Filters on a Visualization](#).

1. Click **+ Add Filter**, and select a data element. Alternatively, drag and drop a data element from the Data Elements pane to the filter bar.

You can't specify data elements of a data set as a filter of other data sets, if the two data sets aren't joined. See [How Visualizations and Filters Interact](#).

2. Set the filter values. How you set the values depends upon the data type that you're filtering.
  - Apply a range filter to filter on columns such as Cost or Quantity Ordered. See [Applying Range Filters](#).
  - Apply a list filter to filter on columns such as Product Category or Product Name. See [Applying List Filters](#).
  - Apply a date filter to filters on columns such as Ship Date or Order Date. See [Applying Date Filters](#).

3. (Optional) Click the filter bar menu or right-click on the filter bar and select **Add Expression Filter**. See [Building Expression Filters](#).
4. (Optional) Click the filter's **Menu** and hover the mouse pointer over the **Limit Value By** option to specify how the filter interacts with the other filters in the filter bar. Note the following:
  - By default, the **Auto** option causes the filter to limit other related filters in the filter bar.

For example, if you have filters for Product Category and Product Name, and if you set the Product Category filter to Furniture and Office Supplies, then the options in the Product Name filter value pick list is limited to the product names of furniture and office supplies. You can select **None** to turn this limit functionality off.
  - You can specify any individual filter in the filter bar that you don't want to limit.

For example, if you have filters for Product Category, Product Sub Category, and Product Name, and in the **Limit Value By** option for the Product Category filter you click Product Sub Category, then the product subcategory filter shows all values and not a list of values limited by what you select for Product Category. However, the values shown for Product Name is limited to what you select for Product Category.
5. (Optional) Click the filter bar menu or right-click on the filter bar, select **Auto-Apply Filters**, then click **Off** to turn off the automatic apply. When you turn off the automatic apply, then each filter's selection displays an **Apply** button that you must click to apply the filter to the visualizations on the canvas.
6. Click the filter bar menu or right-click on the filter bar, and select **Pin to All canvases** of a filter to apply a filter to all canvases in the project.

## Creating Filters on a Visualization

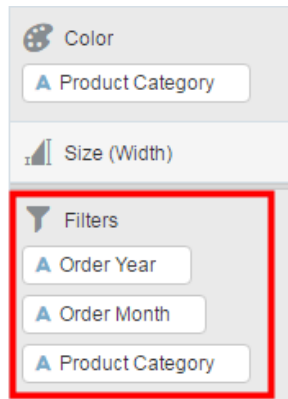
You can add filters to limit the data that's displayed in a specific visualization on the canvas.

If a project contains multiple data sets and some aren't joined, then there are restrictions for how you can use filters. Any visualization that doesn't use the data element of the filter is grayed out. See [How Visualizations and Filters Interact](#).

Visualization filters can be automatically created by selecting **Drill** on the visualization's Menu when the **Synchronize Visualizations** option in the project's Canvas Settings menu is turned off.

Instead of or in addition to adding filters to an individual visualization, you can add filters to the project or to an individual canvas. See [Creating Filters on a Project](#). Any filters included on the canvas are applied before the filters that you add to an individual visualization.

1. Confirm that the Visualize canvas is displayed.
2. In the Visualize canvas, select the visualization that you want to add a filter to.
3. From the Data Elements pane, drag a data element to the Filter section in the Visualization Grammar Pane. If the two data sets aren't joined, then you can't use data elements of a data set as a filter in the visualization of another data set.



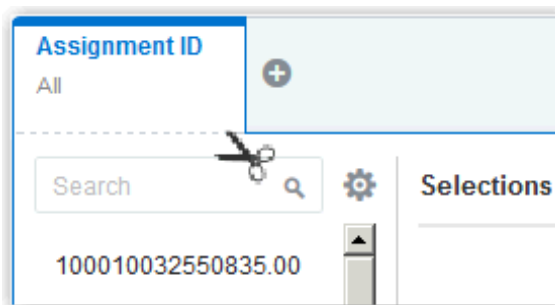
4. Set the filter values. How you set the values depends upon the data type that you're filtering.
  - To set filters on columns such as Cost or Quantity Ordered, see [Applying Range Filters](#).
  - To set filters on columns such as Product Category or Product Name, see [Applying List Filters](#).
  - To set filters on columns such as Ship Date or Order Date, see [Applying Date Filters](#).
5. (Optional) Click the filter bar menu or right-click on the filter bar, select **Auto-Apply Filters**, then click **Off** to turn off automatic apply for all filters on the canvas and within the visualization. When you turn off automatic apply, then each filter's selection displays an **Apply** button that you must click to apply the filter to the visualization.

## Moving Filter Panels

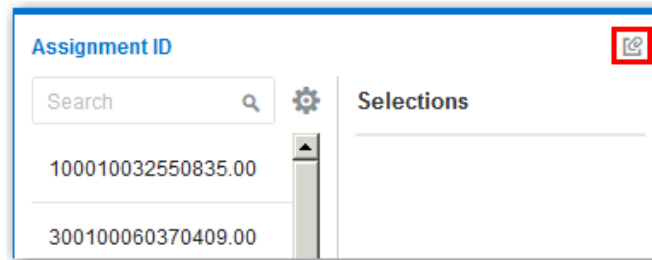
You can move filter panels from the filter bar to a different spot on the canvas.

When you expand filters in the filter bar, it can block your view of the visualization that you're filtering. Moving the panels makes it easy to specify filter values without having to collapse and reopen the filter selector.

- To detach a filter panel from the filter bar, place the cursor at the top of the filter panel until it changes to a scissors icon, then click it to detach the panel and drag it to another location on the canvas.



- To reattach the panel to the filter bar, click the reattach panel icon.



## Applying Range Filters

You use Range filters for data elements that are number data types and that have an aggregation rule set to something other than none.

Range filters are applied to data elements that are measures. Range filters limit data to a range of contiguous values, such as revenue of \$100,000 to \$500,000. Or you can create a range filter that excludes (as opposed to includes) a contiguous range of values. Such exclusive filters limit data to two noncontiguous ranges (for example, revenue less than \$100,000 or greater than \$500,000).

1. In the Visualize canvas, go to the filter bar and click the filter to view the Range list.
2. In the Range list, click **By** to view the selected list of Attributes. All members that are being filtered have check marks next to their names.

You can also optionally perform any of the following steps:

- In the selected list click a member to remove it from the list of selections. The check mark disappears.
  - In the selected list, for any non-selected member that you want to add to the list of selections, click the member. A check mark appears next to the selected member.
  - Click the **Plus (+)** icon, to add member to the selected list. The newly added member is marked as checked.
  - Set the range that you want to filter on by moving the sliders in the histogram. The default range is from minimum to maximum, but as you move the sliders, the Start field and End field adjust to the range you set.
3. Click outside of the filter to close the filter panel.

## Applying Top or Bottom N Filters

You use the Top / Bottom N filter to filter a measure to a subset of its largest (or smallest) values.

You apply top or bottom filters to data elements that are measures. When you add a measure to a filter drop target of a visualization, the default filter type is Range, but you can change the filter type to Top / Bottom N from the Filter Type menu option.

You can apply a Top / Bottom N filter to either a project canvas (it applies to all visualizations in the project), or to a selected visualization. All of the following steps are *optional*:

1. To apply the Top / Bottom N filter to the canvas and all visualizations in the project:

- a. In the **Visualize** canvas, display the **Filter Panel**.
- b. Display the filter menu.
- c. Click the **Filter Type** menu option, and select **Top / Bottom N**.
2. To apply the Top / Bottom N filter to a specific visualization in the project and update the filtered data on the canvas:
  - a. In the **Visualize** canvas, display the **Explore Panel**.
  - b. Click the filter in the **Explore Panel** and display the filter menu.
  - c. Click the **Filter Type** menu option, and select **Top / Bottom N**.
3. To change which filter method is applied, Top or Bottom, in the **Top / Bottom N** list, click the **Method** value.
4. To display a particular number of top or bottom rows, in the **Top / Bottom N** list, click in the **Count** field and enter the number.
5. To change which columns to group by, in the **Top / Bottom N** list, click in the **By** field, or to display the available columns that you can select from, click **Plus (+)**.
6. To deselect any member from the list of attributes, in the **Attributes** list, click the member that you want to deselect.
7. To add a member to the list of attributes, in the **Attributes** list, click any nonselected member.
8. Click outside of the filter to close the **Filter Panel**.

## Applying List Filters

List filters are applied to text and non-aggregatable numbers. After you add a list filter, you can change the selected members that it includes and excludes.

1. In the Visualize canvas, go to the filter bar and click the filter to view the Selections list.

You can also use the **Search** field to find the members you want to add to the filter.
2. Locate the member you want to include and click it to add it to the Selections list.

Use the **Search** field to find a member you want to add to the filter. Use the wildcards \* and ? for searching.
3. You can also optionally perform any of the following steps:
  - In the Selections list click a member to remove it from the list of selections.
  - In the Selections list, you can click the eye icon next to a member to cause it to be filtered out but not removed from the selections list.
  - In the Selections list, you can click the actions icon at the top, and select **Exclude Selections** to exclude the members in the Selections list.
  - Click **Add All** or **Remove All** at the bottom of the filter panel to add or remove all members to or from the Selections list at one time.
4. Click outside of the filter panel to close it. You can also perform the following steps:
  - Clear the filter selections or remove all filters at one time, right-click in the filter bar, and then select **Clear Filter Selections** or **Remove All Filters**.
  - Right-click the filter in the filter bar and select the **Remove Filter**.

## Applying Date Filters

Date filters use calendar controls to adjust time or date selections. You can select a single contiguous range of dates, or use a date range filter to exclude dates within the specified range.

1. In the Visualize canvas, go to the filter bar and click the filter to view the Calendar Date list.
2. In **Start**, select the date that begins the range that you want to filter.  
Use the **Previous** arrow and **Next** arrow to move backward or forward in time, or use the drop-down lists to change the month or year.
3. In **End**, select the date that ends the range that you want to filter.
4. You can also optionally start over and select new dates in the filter. Click **Action** and select **Clear Filter Selections**.
5. Click outside of the filter to close the filter panel.

## Building Expression Filters

Using expression filters, you can define more complex filters using SQL expressions. Expression filters can reference zero or more data elements.

For example, you can create the expression filter "Sample Sales"."Base Facts"."Revenue" < "Sample Sales"."Base Facts"."Target Revenue". After applying the filter, you see the items that didn't achieve their target revenue.

You build expressions using the Expression Builder. You can drag and drop data elements to the Expression Builder and then choose operators to apply. Expressions are validated for you before you apply them. See [About Composing Expressions](#).

1. In the Expression Filter panel, compose an expression.
2. In the **Label** field, give the expression a name.
3. Click **Validate** to check if the syntax is correct.
4. When the expression filter is valid, then click **Apply**. The expression is applied to the visualizations on the canvas.



# 4

## Using Other Functions to Visualize Data

This topic describes other functions that you can use to visualize your data.

### Topics:

- [Typical Workflow for Preparing, Connecting and Searching Artifacts](#)
- [Modifying Text Columns](#)
- [Building Stories](#)
- [Identifying Content with Thumbnails](#)
- [About Composing Expressions](#)
- [Using Data Actions to Connect to Canvases and External URLs](#)
- [Searching Data, Projects, and Visualizations](#)

### Typical Workflow for Preparing, Connecting and Searching Artifacts

Here are the common tasks for using available functions to prepare, connect, and search artifacts.

Task	Description	More Information
Modifying text columns to enhance visualization	Convert text columns into data, time, or timestamp columns and adjust the display format of the columns.	<a href="#">Modifying Text Columns</a>
Build stories	Capture the notes (insights) that you discover in your visualizations into a story that you can revisit later, include in a presentation, or share with team members.	<a href="#">Building Stories</a>
Compose expressions	Compose expressions to use in filters or in calculations.	<a href="#">About Composing Expressions</a>
Create and apply data actions	Create data action links to pass context values from canvases to URLs or project filters.	<a href="#">Using Data Actions to Connect to Canvases and External URLs</a>
Search artifacts	Search for projects, visualizations, and columns. Use BI Ask to quickly build visualizations.	<a href="#">Searching Data, Projects, and Visualizations</a>

## Modifying Text Columns

This topic covers how you can work with calendar columns to enhance visualizations displaying date and time information.

### Topics:

- [Converting Text Columns to Date or Time Columns](#)
- [Adjusting the Display Format of Date or Time Columns](#)
- [General Custom Format Strings](#)

## Converting Text Columns to Date or Time Columns

You can convert any text column to a date, time, or timestamp column.

For example, you can convert an attribute text column to a true date column.

1. Open the project or the data set that includes the column you want to convert. Confirm that you're working in the Prepare canvas.
2. Mouse-over the column that you want to convert.
3. Click **Options**, and select a conversion option (for example, **Convert to Number**, **Convert to Date**).

You can also do this from the Data Sets page when you're editing a data set.

## Adjusting the Display Format of Date or Time Columns

You can adjust the display format of a date or a time column by specifying the format and the level of granularity.

For example, you might want to change the format of a transaction date column (which is set by default to show the long date format such as November 1, 2017) to display instead the International Standards Organization (ISO) date format (such as 2017-11-01). You might want to change the level of granularity (for example year, month, week, or day).

1. Open the project or the data set that includes the date and time column that you want to update. If you're working in a project, then confirm that you're working in the project's Prepare canvas.

2. Click the date or time column you want to edit.

For example, click a date in the data elements area of the Data Panel, or click or hover over a date element on the main editing canvas.

3. If you're working in the main editing canvas, adjust the format by doing one of the following:
  - Click **Options**, then **Extract** to display a portion of the date or time (for example, the year or quarter only).
  - Click **Options**, then **Edit** to display a Expression Editor that enables you to create complex functions (for example, with operators, aggregates, or conversions).

- In the properties pane, click the **Date/Time Format** tab, and use the options to adjust your dates or times (for example, click **Format**) to select from short, medium, or long date formats, or specify your own format by selecting **Custom** and editing the calendar string displayed.
4. If you're working in the data elements area of the Data Panel, adjust the format by doing one of the following:
    - If you want to display just a portion of a calendar column (for example, the year or quarter only), then select and expand a calendar column and select the part of the date that you want to display in your visualization. For example, to only visualize the year in which orders were taken, you might click Order Date and select Year.
    - In the properties pane, click the **Date/Time Format** tab, and use the options to adjust your dates or times.
  5. If you're working in table view, select the column header and click **Options**, then in the properties pane click Date/Time Format to display or update the format for that column.

## General Custom Format Strings

You can use these strings to create custom time or date formats.

The table shows the general custom format strings and the results that they display. These allow the display of date and time fields in the user's locale.

General Format String	Result
[FMT:dateShort]	Formats the date in the locale's short date format. You can also type [FMT:date].
[FMT:dateLong]	Formats the date in the locale's long date format.
[FMT:dateInput]	Formats the date in a format acceptable for input back into the system.
[FMT:time]	Formats the time in the locale's time format.
[FMT:timeHourMin]	Formats the time in the locale's time format but omits the seconds.
[FMT:timeInput]	Formats the time in a format acceptable for input back into the system.
[FMT:timeInputHourMin]	Formats the time in a format acceptable for input back into the system, but omits the seconds.
[FMT:timeStampShort]	Equivalent to typing [FMT:dateShort] [FMT:time]. Formats the date in the locale's short date format and the time in the locale's time format. You can also type [FMT:timeStamp].
[FMT:timeStampLong]	Equivalent to typing [FMT:dateLong] [FMT:time]. Formats the date in the locale's long date format and the time in the locale's time format.
[FMT:timeStampInput]	Equivalent to [FMT:dateInput] [FMT:timeInput]. Formats the date and the time in a format acceptable for input back into the system.
[FMT:timeHour]	Formats the hour field only in the locale's format, such as 8 PM.
YY or yy	Displays the last two digits of the year, for example 11 for 2011.
YYY or yyy	Displays the last three digits of the year, for example, 011 for 2011.
YYYY or yyyy	Displays the four-digit year, for example, 2011.

General Format String	Result
M	Displays the numeric month, for example, 2 for February.
MM	Displays the numeric month, padded to the left with zero for single-digit months, for example, 02 for February.
MMM	Displays the abbreviated name of the month in the user's locale, for example, Feb.
MMMM	Displays the full name of the month in the user's locale, for example, February.
D or d	Displays the day of the month, for example, 1.
DD or dd	Displays the day of the month, padded to the left with zero for single-digit days, for example, 01.
DDD or ddd	Displays the abbreviated name of the day of the week in the user's locale, for example, Thu for Thursday.
DDDD or dddd	Displays the full name of the day of the week in the user's locale, for example, Thursday.
DDDDD or ddddd	Displays the first letter of the name of the day of the week in the user's locale, for example, T for Thursday.
r	Displays the day of year, for example, 1.
rr	Displays the day of year, padded to the left with zero for single-digit day of year, for example, 01.
rrr	Displays the day of year, padded to the left with zero for single-digit day of year, for example, 001.
w	Displays the week of year, for example, 1.
ww	Displays the week of year, padded to the left with zero for single-digit weeks, for example, 01.
q	Displays the quarter of year, for example, 4.
h	Displays the hour in 12-hour time, for example 2.
H	Displays the hour in 24-hour time, for example, 23.
hh	Displays the hour in 12-hour time, padded to the left with zero for single-digit hours, for example, 01.
HH	Displays the hour in 24-hour time, padded to the left with zero for single digit hours, for example, 23.
m	Displays the minute, for example, 7.
mm	Displays the minute, padded to the left with zero for single-digit minutes, for example, 07.
s	Displays the second, for example, 2. You can also include decimals in the string, such as s.# or s.00 (where # means an optional digit, and 0 means a required digit).
ss	Displays the second, padded to the left with zero for single-digit seconds, for example, 02. You can also include decimals in the string, such as ss.# or ss.00 (where # means an optional digit, and 0 means a required digit).
S	Displays the millisecond, for example, 2.

General Format String	Result
SS	Displays the millisecond, padded to the left with zero for single-digit milliseconds, for example, 02.
SSS	Displays the millisecond, padded to the left with zero for single-digit milliseconds, for example, 002.
t	Displays the first letter of the abbreviation for ante meridiem or post meridiem in the user's locale, for example, a.
tt	Displays the abbreviation for ante meridiem or post meridiem in the user's locale, for example, pm.
gg	Displays the era in the user's locale.

## Building Stories

This topic covers how you capture insights and group them into stories.

### Topics:

- [Capturing Insights](#)
- [Creating Stories](#)
- [Viewing Streamlined Content](#)

## Capturing Insights

As you explore data in visualizations, you can capture memorable information to build your story. For example, you might notice before and after trends in your data that you'd like to add to a story to present to colleagues.

1. Display the Narrate pane, and build your story:
  - Use the **Search** option in the Canvases pane to locate visualizations to include in your story. Right-click each canvas to include and click **Add To Story**.
  - Click **Add Note** to annotate your canvases with notes or web links.
  - Use the tabs on the Properties pane to further refine your story. For example, click Presentation to change the presentation style from Compact to Film Strip.
  - To synchronize your story canvases with your visualizations, display the Visualize pane, click **Canvas Settings**, then **Synchronize Visualizations** (or click **Canvas Properties** and select this option).
2. Continue adding notes to build a story about your data exploration.

The story builds in the Narrate canvas.

## Creating Stories

Each project can have one story comprising multiple pages (canvas).

1. In your project, click **Narrate**.
2. Create the story in the following ways:

- Add one or more canvases to the story and select a canvas to annotate.
- To annotate a story, click **Add Note**. You can add text and web links.
- To change the default configuration settings for a story, use the properties pane on the Canvases panel.
- To edit a note, click or hover the mouse pointer over the note, click the menu icon, and select from the editing options.
- To include or exclude a note, right-click the note and use the **Display** or **Hide** options. To display notes, on the canvas property pane, click **Notes**, then **Show All Notes**.
- To show or hide note titles or descriptions, on the canvas property pane, click **General**, and use the **Hide Page** and **Description** options.
- To rearrange notes, drag and drop them into position on the same canvas.
- To limit the data displayed in a story, on the canvas property pane, click **Filters**. If no filters are displayed, go back to the Visualize pane and add one or more filters first, then click **Save**.
- To update filters for a story, on the canvas property pane, click **Filters**, and use the options to hide, reset, or selectively display filters.
- To rename a story, click the story title and update.
- To add the same canvas multiple times to a story, right-click a canvas and click **Add to Story**. You can also right-click the canvases at the bottom of the Narrate pane and click **Duplicate**.
- To display the story at any time click **Present**.
- To close present mode and return to the **Narrate** pane click **X**.
- To toggle notes use the **Show Notes** option.

 **Note:**

You can modify the content on a canvas for a note. For example, you can add a trend line, change the chart type, or add a text visualization. After changing a note, you'll notice that its corresponding wedge or dot (in the Story Navigator) changes from solid blue to hollow. When you select **Update** to apply the changes to the note, you'll see the wedge or dot return to solid blue.

## Viewing Streamlined Content

You can use the presentation mode to view a project and its visualizations without the visual clutter of the canvas toolbar and authoring options.

1. On the Narrate toolbar, click **Present**.  
The project is displayed in presentation mode.
2. To return to the interaction mode, click **X**.

## Identifying Content with Thumbnails

You can quickly visually identify content on the Home page and within projects by looking at thumbnail representations.

Project thumbnails on the Home page show a miniature visualization of what projects look like when opened. Project thumbnails are regenerated and refreshed when projects are saved. If a project uses a Subject Area data set, then the project is represented with a generic icon instead of a thumbnail.

## About Composing Expressions

You can use the Expression window to compose expressions to use in expression filters or in calculations. Expressions that you create for expression filters must be Boolean (that is, they must evaluate to true or false).

While you compose expressions for both expression filters and calculations, the end result is different. A calculation becomes a new data element that you can add to your visualization. An expression filter, on the other hand, appears only in the filter bar and can't be added as a data element to a visualization. You can create an expression filter from a calculation, but you can't create a calculation from an expression filter. See [Creating Calculated Data Elements](#) and [Building Expression Filters](#).

You can compose an expression in various ways:

- Directly enter text and functions in the Expression window.
- Add data elements from the Data Elements pane (drag and drop, or double-click).
- Add functions from the function panel (drag and drop, or double-click).

See [Expression Editor Reference](#).

## Using Data Actions to Connect to Canvases and External URLs

A Data Action link can pass context values from Data Visualization as parameters to external URLs or filters to other projects.

When a link navigates to a project, the data context is displayed in the form of canvas scope filters in the filter bar. The link's data context may include attributes associated with the selections or cell from which the link was initiated.

### Topics:

- [Creating Data Actions to Connect Visualization Canvases](#)
- [Creating Data Actions to Connect to External URLs From Visualization Canvases](#)
- [Applying Data Actions to Visualization Canvases](#)

## Creating Data Actions to Connect Visualization Canvases

You can create data actions to navigate to a canvas in the current project or to a canvas in another project.

You can also use data actions to transfer context-related information (for example, an order number) where the link displays details about an order number in another visualization or project.

1. Create or open a project. Confirm that you're working in the Visualize canvas.
2. Click **Project Properties** and select the **Data Actions** tab.

Alternatively, select **Data Actions** from the Project menu.

3. Click **Add Action** and enter a name for the new navigation link.

For example, Navigate to a Detailed Report.

You can use letters and numbers in a navigation link's name.

 **Note:**

You can add any number of navigation links.

4. Click **Type** and select **Canvas** to choose the Data Action that you want to create.
5. In the **Anchor To** field, select the data item columns from the current visualization to associate with this Data Action. Don't select measure columns or hidden columns.

If you don't specify a value for the **Anchor To** field, then the Data Action applies to all data elements in the visualizations.

6. In the **Project** field, select which project you want to use for the anchor:
  - **This Project** - Select if you want to navigate to a canvas in the active project. Columns that you select must be in the current visualization.
  - **Select from Catalog** - Select to browse for and select the project you want to use.
7. In the **Canvas** field, select the canvas that you want to use for:
  - This project.
  - Another project that you selected in the **Project** field.
8. Click the **Pass Values** field and select which values you want the Data Action to pass.

For example, if in the **Anchor To** field, you specified Order Number, then in the **Pass Values** field select **Anchor Data** to pass the Order number values.

- **All** - Dynamically determines the intersection of the cell that you click (for example, "Product and Year") and passes those values to the target.
- **Anchor Data** - Ensures that the Data Action is displayed at runtime, but only if the required columns specified in the **Anchor To** field are available in the view context.



- **None** - Opens the page (URL or canvas) but doesn't pass any data. For example, if you want to navigate to oracle.com without passing any context.
  - **Custom** - Enables you to specify a custom set of columns to pass.
9. Click **OK** to save.

## Creating Data Actions to Connect to External URLs From Visualization Canvases

You can use data actions to navigate to an external URL from a canvas so that when you click on an attribute such as the supplier ID it displays a specific external website. This might be useful for example, if a product changes to a new supplier.

1. Create or open a project. Confirm that you're working in the Visualize canvas.
2. Click **Project Properties** and select **Data Actions** tab  
Alternatively, just select **Data Actions** from the Project menu.
3. Click **Add Action** and enter a name for the new navigation link.

For example, Navigate to a Detailed Report.

You can use letters and numbers in a navigation link's name.

### Note:

You can add any number of navigation links.

4. Click **Type** and select **URL**.
5. Click **Anchor To** and select the data columns that you want the URL to apply to. Don't select measure columns or hidden columns.

If you don't specify a value for the **Anchor To** field, then the Data Action applies to all data elements in the visualizations.

6. Enter a URL address that starts with http: and optionally include a notation and parameters.

For example, where `http://www.address.com?<key>{<value>}` appears like `www.oracle.com?lob={p3 LOB}&org={D3 Organization}&p1=3.14` Data Visualization displays a list of available matching column names to choose from as you type (for example, P3 LOB, P3k LOB Key). The column names you select here are replaced with values when you pass the URL. So you could select a year, a person, a department.

In case of multiple values for a specific data element for example, p3 LOB, the LOB appears multiple times in the URL. `www.oracle.com?lob=value1&lob=value2&org=orgvalue&p1=3.14`

7. Click **OK** to save.
8. In the **Canvas**, click a cell, or use Ctrl-click to select multiple cells.
9. Right-click and select **Navigate to <URL name>** to display the result.

Selecting the cells determines the parameters to pass.

## Applying Data Actions to Visualization Canvases

You can navigate between canvases and to URLs with links created in Data Actions.

1. Create or open a project. Confirm that you're working in the Visualize canvas.
2. On the canvas from which a Data Action link is to apply to another canvas or to a URL.
  - a. Right-click a data element, or select multiple elements (using Ctrl-click).
  - b. Select Data Actions from the menu.
  - c. Complete the Project Properties dialog.

The name of the Data Actions that are applicable in the current view context are displayed in the context menu.

All the values defined in **Anchor To** field must be available in the view context in order for a data action to be displayed in the context menu.

Note the following rules on matching data elements passed as values with data elements on the target canvas:

- If the same data element is matched in the target project's canvas, and if the target canvas doesn't have an existing canvas filter for the data element, a new canvas filter is added. If there is an existing canvas filter, it's replaced by the value from the source project's canvas.
- If the expected data set is unavailable but a different data set is available, the match is made by using the column name and data type in the different data set, and the filter is added to that.
- If there are multiple column matches by name and data type, then the filter is added to all those columns in the target project or canvas.

The Data Action navigates to the target cell or URL that is mapped and filters the data displayed based on the values specified in the Data Actions dialog.

### Note:

Pass Values context consists of data elements used in the visualization from which the Data Action is invoked. The Pass Values context doesn't include data elements in the project, canvas, or visualization level filters.

## Searching Data, Projects, and Visualizations

This topic describes how you can search for objects, projects, and columns. This topic also describes how you can use BI Ask to create spontaneous visualizations.

### Topics:

- [Indexing Data for Search and BI Ask](#)
- [Visualizing Data with BI Ask](#)
- [Searching for Saved Projects and Visualizations](#)

- [Search Tips](#)

## Indexing Data for Search and BI Ask

When you search or use BI Ask, the search results are determined by what information has been indexed.

Every two minutes, the system runs a process to index your saved objects, project content, and data set column information. The indexing process also updates the index file to reflect any objects, projects, or data sets that you deleted from your system so that these items are no longer displayed in your search results.

For all data sets, the column metadata is indexed. For example, column name, the data type used in the column, aggregation type, and so on. Column data is indexed for Excel spreadsheet, CSV, and TXT data set columns with 1,000 or fewer distinct rows. Note that no database column data is indexed and therefore that data isn't available in your search results.

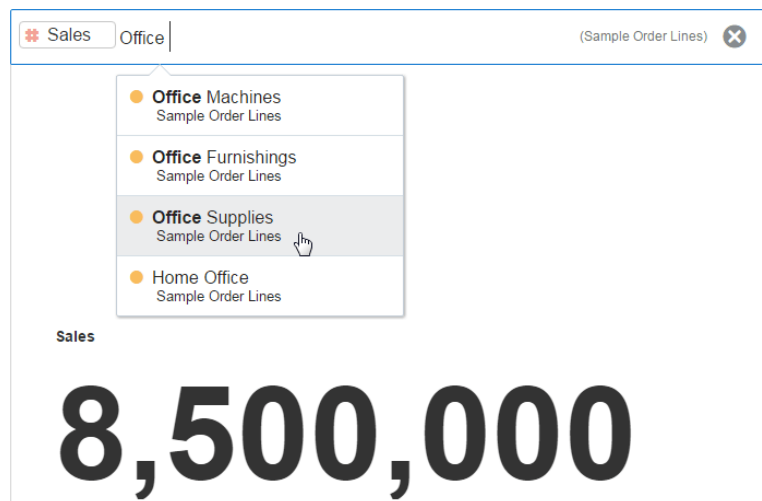
## Visualizing Data with BI Ask

Use BI Ask to enter column names into the search field, select them, and quickly see a visualization containing those columns. You can use this functionality to perform impromptu visualizations without having to first build a project.

BI Ask is supported only for searching the Oracle BI Repository (RPD file).

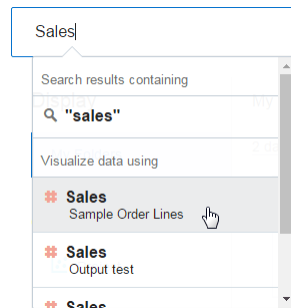
1. In the Home Page, click the **What are you interested in** field.
2. Enter your criteria. As you enter the information, the application returns search results in a drop-down list. If you select an item from this drop-down list, then your visualized data is displayed.
  - What you select determines the data set for the visualization, and all other criteria that you enter is limited to columns or values in that data set.

The name of the data set you're choosing from is displayed in the right side of the **What are you interested in** field. Note the following BI Ask search and visualization example:



- You can search for projects and visualizations or use BI Ask. When you enter your initial search criteria, the drop-down list contains BI Ask results, which are

displayed in the **Visualize data using** section of the drop-down list. Your initial search criteria also builds a search string to find projects and visualizations. That search string is displayed in the **Search results containing** section of the drop-down list and is flagged with the magnifying glass icon. See [Search Tips](#).



- Excel, CSV, and TXT data set columns with 1,000 or less distinct rows are indexed and available as search results. No database data set data values are indexed and available as search results.
3. Enter additional criteria in the search field, select the item that you want to include, and the application builds your visualization. You can also optionally perform the following steps:
    - Enter the name of the visualization that you want your results to be displayed in. For example, enter scatter to show your data in a scatter plot chart, or enter pie to show your data in a pie chart.
    - Click **Change Visualization Type** to apply a different visualization to your data.
    - Click **Open in Data Visualization** to further modify and save the visualization.
  4. To clear the search criteria, click the **X** icon next to your search tags.

## Searching for Saved Projects and Visualizations

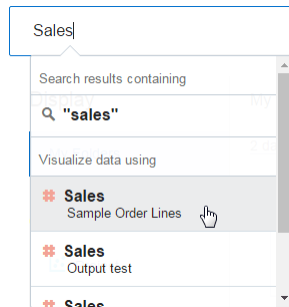
From the Home page you can quickly and easily search for saved objects.

Folders and thumbnails for objects that you have recently worked with are displayed on the Home page. Use the search field to locate other content.

Note that in the search field you can also use BI Ask to create spontaneous visualizations. See [Visualizing Data with BI Ask](#).

1. In the Home Page, click the **What are you interested in** field.
2. Enter your search criteria by typing either keywords or the full name of an object such as a folder or project. As you enter your criteria, the system builds the search string in the drop-down list. See [Search Tips](#).

The drop-down list contains results that match saved objects, but also can contain BI Ask search results. To see object matches (for example, folders or projects), click the row with the magnifying glass icon (located at the top of the drop-down list in the **Search results containing** section). Note that any BI Ask matches are displayed in the **Visualize data using** section of the drop-down list and are flagged with different icons.



3. In the **Search results containing** section of the drop-down list, click the search term that you want to use.

The objects that match your search are displayed in the Home page.

4. To clear the search criteria, click the **X** icon next to your search tags.

## Search Tips

You must understand how the search functionality works and how to enter valid search criteria.

### Wildcard Searches

You can use the asterisk (\*) as a wildcard when searching. For example, you can specify *\*forecast* to find all items that contain the word “forecast”. However, using two wildcards to further limit a search returns no results (for example, *\*forecast\**).

### Meaningful Keywords

When you search, use meaningful keywords. If you search with keywords such as *by*, *the*, and *in* it returns no results. For example, if you want to enter *by* in the search field to locate two projects called “Forecasted Monthly Sales by Product Category” and “Forecasted Monthly Sales by Product Name,” then it returns no results.

### Items Containing Commas

If you use a comma in your search criteria the search returns no results. For example, if you want to search for quarterly sales equal to \$665,399 and enter 665,399 in the search field, then no results are returned. However, entering 655399 does return results.

### Date Search

If you want to search for a date attribute, you search using the year-month-date format. Searching with the month/date/year format (for example, 8/6/2016) doesn't produce any direct matches. Instead, your search results contain entries containing 8 and entries containing 2016.

### Searching in Non-English Locales

When you enter criteria in the search field, what displays in the drop-down list of suggestions can differ depending upon your locale setting. For example, if you're using an English locale and enter *sales*, then the drop-down list of suggestions contains items named *sale* and *sales*. However, if you're using a non-English locale such as Korean and type *sales*, then the drop-down list of suggestions contains only items

that are named *sales* and items such as *sale* aren't included in the drop-down list of suggestions.

For non-English locales, Oracle suggests that when needed, you search using stem words rather than full words. For example, searching for *sale* rather than *sales* returns items containing *sale* and *sales*. Or search for *custom* to see a results list that contains *custom*, *customer*, and *customers*.

# 5

## Adding Data Sources for Analyzing and Exploring Data

You can add your own data to visualizations for analysis and exploration.

### Topics:

- [Typical Workflow for Adding Data Sources](#)
- [About Data Sources](#)
- [Connecting to Database Data Sources](#)
- [Connecting to Oracle Applications Data Sources](#)
- [Creating Connections to Dropbox](#)
- [Creating Connections to Google Drive or Google Analytics](#)
- [Creating Generic JDBC Connections](#)
- [Creating Generic ODBC Connections](#)
- [Creating Connections to Oracle Autonomous Data Warehouse Cloud](#)
- [Creating Connections to Oracle Big Data Cloud](#)
- [Creating Connections to Oracle Talent Acquisition Cloud](#)
- [Adding a Spreadsheet as a Data Source](#)
- [Creating a Binning Column When Preparing Data](#)

### Typical Workflow for Adding Data Sources

Here are the common tasks for adding data from data sources.

Task	Description	More Information
Add a connection	Create a connection if the data source that you want to use is either Oracle Applications or a database.	<a href="#">Creating Oracle Applications Connections</a> <a href="#">Creating Database Connections</a>
Create a data set	Upload data from spreadsheets. Retrieve data from Oracle Applications and databases. Creating a data set from Oracle Applications or a database requires you to create a new connection or use an existing connection.	<a href="#">Adding a Spreadsheet as a Data Source</a> <a href="#">Connecting to Oracle Applications Data Sources</a> <a href="#">Creating Data Sets from Databases</a>
Blend data	Blend data from one data source with data from another data source.	<a href="#">Blending Data that You Added</a> <a href="#">About Changing Data Blending</a>

Task	Description	More Information
Refresh data	Refresh data for the files when newer data is available. Or refresh the cache for Oracle Applications and databases if the data is stale.	<a href="#">Refreshing Data that You Added</a>
Extend uploaded data	Add new columns to the data set.	<a href="#">Modifying Uploaded Data Sets</a>
Control sharing of data sets	Specify which users can access the data that you added.	Controlling Sharing of Data You Added
Remove data	Remove data that you added.	<a href="#">Removing Data from a Project</a>

## About Data Sources

A data source is any tabular structure. You get to see data source values after you load a file or send a query to a service that returns results (for example, another Oracle Business Intelligence system or a database).

A data source can contain any of the following:

- **Match columns** - These contain values that are found in the match column of another source, which relates this source to the other (for example, Customer ID or Product ID).
- **Attribute columns** - These contain text, dates, or numbers that are required individually and aren't aggregated (for example, Year, Category Country, Type, or Name).
- **Measure columns** - These contain values that should be aggregated (for example, Revenue or Miles driven).

You can analyze a data source on its own, or you can analyze two or more data sources together, depending on what the data source contains.

When you save a project, the permissions are synchronized between the project and the external sources that it uses. If you share the project with other users, then the external sources are also shared with those same users.

### Combining Subject Areas and Data Sources

A subject area either extends a dimension by adding attributes or extends facts by adding measures and optional attributes. Hierarchies can't be defined in data sources.

A subject area organizes attributes into dimensions, often with hierarchies, and a set of measures, often with complex calculations, that can be analyzed against the dimension attributes. For example, the measure net revenue by customer segment for the current quarter and the same quarter a year ago.

When you use data from a source such as an Excel file, it adds information that is new to the subject area. For example, suppose you purchased demographic information for postal areas or credit risk information for customers and want to use this data in an analysis before adding the data to the data warehouse or an existing subject area.

Using a source as standalone means that the data from the source is used independently of a subject area. It's either a single file used by itself or it's several files used together and in both cases a subject area is not involved.



**Note the following criteria to extend a dimension by adding attributes from a data source to a subject area:**

- Matches can be made to a single dimension only.
- The set of values in matched columns must be unique in the data source. For example, if the data source matches on ZIP code, then ZIP codes in the source must be unique.
- Matches can be between one or composite columns. An example of a one column match is that product key matches product key. For composite columns, an example is that company matches company and business unit matches business unit.
- All other columns must be attributes.

**Note the following criteria for adding measures from a data source to a subject area:**

- Matches can be made to one or more dimensions.
- The set of values in matched columns doesn't need to be unique in the data source. For example, if the data source is a set of sales matched to date, customer, and product, then you can have multiple sales of a product to a customer on the same day.
- Matches can be between one or composite columns. An example of a one column match is that product key matches product key. For composite columns, an example is that company matches company and business unit matches business unit.

A data source that adds measures can include attributes. You can use these attributes alongside external measures and not alongside curated measures in visualizations. For example, when you add a source with the sales figures for a new business, you can match these new business sales to an existing time dimension and nothing else. The data might include information about the products sold by this new business. You can show the sales for the existing business with those of the new business by time, but you can't show the old business revenue by new business products, nor can you show new business revenue by old business products. You can show new business revenue by time and new business products.

**Working with Sources with no Measures**

Note the following if you're working with sources with no measures.

If a table has no measures, it's treated as a dimension. Note the following criteria for extending a dimension:

- Matches can be between one or composite columns. An example of a one column match is that product key matches product key. For composite columns, an example is that company matches company and business unit matches business unit.
- All other columns must be attributes.

Dimension tables can be matched to other dimensions or they can be matched to tables with measures. For example, a table with Customer attributes can be matched to a table with demographic attributes provided both dimensions have unique Customer key columns and Demographic key columns.

### Working with Sources with Measures

Note the following if you are working with sources with measures.

- You can match tables with measures to other tables with a measure, a dimension, or both.
- When you match tables to other tables with measures, they don't need to be at the same grain. For example, a table of daily sales can be matched to a table with sales by Quarter if the table with the daily sales also includes a Quarter column.

### Working with Matching

If you use multiple sources together, then at least one match column must exist in each source. The requirements for matching are:

- The sources contain common values (for example, Customer ID or Product ID).
- The match must be of the same data type (for example, number with number, date with date, or text with text).

## Connecting to Database Data Sources

You can create, edit, and delete database connections and use the connections to create data sources from databases.

### Topics:

- [Creating Database Connections](#)
- [Creating Data Sets from Databases](#)
- [Editing Database Connections](#)
- [Deleting Database Connections](#)

## Creating Database Connections

You can create connections to databases and use those connections to source data in projects.

When you create a connection to an Oracle database to visualize data, Oracle recommends the usage of credentials of users who have access to the required tables in the database. Note that a database user can visualize a maximum number of 10K tables for a schema.

1. Display the Create Connection dialog using one of these actions:
  - In the Home page, Projects page, or the Data page, click **Create**, then click **Connection** to display the Create Connection dialog.
  - In the Projects Data Elements pane, click **Add** and select **Add Data Set**, then click **Create Data Set**, and click **Create Connection**.
2. In the Create Connection dialog, select a database, and enter the connection details, such as host, port, and so on.

 **Note:**

You can create connections only to Oracle databases.

3. Click **Save**.

You can now begin creating data sets from the connection. See [Creating Data Sets from Databases](#).

4. In the Create Connection dialog, click the icon for the connection type that you want to create a connection for (for example **Oracle Database** ). See [Supported Data Sources](#).

5. (Optional) When you connect to some database types, you might have to specify the following authentication options on the Create Connection and Edit Connection dialogs:

- **Enable Bulk Replication** - If you're loading a data set for a Data Visualization project, then this option should be turned off and you can ignore it. This option is reserved for data analysts and advanced users for replicating data from one database to another database.
- **Authentication**
  - Select **Always use these credentials**, so that the login name and password you provide for the connection are always used and users aren't prompted to log in.
  - Select **Require users to enter their own credentials** when you want to prompt users to enter their own user name and password for the data source. Users required to log in see only the data that they have the permissions, privileges, and role assignments to see.

## Creating Data Sets from Databases

After you create database connections, you can use those connections to create data sets.

You must create the database connection before you can create a data set for it. See [Creating Database Connections](#).

1. On the Home page click **Create** and click **Data Set** to open the Create Data Set dialog. In the Create Data Set dialog, select **Create Connection** and use the Create Connection dialog to create the connection for your data set.
2. In the Data Set editor, first browse or search for and double-click a schema, and then choose the table that you want to use in the data set. When you double-click to select a table, a list of its columns is displayed.

You can use breadcrumbs to quickly move back to the table or schema list.

3. In the column list, browse or search for the columns you want to include in the data set. You can use Shift-click or Ctrl-click to select multiple columns. Click **Add Selected** to add the columns you selected, or click **Add All** to include all of the table's columns in the data source.

Alternatively, you can select the **Enter SQL** option to view or modify the data source's SQL statement or to write a SQL statement.

4. You can also optionally perform the following steps:

- After you've selected columns, you can go to the **Step Editor** at the top of the Data Set editor and click the **Filter** step to add filters to limit the data in the data set. After you've added filters, click **Get Preview Data** to see how the filters limit the data.
  - Go to the **Step Editor** at the top of the Data Set editor and click the last step in the **Step Editor** to specify a description for the data source.
  - Go to the **Step Editor** at the top of the Data Set editor and click the last step in the **Step Editor** and go to the **Refresh** field to specify how you want to refresh the data in the data source. Note the following information:
    - Select **Live** if you want the data source to use data from the database directly rather than copying the data into the cache. Typically because database tables are large, they shouldn't be copied to Data Visualization's cache.
    - If your table is small, then select **Auto** and the data is copied into Data Visualization's cache if possible. If you select **Auto**, you must refresh the data when it's stale.
5. Click **Add**. The View Data Source page is displayed.
  6. In the View Data Source page you can optionally view the column properties and specify their formatting. The column type determines the available formatting options. See [Modifying Uploaded Data Sets](#).

## Editing Database Connections

You can edit a database connection. For example, you can change the name of the connection.

1. On the Data page, click **Connections**.
2. Mouse over the connection that you want to edit. To the right of the highlighted connection, click **Actions menu**, and select **Edit**.
3. In the Edit Connection dialog, edit the connection details, and then click **Save**.

### Note:

You can't see the current password, service name, or Logical SQL for your connections. If you need to change these, you must enter a new connection.

## Deleting Database Connections

You can delete a database connection. For example, you must delete a database connection and create a new connection when the database's password has changed.

### Note:

If the connection contains any data sets, then you must delete the data sets before you can delete the connection.

1. Go to the Data page and select **Connections**.
2. Select the connection that you want to delete and click **Actions menu** or right-click, then click **Delete**.
3. Click **Yes**.

## Connecting to Oracle Applications Data Sources

You can create Oracle Application data sources that help you visualize, explore, and understand the data in your Oracle Fusion Applications with Oracle Transactional Business Intelligence and Oracle BI EE subject areas and analyses.

### Topics:

- [Creating Oracle Applications Connections](#)
- [Composing Data Sets from Subject Areas](#)
- [Composing Data Sets from Analyses](#)
- [Editing Oracle Applications Connections](#)
- [Deleting Oracle Applications Connections](#)

## Creating Oracle Applications Connections

You can create connections to Oracle Applications and use those connections to create data sets.

You use the Oracle Applications connection type to create connections to Oracle Fusion Applications with Oracle Transactional Business Intelligence, and to Oracle BI EE. After you create a connection, you can access and use subject areas and analyses as data sets for your projects.

1. On the Home page, the Projects page, or the Data page, click **Create**, and then click **Connection**.
2. Click the **Oracle Applications** icon.
3. In the Create Connection dialog, enter the connection name, the Oracle Fusion Applications with Oracle Transactional Business Intelligence or Oracle BI EE URL, the user name, and password.

Note the following information:

- HTTP and HTTPS URLs are supported.
- Connection names must be unique and also not contain any special characters.
- You can obtain the connection URL.
  - a. Open the Oracle application you want to connect to.
  - b. Display the catalog folders containing the analysis you want to use as your data set.
  - c. Copy the browser URL into the Create Connection dialog.

Make sure that you strip off anything after /analytics. For example, `http://www.example.com:9704/analytics`.

4. Click **Save**.

Now you can create data sets from this connection. See [Composing Data Sources From Oracle Application Connections](#)

**Note:**

The connection is visible only to you (the creator), but you can create and share data sets for it.

## Composing Data Sets from Subject Areas

You use the Oracle Applications connection type to access the Oracle Fusion Applications with Oracle Transactional Business Intelligence and Oracle BI EE subject areas that you want to use as data sets.

You must create an Oracle Applications connection before you can create a subject area data set. See [Creating Oracle Applications Connections](#).

1. In the Data Visualization Home page, Data page, or the Projects page, click **Create**, click **Data Set**, then click **Connection** and use the Create Connection dialog to specify the details for your data set.
2. In the Data Set editor, choose **Select Columns** to view, browse, and search the available subject areas and their columns that you include in your data set. You can use breadcrumbs to quickly move back through the directories.
3. You can also optionally perform the following steps:
  - In the breadcrumbs click the **Add/Remove Related Subject Areas** option to include or exclude related subject areas. Subject areas are related when they use the same underlying business or logical model.
  - After you've selected columns, go to the **Step Editor** at the top of the Data Set editor and click the **Filter** step to add filters to limit the data in the data set. After you've added filters, click **Get Preview Data** to see how the filters limit the data.
  - Click **Enter SQL** to display the logical SQL statement of the data source. View or modify the SQL statement in this field.

**Note:**

If you edit the data source's logical SQL statement, then the SQL statement determines the data set and any of the column-based selection or specifications are disregarded.

- Go to the **Step Editor** at the top of the Data Set editor and click the last step in the **Step Editor** to specify a description for the data set.
4. Before saving the data set, go to the **Name** field and confirm its name. Click **Add**. The Data Set page is displayed.
5. In the Data Set page you can optionally view the column properties and specify their formatting. The column type determines the available formatting options. See [Modifying Uploaded Data Sets](#).

## Composing Data Sets from Analyses

You use the Oracle Applications connection type to access the analyses that were created in Oracle Fusion Applications with Oracle Transactional Business Intelligence and Oracle BI EE subject areas that you want to use as data sources

You must create an Oracle Applications connection before you can create an analysis data set. See [Creating Oracle Applications Connections](#).

1. On the Home page click **Create** and click **Data Set** to open the Create Data Set dialog. In the Create Data Set dialog, select **Create Connection** and use the Create Connection dialog to create the connection for your data set.
2. In the Data Set editor, select the **Select an Analysis** option to view, browse, and search the available analyses to use in your data set.

You can use breadcrumbs to quickly move back through the directories.

3. Double-click an analysis to use it for your data set. The analysis' columns are displayed in the Data Set editor.
4. You can also optionally perform the following steps:
  - Click **Enter SQL** to display the SQL Statement of the data set. View or modify the SQL statement in this field.
  - Click a column's gear icon to modify its attributes, like data type and whether to treat the data as a measure or attribute.
  - Go to the **Step Editor** at the top of the Data Set editor and click the last step in the **Step Editor** to specify a description for the data set.
5. Before saving the data set, go to the **Name** field and confirm its name. Click **Add**.  
The Data Set page is displayed.
6. In the Data Set page you can optionally view the column properties and specify their formatting. The column type determines the available formatting options. See [Modifying Uploaded Data Sets](#).

## Editing Oracle Applications Connections

You can edit Oracle Applications connections. For example, you must edit a connection if your system administrator changed the Oracle Applications login credentials.

1. In the Data page, click **Connections**.
2. Locate the connection that you want to edit and click its **Actions menu** icon and select **Edit**.
3. In the Edit Connection dialog, edit the connection details. Note that you can't see or edit the password that you entered when you created the connection. If you need to change the connection's password, then you must create a new connection. See [Creating Oracle Applications Connections](#).
4. Click **Save**.

## Deleting Oracle Applications Connections

You can delete an Oracle Applications connection. For example, if your list of connections contains unused connections, then you can delete them to help you keep your list organized and easy to navigate.

### Note:

If any data sets use the connection, then you must delete the data sets before you can delete the connection. Oracle Applications connections are only visible to the user that creates them (connections aren't shared), but a user can create data sets using those connections, and share the data sets with others.

1. In the Data page, click **Connections**.
2. To the right of the connection that you want to delete, click **Actions menu**, and then select **Delete**.
3. Click **Yes**.

## Creating Connections to Dropbox

You can create connections to Dropbox and use those connections to source data in projects.

1. In Data Visualization's Data page (or the Home page), click **Create**, then click **Connection** to display the Create Connection dialog.
2. Browse or search for the Dropbox icon. Click the Dropbox icon.
3. In the Add a New Connection dialog, enter a name for the connection, and then enter the required connection information:

Field	Description
Redirect URL	Confirm that the Dropbox application is open and its Settings area is displaying. Copy the URL in the <b>Redirect URL</b> field and paste it into the Dropbox application's <b>OAuth 2 Redirect URIs</b> field and then click <b>Add</b> .
Client ID	Go to the Dropbox application, locate the <b>App key</b> field, and copy the key value. Go to Data Visualization and paste this value into the <b>Client ID</b> field.
Client Secret	Go to the Dropbox application, locate the <b>App secret</b> field, click <b>Show</b> to reveal the secret, and copy the secret value. Go to Data Visualization and paste this value into the <b>Client Secret</b> field.

4. Click **Authorize**. When prompted by Dropbox to authorize the connection, click **Allow**.

The Create Connection dialog refreshes and displays the name of the Dropbox account and associated email account.

5. Click **Save**.

You can now create data sets from the Dropbox connection. See [Adding a Spreadsheet from Dropbox or Google Drive](#).



## Creating Connections to Google Drive or Google Analytics

You can create connections to Google Drive or Google Analytics and use those connections to source data in projects.

1. Set up a Data Visualization application in Google, if you haven't done so already.
  - a. Sign into your Google account, and go to the Developer's Console.
  - b. Create a project, then go to the API Manager Developers area of the Google APIs site and click **Create app** to create and save a Data Visualization application.
  - c. Enable the application and create credentials for the application by accessing the Analytics API.
  - d. Open the page displaying the credential information, and paste the redirect URL provided by Data Visualization, and copy the Client ID and Client secret.  
  
Read the Google documentation for more information about how to perform these tasks.
2. In Data Visualization's Data page (or the Home page), click **Create**, then click **Connection** to display the Create Connection dialog.
3. Browse or search for the Google Drive or the Google Analytics icon, and then click the icon.
4. In the Add a New Connection dialog, enter a connection name and enter the required connection information as described in this table.

Field	Description
Redirect URL	Confirm that the Google application is open and its Credentials area is displaying. Copy the URL in the <b>Redirect URL</b> field and paste it into the Google application's <b>Authorized redirect URIs</b> field.
Client ID	Go to the Google application's Credentials area, locate the <b>Client ID</b> field, and copy the key value. Go to Data Visualization and paste this value into the <b>Client ID</b> field.
Client Secret	Go to the Google application's credential information, locate the <b>Client secret</b> field and copy the secret value. Go to Data Visualization and paste this value into the <b>Client Secret</b> field.

5. Click **Authorize**.
6. When prompted by Google to authorize the connection, click **Allow**.  
  
The Create Connection dialog refreshes and displays the name of the Google account, and its associated email account.
7. Click **Save**.

You can now create data sets from the Google Drive or Google Analytics connection. See [Adding a Spreadsheet from Dropbox or Google Drive](#).

## Creating Generic JDBC Connections

You can create generic JDBC connections to databases and use those connections to source data in projects. For example, to connect to databases that aren't listed with the default connection types.

This method enables you to use drivers in a JDBC Jar file to connect to specific databases.

The JDBC driver version must match the database version. A version mismatch can lead to spurious errors during the data load process. Even using an Oracle database, if the version of the JDBC driver doesn't match that of the database, then you must download the compatible version of the JDBC driver from Oracle's website and place it in the `\lib` directory.

1. Confirm that you have copied the required JDBC driver's JAR file into Data Visualization Desktop's `\lib` directory.

For example, `C:\Program Files\Oracle Data Visualization\lib`.

2. In Data Visualization's Data page (or the Home page), click **Create**, then click **Connection** to display the Create Connection dialog.
3. In the Create Connection dialog, locate and click the **JDBC** icon.
4. In the Create Connection dialog, enter the connection criteria:

Field	Description
New Connection Name	Any name that uniquely identifies the connection. Avoid using instance-specific names such as host names, because the same connection can be configured against different databases in different environments (for example, development and production).
URL	The URL for your JDBC data source. See the documentation for the driver, and the JAR file for details on specifying the URL.
Driver Class Name	The name of the Driver Class. You can find the name in the JAR file, or from wherever you downloaded the JAR file.
Username	The database username.
Password	The database user password.

5. Click **Save**.

You can now create data sets from the connection. See [Creating Data Sets from Databases](#).

### Note:

If you import a project containing a JDBC connection into a Data Visualization installation where the JDBC driver isn't installed, the import still works. However, the connection doesn't work when you try to run the project or Data Flow. You must recreate the JDBC connection, and JDBC driver to a suitable data source.

## Creating Generic ODBC Connections

You can create generic ODBC connections to databases and use those connections to source data in projects. For example, to connect to databases and database versions that aren't listed with the default connection types.

You can only use generic ODBC connections to connect on Windows systems.

1. Confirm that the appropriate database driver is installed on your computer.

You must have the required database driver installed on your computer to create an ODBC Data Source Name (DSN). If you need to install a database driver, use installation instructions provided by the organization that supplies the database driver.

2. Create the new ODBC data source in Windows.

- a. In Windows, locate and open the ODBC Data Source Administrator dialog.
- b. Click the **System DSN** tab, and then click **Add** to display the Create New Data Source dialog.

Windows uses ODBC DSNs to access the data source and for query execution.

- c. Select the driver appropriate for your data source, and then click **Finish**.
- d. The remaining configuration steps are specific to the data source you want to configure.

Refer to the documentation for your data source.

3. Create the generic ODBC data source in Data Visualization.

- a. In Data Visualization's Data page (or the Home page), click **Create**, then click **Connection** to display the Create Connection dialog.
- b. In the Create Connection dialog, locate and click the **ODBC** icon.
- c. In the Create Connection dialog, enter the connection criteria:

Field	Description
Name	Any name that uniquely identifies the connection.
DSN	The name of the system DSN that you set up on your computer.
Username	The database username.
Password	The password for the database user.

- d. Click **Save**.

You can now create data sets from the connection. See [Creating Data Sets from Databases](#).

 **Note:**

If you import a project containing an ODBC connection into a Data Visualization installation where the ODBC DSN doesn't exist, and the ODBC driver isn't installed, the import still works. However, the connection doesn't work when you try to run the project or Data Flow. You must recreate the ODBC connection, and recreate the ODBC DSN, and ODBC driver to a suitable data source.

## Creating Connections to Oracle Autonomous Data Warehouse Cloud

You can create connections to Oracle Autonomous Data Warehouse Cloud and use those connections to source data in projects.

1. Before you create connections to Oracle Autonomous Data Warehouse Cloud, you must enable the Oracle Autonomous Data Warehouse Cloud connection.

- a. Edit the `external_providers.json` file in the following location

```
<Oracle_Home>/bi/providers/external_providers.json.
```

- b. In the `supported-providers` tag in the BI12C section, add the additional provider `DWCS`.

For example:

```
"BI12C" : [ "NO_OP", "DWCS", "OSCS", "ORACLE_10G_R2", "CUSTOM",
"ORACLE_11G", "ORACLE_12C", "FA", "ELOQUA",
```

- c. Save the file.
  - d. Restart the BI Services.
2. Get the client credentials zip file containing the trusted certificates that enable Data Visualization to connect to Oracle Autonomous Data Warehouse Cloud.

- a. Obtain the `cwallet.sso` file from Oracle Autonomous Data Warehouse Cloud.

See [Downloading Client Credentials \(Wallets\)](#) in *Using Oracle Autonomous Data Warehouse Cloud*.

You extract the `cwallet.sso` file from wallet file. For example, from the file:

```
wallet_ADWC1.zip
```

- b. Copy the `cwallet.sso` file to the Windows Users location:

```
<Oracle_Home>/user_projects/domains/bi/bidata/components/
OBIS/dwcs
```

If the folder isn't available, create it.

This client credentials zip file contains the trusted certificates for client applications like Data Visualization to connect to Oracle Autonomous Data Warehouse Cloud.

- c. Restart the BI Services.

3. On the Oracle Data Visualization Home page, click **Create** then click **Connection** to display the Create Connection dialog.
4. Click **Oracle Autonomous Data Warehouse** to display the fields for the connection.
5. Enter a connection name in the **New Connection Name** field.
6. Enter the remaining details as needed.
7. Click **Save** to create the connection.

You can now create data sets from the connection.

## Creating Connections to Oracle Big Data Cloud

You can create a connection to access data in Oracle Big Data Cloud Compute Edition and use those connections to source data in projects.

You create an Oracle Big Data Cloud Service Compute Edition connection using these steps.

1. Before you can create connections to Oracle Big Data Cloud Service Compute Edition you must ensure that the connections are secure.
  - a. Download a certificate and generate a Java Key Store file for the corresponding Oracle Big Data Cloud Service Compute Edition environment.  
See *About Accessing Thrift* in *Using Oracle Big Data Cloud*.
  - b. Place the Java Key Store file in:  

```
%LOCALAPPDATA%\DVDesktop\components\OBIS\bdcscce
```
  - c. Restart Data Visualization Desktop.
2. In Data Visualization, click **Create** and then click **Connection** to display the Create Connection dialog.
3. Click **Oracle Big Data Cloud** to display the fields for the connection.
4. Enter a connection name in the **New Connection Name** field.
5. Enter the remaining details as needed.
6. Click **Save** to create the connection.

You can now create data sets from the connection.

## Creating Connections to Oracle Talent Acquisition Cloud

You can create connections to Oracle Talent Acquisition Cloud (OTAC) to access data for analysis and use those connections to source data in projects.

1. Click **Create** and then click **Connection** to display the Create Connection dialog.
2. Click **Oracle Talent Acquisition Cloud** to display the fields for the connection.
3. Enter your connection name in the **New Connection Name** field.
4. Enter the URL for the Oracle Talent Acquisition Cloud connection.

For example, if the Oracle Talent Acquisition Cloud URL is `https://example.taleo.net`, then the connection URL that you must enter is `https://example.taleo.net/smartorg/Bics.jss`.

5. Enter your username and password in the corresponding fields.
6. Click an **Authentication** option:
  - If you select **Always use these credentials**, then the login name and password you provide for the connection is always used and users aren't prompted to log in.
  - If you select **Require users to enter their own credentials**, then users are prompted to enter their user names and passwords to use the data from the Oracle Applications data source. Users who are required to log in see only the data that they have the permissions, privileges, and role assignments to see.
7. Click **Save** to create the connection.

You can now create data sets from the connection.

## Adding a Spreadsheet as a Data Source

You can add a spreadsheet as a data source. You can browse for and upload spreadsheets from a variety of places, such as your computer, Google Drive, and Dropbox.

### Topics:

- [About Adding a Spreadsheet as a Data Set](#)
- [Adding a Spreadsheet from Your Computer](#)
- [Adding a Spreadsheet from Dropbox or Google Drive](#)

## About Adding a Spreadsheet as a Data Set

Data source files from a Microsoft Excel spreadsheet file must have the XLSX extension (signifying a Microsoft Office Open XML Workbook file). You can also add CSV and TXT files.

Before you can upload a Microsoft Excel file as a data set, you must structure the file in a data-oriented way and it mustn't contain pivoted data. Note the following rules for Excel tables:

- Tables must start in Row 1 and Column 1 of the Excel file.
- Tables must have a regular layout with no gaps or inline headings. An example of an inline heading is one that repeats itself on every page of a printed report.
- Row 1 must contain the table's column names. For example, Customer Given Name, Customer Surname, Year, Product Name, Amount Purchased, and so on. In this example:
  - Column 1 has customer given names.
  - Column 2 has customer surnames.
  - Column 3 has year values.
  - Column 4 has product names.
  - Column 5 has the amount each customer purchased for the named product.
- The names in Row 1 must be unique. Note that if there are two columns that hold year values, then you must add a second word to one or both of the column

names to make them unique. For example, if you have two columns named Year Lease, then you can rename the columns to Year Lease Starts and Year Lease Expires.

- Rows 2 onward are the data for the table, and they can't contain column names.
- Data in a column must be of the same kind because it's often processed together. For example, Amount Purchased must have only numbers (and possibly nulls), enabling it to be summed or averaged. Given Name and Surname must be text as they might be concatenated, and you may need to split dates into their months, quarters, or years.
- Data must be at the same granularity. A table can't contain both aggregations and details for those aggregations. For example, if you have a sales table at the granularity of Customer, Product, and Year, and contains the sum of Amount Purchased for each Product by each Customer by Year. In this case, you wouldn't include Invoice level details or a Daily Summary in the same table, as the sum of Amount Purchased wouldn't be calculated correctly. If you have to analyze at invoice level, day level, and month level, then you can do either of the following:
  - Have a table of invoice details: Invoice Number, Invoice Date, Customer, Product, and Amount Purchased. You can roll these up to day or month or quarter.
  - Have multiple tables, one at each granular level (invoice, day, month, quarter, and year).

## Adding a Spreadsheet from Your Computer

You can upload an Excel spreadsheet, CSV file, or TXT file data source located on your computer to use as a data set.

Before you add a spreadsheet as a data set, confirm you've done the following:

- Confirm that you have either an Excel spreadsheet in .XLSX format or a CSV or TXT file as the data source used to create a data set.
- For an Excel spreadsheet, ensure that it contains no pivoted data.
- Understand how the spreadsheet needs to be structured for successful import. See [About Adding a Spreadsheet as a Data Set](#).

Follow these steps to add a spreadsheet from your computer and use it as a data source:

1. From the Home page, click **Create**, then click **Data Set** to display the Create Data Set dialog.
2. Click **File** and browse to select a suitable (unpivoted) XLSX file, CSV file, or TXT file.
3. Click **Open** to upload and open the selected spreadsheet in Data Visualization. The Data Set editor is displayed.
4. Make any required changes to Name, Description, or to column attributes.

If you're uploading a CSV or TXT file, then in the Separated By field, confirm or change the delimiter. If needed, choose Custom and enter the character you want to use as the delimiter. In the CSV or TXT file, a custom delimiter must be one character. The following example uses a pipe (|) as a delimiter: Year|Product|Revenue|Quantity|Target Revenue| Target Quantity.

5. Click **Add** to save your changes and create the data set.
6. If a data set with the same name already exists:
  - Click **Yes** if you want to overwrite the existing data set.
  - Click **No** if you want to update the data set name.

## Adding a Spreadsheet from Dropbox or Google Drive

If you're storing spreadsheets in Dropbox or Google Drive you can add a spreadsheet to create a data set.

Before you add a spreadsheet from Dropbox or Google Drive, do the following:

- Confirm that a connection exists. See [Creating Connections to Dropbox](#) and [Creating Connections to Google Drive or Google Analytics](#).
- Confirm that the spreadsheet you want to use is either an Excel spreadsheet in .XLSX format, a CSV file, or a TXT file.
- For an Excel spreadsheet, ensure that it contains no pivoted data.
- Understand how the spreadsheet needs to be structured for successful import. See [About Adding a Spreadsheet as a Data Set](#).

Use the following steps to add a spreadsheet.

1. In the Data Set editor, search or browse the Dropbox or Google Drive directories and locate the spreadsheet that you want to use.

You can use breadcrumbs to quickly move back through the directories.
2. Double-click a spreadsheet to select it. When you select a spreadsheet, its columns and data values are displayed.
3. Click **Add** to create the data set.

## Creating a Binning Column When Preparing Data

Binning a measure creates a new column based on the value of the measure. You can assign a value to the bin dynamically by creating the number of equal size bins (such as the same number of values in each bin), or by explicitly specifying the range of values for each bin.

You can create a bin column based on a data element.

1. Create or open the Data Visualization project in which you want to create a binning column.
2. Open the data elements, and confirm that you're working in the Prepare canvas.
3. Click **Options** for the selected column, and select **Bin**.
4. In the Bin dialog, specify the options for the bin column, as described in the following table:

Field	Description
New element name	Change the name of the bin column.



Field	Description
Number of Bins	Click to select a different number from the list.
Range Histogram	<p>Based on your selection in the <b>Method</b> field, the range (width) and count (height) of the bins are updated.</p> <ul style="list-style-type: none"> <li>• In the <b>Manual</b> method you can move the slider to select the boundary (that is, range and count) of each bin. The number of sliders change based on the Count of Bins.</li> <li>• In the <b>Equal Width</b> method, the boundary of each bin is the same but the height (that is, count) differs. Based on your selection in the <b>Bin Labels</b> field, the bin column labels are updated.</li> <li>• In the <b>Equal Height</b> method, the height of each bin is the same or very slightly different but the width (that is, range) is equal.</li> </ul>
Range List	If you select the <b>Manual</b> method, you can change the name of each bin.
Bin By	If you select the <b>Equal Width</b> method, click to select a dimension (that is, a data element) on which to apply the bin.

5. Click **OK** to add the new column, and close the Bin dialog.
6. Click **Save**.

# 6

## Managing Data that You Added

This topic describes the functions available to manage the data that you added from data sources.

### Topics:

- [Typical Workflow for Managing Added Data](#)
- [Managing Data Added from Data Sources](#)
- [Managing Data Sets](#)
- [Blending Data that You Added](#)
- [About Changing Data Blending](#)

## Typical Workflow for Managing Added Data

Here are the common tasks for managing the data added from data sources.

Task	Description	More Information
Manage added data	Modify, update, and delete the data that you added from various data sources.	<a href="#">Managing Data Added from Data Sources</a>
Refresh data	Refresh data in the data set when newer data is available or refresh the cache for Oracle Applications and databases if the data is stale.	<a href="#">Refreshing Data that You Added</a>
Update details of added data	Inspect and update the properties of the added data.	<a href="#">Updating Details of Data that You Added</a>
Manage data sets	See the available data sets and examine or update a data set's properties.	<a href="#">Managing Data Sets</a>
Blend data	Blend data from one data source with data from another data source.	<a href="#">Blending Data that You Added</a> <a href="#">About Changing Data Blending</a>

## Managing Data Added from Data Sources

You can modify, update, and delete the data that you added from various data sources to Data Visualization.

### Topics:

- [Managing Data Sets](#)
- [Refreshing Data that You Added](#)
- [Updating Details of Data that You Added](#)
- [Deleting Data Sets from Data Visualization](#)

## Managing Data Sets

You can use the Data Sets page to see all of the available data sets.

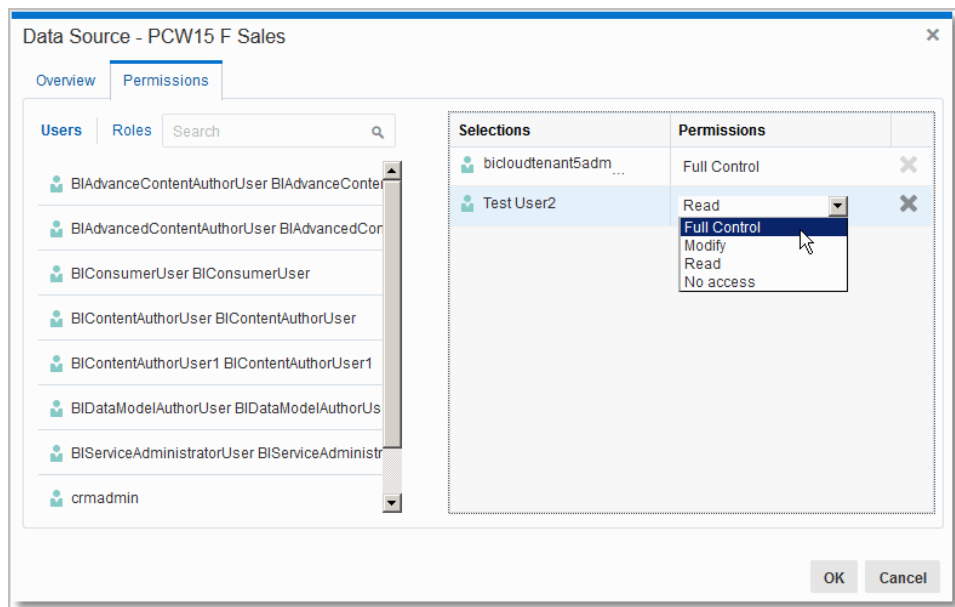
You can also use the Data Sets page to examine data set properties, change column properties such as the aggregation type, set permissions, and delete data sets that you no longer need to free up space. Data storage quota and space usage information is displayed, so that you can quickly see how much space is free.

1. Go to the **Data** page, then **Data Sets** section.
2. Click the **Actions menu** of a data set or right-click the data set that you want to manage, and click **Edit**,
3. Optionally, use the **Inspect** option to review data set columns and change the data set properties. For example, you can change the Product Number column's aggregation type to Minimum.
4. Optionally, use the **Inspect** option to change whether to treat data set columns as measures or attributes.

You can't change how a column is treated if it's already matched to a measure or attribute in the data model. See [Blending Data That You Added](#).

5. Optionally, use the **Inspect** option to specify the permissions that users and roles have for the data.

You're allowed to set permissions on some data sources, such as uploaded data sets. See [Controlling Sharing of Data You Added](#).



6. Optionally, use the **Inspect** option to change the Query Mode for a database table. The default is **Live** because database tables are typically large and shouldn't be copied to cache. If your table is small, then select **Auto** and the data is copied into the cache if possible. If you select **Auto**, then you have to refresh the data when it's stale.
7. Optionally, update data for a data set created from a Microsoft Excel file or Oracle Applications by right-clicking the data set and selecting **Reload Data**.

 **Note:**

If you have Full Control permissions, you can grant permissions to others and delete uploaded data sets, but be careful not to delete a data file that is still a data source for projects. See [Deleting Data that You Added](#).

## Refreshing Data that You Added

After you add data, the data might change, so you must refresh the data from its source.

 **Note:**

Rather than refreshing a data set, you can replace it by loading a new data set with the same name as the existing one. However, replacing a data set can be destructive and is discouraged. Don't replace a data set unless you understand the consequences:

- Replacing a data set breaks projects that use the existing data set if the old column names and data types aren't all present in the new data set.
- Any data wrangling (modified and new columns added in the data stage) is lost and projects using the data set are likely to break.

You can refresh data from all source types: databases, files, and Oracle Applications.

### Databases

For databases, the SQL statement is rerun and the data is refreshed.

### CSV or TXT

To refresh a CSV or TXT file, you must ensure that it contains the same columns that are already matched with the data source. If the file that you reload is missing some columns, then you'll see an error message that your data reload has failed due to one or more missing columns.

You can refresh a CSV or TXT file that contains new columns, but after refreshing, the new columns are marked as hidden and don't display in the Data Elements pane for existing projects using the data set. To resolve this issue, use the **Inspect** option of the data set to show the new columns and make them available to existing projects.

### Excel

To refresh a Microsoft Excel file, you must ensure that the newer spreadsheet file contains a sheet with the same name as the original one. In addition, the sheet must contain the same columns that are already matched with the data source. If the Excel file that you reload is missing some columns, then you'll see an error message that your data reload has failed due to one or more missing columns.

You can refresh an Excel file that contains new columns, but after refreshing, the new columns are marked as hidden and don't display in the Data Elements pane for

existing projects using the data set. To resolve this issue, use the **Inspect** option of the data set to show the new columns and make them available to existing projects.

### Oracle Applications

You can reload data and metadata for Oracle Applications data sources, but if the Oracle Applications data source uses logical SQL, reloading data only reruns the statement, and any new columns or refreshed data won't be pulled into the project. Any new columns come into projects as hidden so that existing projects that use the data set aren't affected. To be able to use the new columns in projects, you must unhide them in data sets after you refresh. This behavior is the same for file-based data sources.

To refresh data in a data set:

1. Go to the **Data** page and select **Data Sets**.
2. Select the data set you want to refresh and click **Actions menu** or right-click, then select **Reload Data**. To refresh data sets in a project:
  - Data Elements panel: Select a data set and right-click, then select **Reload Data**.
  - Visualize and Prepare canvas: Click **Menu** and select **Refresh Data Sets**. You can also right-click a data set in the data sets tabs bar of the Prepare canvas and select **Reload Data**.
3. If you're reloading a spreadsheet and the file is no longer in the same location or has been deleted, then the Reload Data dialog prompts you to locate and select a new file to reload into the data source.
4. Click **Select File** or drag a file to the Reload Data dialog.
5. A success message is displayed after your data is reloaded successfully.
6. Click **OK**.

The original data is overwritten with new data, which is displayed in visualizations after they are refreshed.

## Updating Details of Data that You Added

After you add data, you can inspect its properties and update details such as the description and aggregation.

1. Go to the **Data** page and select **Data Sets**.
2. Select the data set whose properties you want to update and click the **Actions menu** or right-click, then select **Inspect**.
3. View the properties and modify the description of the data as appropriate.

If you're working with a file-based data source (CSV, TXT, or Microsoft Excel spreadsheet), then note the following information:

- If the file you used to create the data set was moved or deleted, then the connection path is crossed out in the inspector dialog. You can reconnect the data set to its original source file, or connect it to a replacement file by right-clicking the data set in the Display pane and in the Options menu select **Reload Data**. You can then browse for and select the file to load to the data set.

- If you reloaded a file with new columns, then the new columns are marked as hidden and don't display in the Data Elements pane for existing projects using the data set. To unhide these columns, click the **Hidden** option.
4. You can optionally change the Query Mode for a database table. The default is *Live* because database tables are typically large and shouldn't be copied to cache. If your table is small, then select **Auto** and the data is copied into the cache if possible. If you select **Auto**, then you'll have to refresh the data when it's stale.
  5. In the Columns area, specify whether to change a column to a measure or attribute as appropriate. For measures, specify the aggregation type, such as *Sum* or *Average*.  
See also [Specifying Aggregation for Measures in Fact Tables](#).
  6. Optionally, share the data with others.  
See [Controlling Sharing of Data You Added](#).
  7. Click **OK** to save your changes.

## Deleting Data Sets from Data Visualization

You can delete data sets from Data Visualization when you need to free up space on your system.

Deleting permanently removes the data set and breaks any projects that use the deleted data set. You can't delete subject areas that you have included in projects.

Deleting data differs from removing a data set from a project. See [Removing Data that You Added](#).

1. Go to the **Data** page and select **Data Sets**.
2. Select the data set you want to delete and click the **Actions Menu** or right-click, then select **Delete**.

## Modifying and Adding Uploaded Data Sets

You can modify and manage the data sets that you created and then added to visualization projects.

### Topics:

- [Modifying Uploaded Data Sets](#)
- [Adding Data to a Project](#)
- [Removing Data from a Project](#)
- [About Editing Data Sets](#)

## Modifying Uploaded Data Sets

You can modify uploaded data sets to help you further curate (organize and integrate from various sources) data in projects. This is also sometimes referred to as *data wrangling*.

You can create new columns, edit columns, and hide and show columns for a data set. The column editing options depend on the column data type (date, strings, or

numeric). Selecting an option invokes a logical SQL function that edits the current column or creates a new one in the selected data set.

For example, you can select the Convert to Text option for the Population column (number data type). It uses the formula of the Population column, and wraps it with a logical SQL function to convert the data to text and adds that newly converted data text column to the data set. Note that the original Population column isn't altered.

Modifying data sets can be very helpful in cases where you haven't been able to perform joins between data sets because of *dirty data*. You can create a column group or build your own logical SQL statement to create a new column with which you essentially "scrub" data (amend or remove data in the database that isn't correct in some way).

You can modify columns in various ways such as:

- For a date or time column, create a year, quarter, month, or day column.
- For an attribute column, convert a column to a number or convert it to a date. You can:
  - Concatenate or replace the column.
  - Group or split the column.
  - Apply uppercase, lowercase, or sentence-case to the data items in the column.
- For a measure column, apply operators such as power, square root, or exponential.

### Renaming a Data Set

Even if you change the name of a data set, that change doesn't affect the reference for the project; that is, the project using the specific data set continues to work.

1. Go to the **Data** page and select **Data Sets**.
2. Select a data set you want to rename and click the **Actions menu** or right-click, then select **Edit**.
3. Click **Edit Data Set** table icon.
4. Change the value in the **Name** field, then click **Save**.

If a data set with the same name already exists in your system, an error message is displayed. Click **Yes** to overwrite the existing data set (with the data set whose name you're changing) or cancel the name change.

### Modifying the Data Set Columns

1. In the Project Editor, click the Prepare canvas.
2. On the project toolbar, click **Stage**.
3. If there is more than one uploaded data set in the project, then go to the tabs at the bottom of the window and select the data set that you want to work with. The first 100 records in the selected data set are displayed.

Order Line ID	Order ID	Order P...	Customer ID
1	88525	Not Specified	2
10	90194	High	6
100	91256	Not Specified	36
1000	88930	High	382
1001	88934	Not Specified	382
1002	88934	Not Specified	382
1003	88928	Critical	383
1004	88928	Critical	383
1005	88931	High	383
1006	90342	Medium	385
1007	90346	Medium	385
1008	90342	Medium	386
1009	90342	Medium	386
101	91256	Not Specified	37
1010	90343	Critical	386
1011	90350	Not Specified	386
1012	90350	Not Specified	386
1013	90339	High	387
1014	90340	High	387

Source Diagram **Sample Orders** Sample Order Lines +

- If there are more than one uploaded data sets in the project, select the one you want to work with. Only the first 100 records in the selected data set are displayed.

The screenshot shows a data visualization interface with a table titled "Revenue by Product". The table contains data for various products and their categories. A dropdown menu is open over the "XSADimProducts\_Dim\_Lite" data source, showing options for column modifications.

Revenue	Product	Category
20.00	Bluetooth Adaptor	Accessories
15.00	HomeCoach 2000	Fixed

- Click **Options** for the column that you want to work with, and then select an option to modify or convert the column. The options list and column modifications you can perform depends on the type of column you're working with.

Data wrangling doesn't modify the original columns in the data set. Instead, it creates duplicate columns.

- Click **Save**.



 **Note:**

When you edit a data set in this way, it affects all projects that use the data set. For example, if another user has a project that uses the data set that you modified, and they open the project after you change the data set, they see a message in their project that indicates that the data set has been modified.

The following table lists the column options that might be available.

Column Option	Description
Day, Month Name, Quarters, Year	NA
Edit	Edits the current column and can be used to reformat a source column without creating a second column and hiding the original column.
Hide	Hides the column in the Data Elements pane and in visualizations on the canvas. If you want to see hidden columns, click <b>Hidden columns</b> (ghost icon) on the page footer. You can then unhide individual columns or unhide all hidden columns at the same time.
Group, Conditional Group	Select <b>Group</b> to create your own custom groups. For example, you can group States together into custom Regions. Or you can categorize dollar amounts into groups indicating small, medium, and large.
Split	Splits a specific column value into parts. For example, you can split a column called Name into first and last name.
Uppercase	Updates the contents of a column with the values in all capital letters.
Lowercase	Updates the contents of a column with the values all in lowercase letters.
Sentence Case	Updates the contents of a column to make the first letter of the first word of a sentence uppercase.
Rename	Allows you to change the name of any column.
Duplicate	Creates a column with the identical contents of the selected column.
Convert to Text	Changes the data type of a column to Text.
Replace	Changes specific text in the selected column to a different specified value. For example, you can change all instances of Mister to Mr. in the column.
Create	Creates a column based on a function.
Convert to Number	Changes the data type of the column to Number, which deletes any values that aren't numbers from the column.
Convert to Date	Changes the data type of the column to Date, which deletes any values that aren't dates from the column.
Bin	Creates your own custom groups for number ranges. For example, you can create bins for an Age column with age ranges binned into Pre-Teen, Young Adult, Adult, Senior based on custom requirements.
Log	Calculates the natural logarithm of an expression. The logarithm is the inverse operation to exponentiation, just as division is the inverse of multiplication. That means the logarithm of a number is the exponent to which another fixed number, the base, must be raised to produce that number. For example, $\log_2 64 = 6$ , as $64 = 2^6$ .
Power	Takes the values of a column and raises them to the power that you specify. The default power is 2.
Square Root	Creates a new column populated with the square root of the value in the column selected.

## Adding Data to a Project

You can add one or more data sets to your new or existing projects.

You can use the Add Data Set page to familiarize yourself with all available data sets. Data sets have distinct icons to help you quickly identify them by type.

1. You can add a data set to a project in two ways:
  - To create a new project, go to the Home page, click **Create**, then click **Project** to display the Add Data Set dialog.
  - If you're working with an existing project, then open the project and in the Data Elements pane click **Add (+)**, then **Add Data Set** to display the Add Data Set dialog.
2. Build your project using the columns that are displayed in the Data Elements pane. Or if needed, explore or modify the data set to better fit your project.
  - You can create new columns, edit columns, and hide and show columns in the data set. See [Modifying Uploaded Data Sets](#).
  - If your project contains two data sets, then you can blend the data from one data set with the other. See [Blending Data that You Added](#) and [About Changing Data Blending](#).
  - You can review your data set's columns to better understand its data. See [#unique\\_135](#).

## Removing Data from a Project

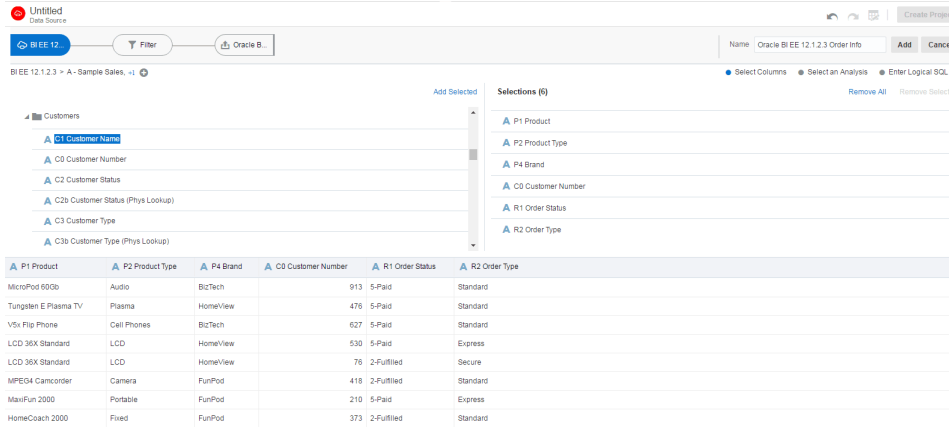
You can remove a data set from a project.

Note that removing data from a project differs from deleting the data set from Data Visualization. See [Deleting Data Sets from Data Visualization](#).

## About Editing Data Sets

You can work with data sets in Data Visualization that come from spreadsheets, Oracle Applications, or database data sources.

The image shows the Data Set editor when you're working with a data set created from a subject area or analysis in an Oracle application. The Data Set editor looks different and enables you to perform different tasks when you're working with a data set created from a spreadsheet or a database. In the Data Set editor you perform tasks such as searching or browsing for columns, adding filters, updating column attributes, and writing Logical SQL.



You can edit data sets in the Data Set dialog:

- You can navigate between the column selector page, the filters page, and the information page when working with data sets created from Oracle Applications or databases by clicking the bubbles on the Step editor.
- You can see a sample of the data set's data by clicking **Get Preview Data** or the **Preview Data** icon. For example, to see if the filtered data is what you expect, add a filter and then select **Get Preview Data**.
- You can include or exclude a related subject area, when you're working with a data set created from a subject area by clicking **Add/Remove Related Subject Area**.
- You can adjust column attributes of a data set that is created from a spreadsheet or a database. For example, you can configure a column to be treated as a measure or an attribute, and if a measure column, you can add an aggregation.
- You can specify which query mode to use when refreshing a data set created from a database.
- You can edit the SQL statement of a data set, when it is created from a database or Oracle Applications.

## Blending Data that You Added

You might have a project where you added multiple data sets. You can blend data from one data set with data from another data set.

For example, Data Set A might contain new dimensions that extend the attributes of Data Set B. Or Data Set B might contain new facts that you can use alongside the measures that already exist in Data Set A.

When you add more than one data set to a project, the system tries to find matches for the data that's added. It automatically matches external dimensions where they share a common name and have a compatible data type with attributes in the existing data set.

Data sets that aren't joined are divided by a line in the Data Elements pane of the project. If the project includes multiple data sets and if any aren't joined, then you'll see restrictions between data elements and visualizations. For example, you can't use the data elements of a data set in the filters, visualizations, or calculations of another data set if they're not joined. If you try to do so, you see an error message. You can match data elements of data sets that aren't joined in the Data Diagram of a project, or you can create individual filters, visualizations, or calculations for each data set.

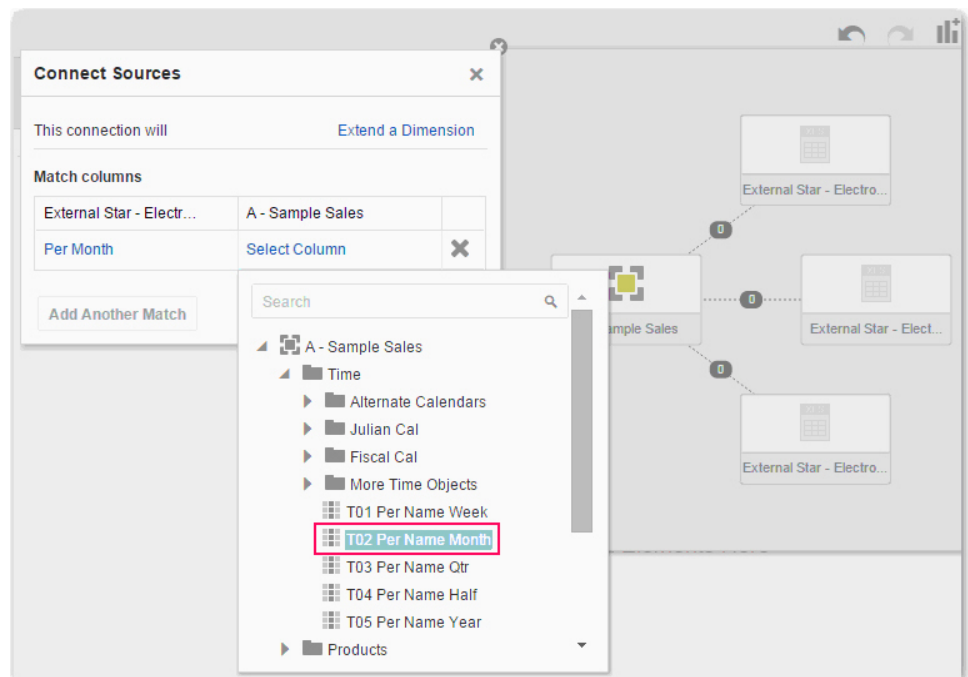
You can specify how you want the system to blend your data. See [About Changing Data Blending](#).

1. Add one or multiple data sets to your project. See [Adding Data from External Sources](#).
2. In the Data Elements pane, click **Menu**, then **Data Diagram**. You can also select a data set in the Data Element pane, then right-click and select **Data Diagram**.
3. Click the number along the line that connects the external source to the newly loaded source to display the Connect Sources dialog.
4. In the Connect Sources dialog, make changes as necessary.
  - a. To change the match for a column, click the name of each column to select a different column from the data sets.

 **Note:**

If columns have the same name and same data type, then they're recognized as a possible match. You can customize this and specify that one column matches another by explicitly selecting it even if its name isn't the same. You can select only those columns with a matching data type.

- b. Click **Add Another Match**, and then select a column from the data sets to match.



- c. For a measure that you're uploading for the first time, specify the aggregation type such as *Sum* or *Average*.
    - d. Click the **X** to delete a match.
5. Click **OK** to save the matches from the external source to the data model on the server.

## About Changing Data Blending

Sometimes Data Visualization omits rows of data that you expect to see in a data set. This happens when your project includes data from two data sets that contain a mixture of attributes and values, and there are match values in one source that don't exist in the other.

When this happens, you must specify which data set to use for data blending. See [Changing Data Blending](#).

Suppose we have two data sets (Source A and Source B) with slightly different rows, as shown in the following image. Note that Source A doesn't include IN-8 and Source B doesn't include IN-7.

T1 - Source A			T2 - Source B		
Inv#	Date	Rev	Inv#	Rep	Bonus
IN-1	1/1/2015	100.00	IN-1	Billie	1.00
IN-2	1/1/2015	200.00	IN-2	Joe	2.00
IN-3	1/1/2015	300.00	IN-3	Kim	3.00
IN-4	1/2/2015	400.00	IN-4	Billie	4.00
IN-5	1/2/2015	500.00	IN-5	Joe	5.00
IN-6	1/2/2015	600.00	IN-6	Kim	6.00
IN-7	1/3/2016	800.00	IN-8	Mika	8.00

The following results are displayed if you select the **All Rows** data blending option for Source A and select the **Matching Rows** data blending option for Source B. Because IN-7 doesn't exist in Source B, the results contain null Rep and null Bonus.

T4 - SA All SB Match -- no Mika				T5 - SA All SB Match -- no Mika				T6 - SA All SB Match -- no Mika			
Date	Rep	Rev	Bonus	Date	Rev	Bonus	Rep	Rev	Bonus		
1/1/2015	Billie	100.00	1.00	1/1/2015	600.00	6.00	Billie	500.00	5.00		
	Joe	200.00	2.00	1/2/2015	1,500.00	15.00	Joe	700.00	7.00		
	Kim	300.00	3.00	1/3/2016	800.00	(null)	Kim	900.00	9.00		
1/2/2015	Billie	400.00	4.00				(null)	800.00	(null)		
	Joe	500.00	5.00								
	Kim	600.00	6.00								
1/3/2016	(null)	800.00	(null)								

The following results are displayed if you select the **Matching Rows** data blending option for Source A and select the **All Rows** data blending option for Source B. Because IN-8 doesn't exist in Source A, the results contain null Date and null Revenue.

T7 - SA Match SB All -- No 3Jan				T8 - SA Match SB All -- No 3Jan				T9 - SA Match SB All -- No 3Jan			
Date	Rep	Rev	Bonus	Date	Rev	Bonus	Rep	Rev	Bonus		
1/1/2015	Billie	100.00	1.00	1/1/2015	600.00	6.00	Billie	500.00	5.00		
	Joe	200.00	2.00	1/2/2015	1,500.00	15.00	Joe	700.00	7.00		
	Kim	300.00	3.00	(null)	(null)	8.00	Kim	900.00	9.00		
1/2/2015	Billie	400.00	4.00				Mika	(null)	8.00		
	Joe	500.00	5.00								
	Kim	600.00	6.00								
(null)	Mika	(null)	8.00								

The visualization for Source A includes Date as an attribute, and Source B includes Rep as an attribute, and the match column is Inv#. Under dimensional rules, you can't

use these attributes with a measure from the opposite table unless you also use the match column.

There are two settings for blending tables that contain both attributes and measures. These are set independently in each visualization based on what columns are used in the visualization. The settings are **All Rows** and **Matching Rows** and they describe which source rows the system uses when returning data to be visualized.

The system automatically assigns data blending according to the following rules:

- If the visualization contains a match column, then the system sets sources with the match column to **All Rows**.
- If the visualization contains an attribute, then the system sets its source to **All Rows** and sets the other sources to **Matching Rows**.
- If attributes in the visualization come from the same source, then the system sets the source to **All Rows**, and sets the other sources to **Matching Rows**.
- If attributes come from multiple sources, then the system sets the source listed first in the project's elements panel to **All Rows** and sets the other sources to **Matching Rows**.

## Changing Data Blending

You can change data blending in a project with multiple data sets. Data blending specifies which data set takes precedence over the other.

See [Blending Data that You Added](#).

1. Select a visualization on the canvas that has more than one data set, and in the Properties pane, click **Data Sets**.
2. To change the default blending, click **Data Blending**, and select either **Auto** or **Custom**.

If you choose **Custom**, you can set the blending to either **All Rows** or **Matching Rows**.

- You must assign at least one source to **All Rows**.
- If both sources are **All Rows**, then the system assumes that the tables are purely dimensional.
- You can't assign both sources to **Matching Rows**.

# 7

## Using Data Flows to Create Curated Data Sets

You can use data flows to produce curated (combined, organized, and integrated) data sets.

### Topics:

- [Typical Workflow for Creating Curated Data Sets with Data Flows](#)
- [About Data Flows](#)
- [About Editing a Data Flow](#)
- [Creating a Data Flow](#)
- [Adding Filters to a Data Flow](#)
- [Adding Aggregates to a Data Flow](#)
- [Merging Columns in a Data Flow](#)
- [Merging Rows in a Data Flow](#)
- [Creating a Binning Column in a Data Flow](#)
- [Creating a Sequence of Data Flows](#)
- [Creating a Group in a Data Flow](#)
- [Adding Cumulative Values to a Data Flow](#)
- [Customizing Data Flow Step Names and Descriptions](#)
- [Executing a Data Flow](#)
- [Saving Output Data from a Data Flow to a Database](#)
- [Running a Data Flow](#)

## Typical Workflow for Creating Curated Data Sets with Data Flows

Here are the common tasks for creating curated data sets with data flows.

Task	Description	More Information
Create a data flow	Create data flows from one or more data sets.	<a href="#">Creating a Data Flow</a>
Add filters	Use filters to limit the data in a data flow output.	<a href="#">Adding Filters to a Data Flow</a>
Add aggregates	Apply aggregate functions to group data in a data flow.	<a href="#">Adding Aggregates to a Data Flow</a>

Task	Description	More Information
Merge columns and rows of data sets	Combine two or more columns and rows of data sets in a data flow.	<a href="#">Merging Columns in a Data Flow</a> <a href="#">Merging Rows in a Data Flow</a>
Create a binning column	Assign a value to add a binning column to the data set.	<a href="#">Creating a Binning Column in a Data Flow</a>
Create a sequence of data flows	Create and save a sequential list of data flows.	<a href="#">Creating a Sequence of Data Flows</a>
Create a group	Create a group column of attribute values in a data set.	<a href="#">Creating a Group in a Data Flow</a>
Add cumulative values	Group data by applying cumulative aggregate functions in a data flow.	<a href="#">Adding Cumulative Values to a Data Flow</a>
Save output data to a database	Connect to a database and save the output data from a data flow to a table in a database.	<a href="#">Saving Output Data from a Data Flow to a Database</a>
Execute a data flow	Execute data flows to create data sets.	<a href="#">Executing a Data Flow</a>
Run a data flow	Run a saved data flow to create data sets or to refresh the data in a data set.	<a href="#">Running a Data Flow</a>

## About Data Flows

Data flows let you take one or more data sets and organize and integrate them to produce a curated set of data that you can use to easily create effective visualizations.

You use the Data Visualization's data flow editor to select specific data from existing data sets, apply transformations, add joins and filters, remove unwanted columns, add new derived measures, add derived columns, and add other operations. The data flow is then run to produce a data set that you can use to create complex visualizations.

See [Creating a Data Flow](#) and [Running a Data Flow](#).

## About Editing a Data Flow

Build your data flow by adding steps to select, limit, and customize your data.

The following image shows the Data Flow editor.



The screenshot shows the Oracle Data Flow Editor interface. The top pane displays a workflow diagram with the following steps: Sample O..., Select Columns, Filter, Join, Select Columns, Aggregate, and Save Data. The bottom pane is the 'Select Columns' editor, which includes a search bar, 'Add all', 'Add selected', 'Selected(28/29)', 'Remove all', and 'Remove selected' buttons. Below the buttons is a table of columns and a preview table of data.

Order Line ID	Order Priority	Customer ID	# of Customers	Customer Name	Customer Segment	City	Product Category	Product Sub Category
7401	Critical	2704	2704	Juan Gold	Consumer	Kharkiv	Office Supplies	Paper
5706	Not Specified	2099	2099	Nathan Fox	Home Office	Hong Kong	Office Supplies	Labels
6726	Not Specified	2468	2468	Rhonda Stein	Corporate	Aomori	Office Supplies	Pens & Art Supplies

### What Can You Do in the Data Flow Editor?

The Data Flow editor is a flexible tool, designed to help you easily create data flows. You can also:

- select, add, and rename columns
- add or adjust aggregates
- add filters
- create a merge column
- merge rows
- create a binning column
- add a sequence
- create a group
- add cumulative values
- customize step names
- schedule a data flow
- add another data set

You add steps in the workflow diagram pane and specify details for those steps in the Step editor pane.

These helpful tips should help you to use the Step Editor pane more effectively:

- You can hide or display the Step editor pane by clicking **Step editor** at the bottom of the Data Flow editor.  
You can hide or display the Preview data columns pane by clicking **Preview data** at the bottom of the Data Flow editor.
- The Preview data columns pane updates automatically as you make changes to the data flow.

For example, you could add a Select Columns step, remove some columns, and then add an Aggregate step. While working on the Aggregate step, the Preview data columns pane already shows the columns and data that you just specified in the Select Columns step.

- You can specify whether or not to automatically refresh step changes in the Preview data columns pane by clicking **Auto apply**.
- You can add another data set and join it to the existing data sets in your data flow by selecting **Add Data** in the Data Flow Steps panel.

Joins are created automatically when you add a data set; however, you can edit the join details in the Join dialog.

- Oracle Data Visualization validates data flow steps as you add them to or delete them from the data flow.
- If you're adding an expression (in an Add Column step or a Filter step), then you must click **Apply** to finalize the step.

If you add a new step to the workflow diagram without clicking **Apply**, then your expression won't be applied, and the next step that you add won't use the correct data.

## Creating a Data Flow

You can create a data flow from one or more data sets. With a data flow, you produce a curated data set that you can use to easily and efficiently create meaningful visualizations.

1. In the Home Page, click **Create**, then click **Data Flow** to display the Add Data Set dialog, follow the on-screen instructions to specify a data set, then click **Add**.
2. To add steps to your data flow, in the Data Flow editor, go to the workflow diagram pane and click **Add a step (+)** next to the data set step. See [Adding Filters to a Data Flow](#), [Adding Aggregates to a Data Flow](#), and [Merging Columns in a Data Flow](#).
3. In the Add step dialog, select the step that you want to add and provide the required details in the Step editor pane.
4. (Optional) To delete a step from the workflow diagram, click **X** or right-click the step and select **Delete**. Note that deleting a step might make the other steps in the data flow invalid, as indicated by red X icons displayed for the invalid steps.
5. Click **Save** to save but not run the data flow. Note that you can save a data flow that contains validation errors. When you save a data flow, it's displayed in the Display pane of the Data page, in the Data Flows area.

When you've finished adding steps to the data flow diagram, you can also execute the data flow without saving it, or save the data flow as a database connection. See [Executing a Data Flow](#), [Saving Output Data from a Data Flow to a Database](#).

## Adding Filters to a Data Flow

You can use filters to limit the amount of data included in the data flow output. For example, limiting sales revenue data of a column to the years 2010 through 2017.

You can filter a data element by adding the Filter step in the Step Editor pane.

1. Create or open the data flow that you want to apply a filter to.
2. Click **Add a step (+)**, and select **Filter**.
3. In the Filter pane, select the data element you want to filter:

Field	Description
Add Filter (+)	Select the data element you want to filter, in the Available Data dialog. Alternatively, click <b>Data Elements</b> in the Data Panel, and drag and drop a data element to the Filter pane.
Filter fields	Change the values, data or selection of the filter (for example, maximum and minimum range). Based on the data element, specific filter fields are displayed. You can apply multiple filters to a data element.
Filter menu icon	Select a function to clear the filter selection and disable or delete a filter.
Filter pane menu icon	Select a function to clear all filter selections, remove all filters, and auto-apply filters. You can select to add an expression filter.
Add Expression Filter	Select to add an Expression Filter. Click <b>f(x)</b> , select a function type, and then double-click to add a function in the <b>Expression</b> field. Click <b>Apply</b> .
Auto-Apply Filters	Select an auto-apply option for the filters, such as Default (On).

 **Note:**

Based on the applied filter, the data preview (for example, the displayed sales data in a column) is updated.

4. Click **Save**.

## Adding Aggregates to a Data Flow

You can group data by applying aggregate functions such as count, sum, and average.

If the data set already contains aggregates, then they're displayed when you add an aggregate step. You can add an aggregate in the Step Editor pane.

1. Create or open the data flow that you want to add an aggregate step to.
2. Click **Add a step (+)**, and select **Aggregate**.
3. In the Aggregate pane, to add a column to the aggregate, click **Actions** then click **Aggregate**.
4. To select an aggregate function to apply to an aggregate column, click the arrow in the **Function** field for the selected column and select a value to aggregate by. For example, for the Profit column you could choose Sum.
5. To remove an aggregate from the selected aggregate list, hover the mouse pointer over the aggregate's name, click **Actions**, and click **Group By**.
6. To save your changes, click **Save Data Flow**.

## Merging Columns in a Data Flow

You can combine two or more columns to display as one. For example, you can merge the street address, street name, state, and ZIP code columns so that they display as one item in the visualizations using the data flow's output.

You create a merged column by adding a merge column step in the Step Editor pane.

1. Create or open the data flow that you want to add a merge column to.
2. Click **Add a step (+)**, and select **Merge Columns**.
3. In the Merge Columns pane, specify the options for combining the columns:

Field	Description
New column name	Change the name of the merge column.
Merge column	Select the first column you want to merge.
With	Select the second column you want to merge.
(+) Add Column	Select more columns you want to merge.
Delimiter	Select a delimiter to separate column names (for example, Space, Comma, Dot, or Custom Delimiter).

4. Click **Save**.

## Merging Rows in a Data Flow

You can merge the rows of two data sets. The result can include all the rows from both data sets, the unique rows from each data set, the overlapping rows from both data sets, or the rows unique to one data set.

Before you merge the rows, do the following:

- Confirm that each data set has the same number of columns.
- Check that the data types of the corresponding columns of the data sets match. For example, column 1 of data set 1 must have the same data type as column 1 of data set 2.

You can add a Merge Rows step in the Step Editor pane.

1. Create or open the data flow that contains the data sets you want to merge.
2. Select the two data sets, right-click, and select **Merge rows**.
3. Select the option for merging the rows, as described in the following table:

Option	Description
All rows from Input 1 and Input 2 (Union All)	All the rows of both the data sets are displayed.
Unique rows from Input 1 and Input 2 (Union)	The data of each unique rows are merged and displayed with the other rows.
Rows common to Input 1 and Input 2 (Intersect)	Only the common rows are displayed with the merged data.
Rows unique to Input 1 (Except)	Only the unique rows of data set 1 are displayed.
Rows unique to Input 2 (Except)	Only the unique rows of data set 2 are displayed.

4. Click **Save**.

## Creating a Binning Column in a Data Flow

Binning a measure creates a new column based on the value of the measure. You can assign a value to the bin dynamically by creating the number of equal size bins (such as the same number of values in each bin), or by explicitly specifying the range of values for each bin.

You can add a Bin step in the Step Editor pane.

1. Create or open the data flow in which you want to create a bin column.
2. Click **Add a step (+)**, and select **Bin**.

Alternatively, you can select **Add Columns**, and then click **(+) Column** to select **Bin**.

3. In the Bin pane, click **Select Column**.
4. In the Available Columns dialog, select the data element.
5. In the Bin pane, specify the options for the bin column:

Field	Description
Bin	Select a different data element.
New element name	Change the name of the bin column.
Number of Bins	Enter a number, or use the arrows to increment or decrement the number of bins.
Method	Select one of the methods, <b>Manual</b> , <b>Equal Width</b> , or <b>Equal Height</b> .
Histogram View	Based on your selection in the <b>Method</b> field, the histogram range (width) and histogram count (height) of the bins are updated. <ul style="list-style-type: none"> <li>• In the <b>Manual</b> method, you can move the slider to select the boundary; that is, the histogram range and count. The number of sliders changes based on the histogram count. You can switch to the List view and enter the range manually along with the bin names.</li> <li>• In the <b>Equal Width</b> method, the histogram range is divided into intervals of the same size. For equal width binning, the column values are measured, and the range is divided into equal-sized intervals. The edge bins can accommodate very low or very high values in the column.</li> <li>• In the <b>Equal Height</b> method, the height of each bin is same or very slightly different but the histogram range is equal. For equal height or frequency binning, the intervals of each bin is based on each interval containing approximately the equal number of elements (that is, records). <b>Equal Height</b> method is preferred specifically for the skewed data.</li> </ul>
List View	If you select the <b>Manual</b> method, you can change the name of the bins, and you can define the range for each bin.

### Note:

Based on your changes, the data preview (for example, the bin column name) is updated.

6. Click **Save**.

## Creating a Sequence of Data Flows

A sequence is a saved sequential list of specified data flows and is useful when you want to run multiple data flows as a single transaction. If any flow within a sequence fails, then all the changes done in the sequence are rolled back.

1. Click **Create**, and select **Sequence**.
2. Drag and drop the data flows and sequences to the Sequence pane.
3. Click the menu icon to move an item up or down in the list, and to remove an item.
4. Click **Save**. When you save a sequence, it's displayed in the Sequence area of the Data page.
5. Go to the Sequence area of the Data page, select the sequence, and click **Execute Sequence**.

After you run a sequence, the resulting data sets are displayed in the Data page.

6. Go to the Data page and click Data Sets to see the list of resulting data sets.

## Creating a Group in a Data Flow

You can use binning attributes to define groups of attribute values in a data set.

1. Create or open the data flow in which you want to create a group column.
2. Click **Add a step (+)**, and select **Group**.
3. Select the data element in the Available Columns dialog. You can't select the numbered type data element.
4. Specify the options for the new group column in the Group pane:

Field	Description
Group	Change the name of a group (for example, Group1).
Available values list	Select the values you want to include in a group. The selected values are displayed in the <b>Selections</b> list. Based on your selection, the histogram is updated. The height of the horizontal bar is based on the count of a group in the data set.
Name	Change the name of the new group column.
Selections	Contains all columns selected for this group.
(+) Group	Add a new group. You can select a group, and click <b>X</b> to delete it.
Include Others	Group values that haven't been added to any of the other groups.
Add all	Add all the values in the available list to a group.
Remove all	Remove all the selected values from a group.

### Note:

Based on your changes, the data preview (for example, the group column name) is updated.

5. Click **Save**.

## Adding Cumulative Values to a Data Flow

You can group data by applying the cumulative aggregate functions such as the moving and running aggregate. A moving aggregate aggregates values over a row and a specific number of preceding rows. A running aggregate aggregates values over all the preceding rows. Because both the moving and running aggregates are based on the preceding rows, the sort order of rows is important. You can specify the order as part of the aggregate.

You can add a Cumulative Value step in the Step Editor pane.

1. Create or open the data flow in which you want to add a cumulative value column.
2. Click **Add a step (+)**, and select **Cumulative Value**.
3. In the Cumulative Value pane, specify the cumulative aggregate functions for the new column:

Field	Description
Aggregate	Select a data column.
Function	Select a function. The available types of function are based on the data column. If the column data type is incompatible with the function, an error message is displayed.
Rows	Select the value. You can edit this field only for specific functions. If the value isn't a positive integer, an error message is displayed.
New column name	Change the aggregate column name. If two columns have the same name, an error message is displayed.
(+) Aggregate	Create a new aggregate column. Select a column. If no aggregate column is defined, an error message is displayed.
(+) Sort Column	Select a sort by column for the data column. Click <b>Options</b> to move a sort column up or down in the list. Select a sort order. If you add two sort orders to the same column, an error message is displayed.
Sort order list	Select the sort order type. The available types of sort order are based on the selected data element.
(+) Restart Column	Select a restart column for the data column. Click <b>Options</b> to move a restart element up or down in the list. Select a restart element. If you add a duplicate restart column, an error message is displayed.

### Note:

Based on your defined values, the data preview (for example, New column name) is updated.

4. Click **Save**.

## Customizing Data Flow Step Names and Descriptions

You can rename a data flow step and add or edit the description.

1. Create or open a data flow or data set.
2. Click **Add a step (+)**, and select a step.
3. Click the step name (for example, Merge Columns) in the step pane header.
4. Enter a new name or edit the existing name in the **Name** field, and enter a description if required.
5. To save your changes, click **Enter**, or click outside the header fields.

## Executing a Data Flow

Executing a data flow produces a data set that you can use to create visualizations.

To successfully execute a data flow, it must be free of validation errors.

1. Create or open the data flow that you want to execute and produce a data set from.
2. Click **Add a step (+)** and select **Save Data**.
3. In the Save Data Set pane enter the **Data Set** name and **Description** to identify your data set. Don't change the **Save data to** field.
4. Click **Execute Data Flow** to run the data flow. If there is no validation error, a completion message is displayed.

### Note:

When you execute a data flow without saving it, the data flow isn't saved and isn't displayed in the Data Flows list. Therefore, the data flow isn't available for you to modify or run.

Go to the Data page and select Data Sets to see your resulting data set in the list.

5. Click **Save As**. In the Save Data Flow As dialog enter a **Name** and **Description** to identify your data flow.

Go to the Data page and select Data Flows to see your resulting data flow in the list.

## Saving Output Data from a Data Flow to a Database

You can connect to a database and save output data from a data flow to a table in that database.

You can save a data flow to a database to securely store the data flow in the database and take advantage of its managed backup and recovery facility. You can transform the data source by overwriting it with the data flow data. The data source and data flow tables must be in the same database and have the same name. To successfully save a data flow to a database, it must be free of validation errors.



1. Create or open the data flow that you want to save as a database connection.
2. Click **Add a step (+)** and select **Save Data** . Or if you have already saved the data flow, then click the **Save Data** step.
3. In the Save Data Set pane, enter the **Data Set** name and **Description** to identify your data set.
4. Click **Save data to list** and select **Database Connection**.
5. Click **Select connection** to display the Save Data to Database Connection dialog.
6. Select a connection to save your data flow.  
You must already have created a database connection before you can select one. See [Creating Database Connections](#).

For example, you can save to an Oracle database, Apache Hive database, Hortonworks Hive database, or Map R Hive database.

7. Enter a name in the **Table** field.  
The table name must conform to the naming convention of the selected database. For example, the name of a table in an Oracle database can't begin with numeric characters.
8. Click **Execute data flow** to run the data flow. If there is no validation error, a completion message is displayed and the data is saved in the selected database using the table name that you specified.
  - If you have a table in the database with the same name, the data in the table is overwritten when you save to the database.
  - When you execute the data flow, the data is only saved to a database, but the data flow isn't saved and isn't displayed in the Data Flows list. Therefore, the data flow isn't available for you to modify or run.
9. Click **Save As**. In the Save Data Flow As dialog enter a **Name** and **Description** to identify your data flow.

Go to the Data page and select Data Flows to see your resulting data flow in the list.

## Running a Data Flow

You can run a saved data flow to create a corresponding data set or to refresh the data in the data set created from the data flow.

You run the data flow manually to create or refresh the corresponding data set. For an existing data set, run the data flow if you know that the columns and data from the data set that was used to build the data flow have changed.

1. In the Data page, go to the Data Flows section, and locate the data flow that you want to run.
2. Click the data flow's **Actions menu** and select **Run**.

### Notes about running data flows:

- To run a saved data flow, you must specify a Save Data step as its final step. To add this step to the data flow, click the data flow's **Actions menu** and select **Open**. After you've added the step, save the data flow and try to run it again.

- When creating a new database data source, set the database's query mode to **Live**. Setting the query mode to **Live** allows the data flow to access data from the database (versus the data cache) and pushes any expensive operations such as joins to the database. See [Managing Data Sets](#).
- When you update a data flow that uses data from a database source, the data is either cached or live depending on the query mode of the source database.
- Complex data flows take longer to run. While the data flow is running, you can go to and use other parts of the application, and then come back to the Data Flows pane to check the status of the data flow.
- You can cancel a long-running data flow. To do so, go to the Data Flows section, click the data flow's **Action menu** and select **Cancel**.
- If it's the first time you've run the data flow, then a new data set is created and you can find it in the Data Sets section of the Data page. The data set contains the name that you specify on the data flow's Save Data step. If you've run the data flow before, then the resulting data source already exists and its data is refreshed.

# 8

## Importing and Sharing

You can import and export projects to share them with other users. You can also share a file of a visualization, canvas, or story that can be used by other users.

### Topics:

- [Importing and Sharing Projects or Folders](#)
- [Sharing Visualizations, Canvases, or Stories](#)

## Typical Workflow for Importing and Sharing Artifacts

Here are the common tasks for sharing and importing folders, projects, visualizations, canvases, and stories with other users.

Task	Description	More Information
Import projects and folders	Import projects and folders as applications.	<a href="#">Importing an Application or Project</a>
Share a folder, project, visualization, canvas, or story	Share a project or folder as an application with users. You can also share your project's visualizations, canvases, or stories as a file.	<a href="#">Sharing a Project or Folder as an Application</a> <a href="#">Sharing a File of a Visualization, Canvas, or Story</a>

## Importing and Sharing Projects or Folders

You can import projects and applications from other users and sources, and export projects to make them available to other users.

### Topics:

- [Importing an Application or Project](#)
- [Sharing a Project or Folder as an Application](#)

## Importing an Application or Project

You can import an application or project created and exported by another user, or you can import an application from an external source such as Oracle Fusion Applications.

The import includes everything that you need to use the application or project such as associated data sets, connection string, connection credentials, and stored data.

1. On the Home page, click **Projects**, then **Page Menu**, and select **Import**.
2. In the Import dialog, click **Select File** or drag a project or application file onto the dialog, then click **Import**.

3. If an object with the same name already exists in your system, then choose to replace the existing object or cancel the import. See [When I import a project, I get an error stating that the project, data source, or connection already exists](#).
4. If an object with the same name already exists in your system, then choose to replace the existing object or cancel the import. See “When I import a project, I get an error stating that the project, data source, or connection already exists” in the Troubleshooting chapter.

## Sharing a Project or Folder as an Application

You can share a project to export it as an application that can be imported and used by other users.

The export produces a .DVA file that includes the items that you specify such as associated data sets, connection string, connection credentials, and stored data.

1. On the Home page, click **Projects**, then select the project or folder that you want to share.
2. Click the **Actions menu**, select **Share**, then click **File**.
3. In the File dialog, click the **Include Data** option to include the data with the project or folder.
4. Click the **Connection Credentials** option if you want to include the data source connection’s user name and password with the exported project. Note the following information:
  - **For a project with an Excel, CSV, or TXT data source** - Because an Excel, CSV, or TXT data source doesn’t use a data connection, clear the **Include Connection Credentials** option.
  - **For a project with a database data source** - If you clear the **Connection Credentials** option, then the user must provide a valid user name and password to load data into the imported project.
  - **For a project with an Oracle Applications or Oracle Essbase data source** - Selecting the **Connection Credentials** option works if on the connection setup’s Create Connection dialog you specified the **Always use this name and password** option in the **Authentication** field. If you clear the **Connection Credentials** option or specified the **Require users to enter their own username and password** option in the **Authentication** field, then the user must provide a valid user name and password to load data into the imported project.
5. If you selected the **Include Data** option or the **Include Connection Credentials** option, then enter and confirm a password that the user must provide to import the project or folder and decrypt its connection credentials and data.
6. Click **Save**.

## Sharing Visualizations, Canvases, or Stories

You can share visualizations, canvases, or stories to make them available to other users.

### Topics:

- [Sharing a File of a Visualization, Canvas, or Story](#)

- [Printing a Visualization, Canvas, or Story](#)
- [Writing Visualization Data to a CSV or TXT File](#)

## Sharing a File of a Visualization, Canvas, or Story

You can share one or more of your project's visualizations, canvases, or stories as a file.

1. Create or open a data visualization project.
2. Click the **Share** icon on the project toolbar, then click **File** to open the File dialog.
3. In the File dialog, specify and select the options based on the selected format of the file.
  - **Powerpoint (pptx), Acrobat (pdf), and Image (png)**: Specify the file name, and paper size and orientation. Based on the pane, do one of the following:
    - **Visualize** - You have to select either to include the active canvas or visualization, or all canvases.
    - **Narrate** - You have to select either to include the active page or visualization, or all story pages.
  - **Data (csv)** - Specify the file name.
  - **Package (dva)** - Specify the file name. You can also select the **Include Data**, and **Connection Credentials** options. If you select the **Connection Credentials** option, enter and confirm a password to retrieve the packaged data. You can also select **Include ACLs in archive**.



### Note:

You can only select **Package (dva)** as the file format for sharing a project.

4. Click **Save**.
5. In Save As dialog, change the file name if you want, making sure to including the file extension, and browse to the location where you want to save the file. Click **Save**.

## Printing a Visualization, Canvas, or Story

You can print one or more of your project's visualizations, canvases, or stories.

1. Create or open a data visualization project.
2. Click the **Share** icon on the project toolbar, then click **Print** to open the Print dialog.
3. In the Print dialog, specify the file name, and paper size and orientation. You also have to select either to include all the open visualization or canvas, or only the active visualization or canvas in the file.
4. Click **Print**. The browser's print dialog is displayed.
5. Specify other printing preferences such as which printer to use and how many copies to print and click **Print**.

## Writing Visualization Data to a CSV or TXT File

You can write the data from a visualization to a CSV or TXT file. This lets you open and update the visualization data in a compatible application such as Excel.

1. Locate the visualization with data that you want to write to the CSV or TXT format, and click **Share** on the visualization toolbar, and then select **File**, select the Format (for example .CSV) and click **Save**.

The Save As dialog is displayed.

2. Name the file and browse to the location where you want to save the file. Change the file extension to .txt, if needed. Click **Save**.

# A

## Frequently Asked Questions

This reference provides answers to frequently asked questions for Oracle BI Data Visualization.

### Topics:

- [FAQs for Data Visualization Projects and Data Sources](#)

## FAQs for Data Visualization Projects and Data Sources

This topic identifies and explains common questions about Data Visualization projects and data sources.

### Topics

- [What data sources are supported?](#)
- [What if I'm using a Teradata version different than the one supported by Data Visualization?](#)

### What data sources are supported?

You can include data only from specific types and versions of sources. See [Supported Data Sources](#).

### What if I'm using a Teradata version different than the one supported by Data Visualization?

If you're working with a Teradata version different than the one supported by Data Visualization, then you have to update the `extdriver.paths` configuration file before you can successfully build a connection to Teradata. This configuration file is located here: `C:\<your directory>\AppData\Local\DVDesktop\extdrvier.paths`. For example, `C:\Users\jsmith\AppData\Local\DVDesktop\extdriver.paths`.

When updating the `extdriver.paths` configuration file, remove the default Teradata version number and replace it with the Teradata version number that you're using. Make sure that you include `\bin` in the path. For example if you're using Teradata 14.10, change `C:\Program Files\Teradata\Client\15.10\bin` to `C:\Program Files\Teradata\Client\14.10\bin`.

# B

## Troubleshooting

This topic provides troubleshooting tips for Data Visualization Desktop.

### Topics

- [When I import a project, I get an error stating that the project, data source, or connection already exists](#)
- [When I try to build a connection to Teradata, I get an error and the connection is not saved](#)
- [I have issues when I try to refresh data for file-based data sources](#)
- [I can't refresh data from a MongoDB data source](#)
- [Oracle Support needs a file to help me diagnose a technical issue](#)
- [I need to find more information about a specific issue](#)

## Troubleshooting Data Visualization Issues

This topic describes common problems that you might encounter when working with Data Visualization and explains how to solve them.

### **When I import a project, I get an error stating that the project, data source, or connection already exists**

When you're trying to import a project, you might receive the following error message:

"There is already a project, data source or connection with the same name as something you're trying to import. Do you want to continue the import and replace the existing content?"

This error message is displayed because one or more of the components exported with the project is already on your system. When a project is exported, the outputted .DVA file includes the project's associated data sources and connection string. To resolve this error, you can either click **OK** to replace the components on your system, or you can click **Cancel** and go into your system and manually delete the components.

This error message is also displayed when the project you're trying to import contains no data. When you export a project without data, the project's and data sources' metadata are included in the .DVA. To resolve this issue, you can click **OK** to replace the components on your system, or you can click **Cancel** and go into your system and manually delete the data source or connection that's causing the error.

### **When I try to build a connection to Teradata, I get an error and the connection is not saved**

When you're trying to create a connection to Teradata, you might receive the following error message:



“Failed to save the connection. Cannot create a connection since there are some errors. Please fix them and try again.”

This error message is displayed because the version of Teradata that you're using is different from the version supported by Data Visualization. To resolve this issue, update the `extdriver.paths` configuration file. This configuration file is located here: `C:\<your directory>\AppData\Local\DVDesktop\extdriver.paths`. For example, `C:\Users\jsmith\AppData\Local\DVDesktop\extdriver.paths`.

To update the `extdriver.paths` configuration file, remove the default Teradata version number and replace it with the Teradata version number that you're using. Make sure that you include `\bin` in the path. For example if you're using Teradata 14.10, then change `C:\Program Files\Teradata\Client\15.10\bin` to `C:\Program Files\Teradata\Client\14.10\bin`. See [What if I'm using a Teradata version different than the one supported by Data Visualization?](#)

### I have issues when I try to refresh data for file-based data sources

Keep in mind the following requirements when you refresh data for Microsoft Excel, CSV, or TXT data sources:

- To refresh an Excel file, ensure that the newer spreadsheet file contains a sheet with the same name as the original file you uploaded. If a sheet is missing, then you must fix the file to match the sheets in the original uploaded file.
- If the Excel, CSV, or TXT file that you reload is missing some columns, then you'll get an error stating that your data reload has failed. If this happens, then you must fix the file to match the columns in the original uploaded file.
- If the Excel, CSV, or TXT file you used to create the data source was moved or deleted, then the connection path is crossed out in the Data Source dialog. You can reconnect the data source to its original source file, or connect it to a replacement file, by right-clicking the data source in the Display pane and in the Options menu select **Reload Data**. You can then browse for and select the file to load.
- If you reloaded an Excel, CSV, or TXT file with new columns, then the new columns are marked as hidden and don't display in the Data Elements pane for existing projects using the data set. To unhide these columns, click the **Hidden** option.

Data Visualization requires that Excel spreadsheets have a specific structure. See [About Adding a Spreadsheet as a Data Set](#).

### I can't refresh data from a MongoDB data source

The first time Data Visualization connects to MongoDB, the MongoDB driver creates a cache file. If the MongoDB schema was renamed and you try to reload a MongoDB data source or use the data source in a project, then you might get an error or Data Visualization doesn't respond.

To correct this error, you need to clear the MongoDB cache. To clear the cache, delete the contents of the following directory: `C:\<your directory>\AppData\Local\Progress\DataDirect\MongoDB_Schema`. For example, `C:\Users\jsmith\AppData\Local\Progress\DataDirect\MongoDB_Schema`

To correct this error, ask your administrator to clear the MongoDB cache.

### **Oracle Support needs a file to help me diagnose a technical issue**

If you're working with the Oracle Support team to resolve a specific issue, they may ask you to generate a diagnostic dump file. To generate this file, do the following:

1. Open the command prompt and change the directory to the Data Visualization Desktop installation directory (for example, C:\Program Files\Oracle Data Visualization).
2. Type `diagnostic_dump.cmd` and then provide a name for the .zip output file (for example, `output.zip`).
3. Press Enter to execute the command.

You can find the diagnostic output file in your Data Visualization Desktop installation directory.

### **I need to find more information about a specific issue**

The community forum is another great resource that you can use to find out more information about the problem you're having.

You can find the forum here: [Oracle Community Forum](#).

# C

## Accessibility Features and Tips for Oracle Data Visualization

Use these tips to improve your experience with accessibility features for Oracle Data Visualization.

### Topics:

- [Keyboard Shortcuts for Data Visualization](#)

## Keyboard Shortcuts for Data Visualization

You can use keyboard shortcuts to navigate and to perform actions.

Use these keyboard shortcuts for working with a project in the Visualize Canvas.

Task	Keyboard Shortcut
Save a project with the changes.	Ctrl + S
Copy the selected items to the clipboard.	Ctrl + C
Save a newly created project with a specific name.	Ctrl + Shift + S
Undo the last change.	Ctrl + Z
Reverse the last undo.	Ctrl + Y

Use these keyboard shortcuts while working on a visualization in the Visualize canvas.

Task	Keyboard Shortcut
Copy a visualization to paste it to another canvas.	Ctrl + C
Paste the visualization in a visualization.	Ctrl + V
Duplicate a visualization.	Ctrl + D
Delete a visualization.	Delete key

Use these keyboard shortcuts while working with a filter in the filter panel on the filter bar.

Task	Keyboard Shortcut
Search items in a filter.	Enter key
Add the search string to the selection list.	Ctrl + Enter

# D

## Data Sources and Data Types Reference

This topic provides details about supported data sources, databases, and data types.

### Topics

- [Supported Data Sources](#)
- [Limited Support for Some Databases](#)
- [Oracle Applications Connector Support](#)
- [Data Visualization Supported and Unsupported Data Types](#)

## Supported Data Sources

Here are the supported data sources and version numbers.

### Data Sources Supported for Use with Oracle Data Visualization for BI EE

Supported Data Source	Version
Oracle Applications	11.1.1.9+ or Fusion Applications Release 8 and later This connector only supports specific Oracle SaaS Applications. See <a href="#">Oracle Applications Connector Support</a> .
Oracle Autonomous Data Warehouse Cloud	NA
Oracle Big Data Cloud (Beta)	NA
Oracle Database	11.2.0.4+ 12.1+ 12.2+
Oracle Content and Experience Cloud	NA
Oracle Essbase	Essbase 11.1.2.4.0+
Oracle Service Cloud	NA
Oracle Talent Acquisition Cloud (Beta)	15b.9.3+
Action Ingres	5.0+
Action Matrix	5.0+
Action Vector	5.0+
Amazon Aurora	NA
Amazon EMR	<ul style="list-style-type: none"><li>• Amazon EMR 4.7.2 running Amazon Hadoop 2.7.2 and Hive 1.0.0</li><li>• Amazon EMR (MapR) - Amazon Machine Image (AMI) 3.3.2 running MapR Hadoop M3 and Hive 0.13.1</li><li>• Complex data types aren't supported for Amazon EMR.</li></ul>
Amazon Redshift	1.0.1036 +
Apache Drill	1.7+

Supported Data Source	Version
Apache Hive	1.2.1+ Supported version: <ul style="list-style-type: none"> <li>• Hive 1.0.x</li> <li>• Hive 1.1.x</li> <li>• Hive 1.2.x</li> <li>• Hive 2.0.x</li> <li>• Hive 2.1.x</li> </ul>
Cassandra	3.10
IBM DB2	10.1+ 10.5+
CSV File	NA
DropBox	NA
Google Analytics	NA
Google Cloud SQL	NA
Google Drive	NA
GreenPlum	4.3.8+
HortonWorks Hive	1.2+
HP Vertica	7+
IBM BigInsights Hive	1.2+
Impala	2.7+
Informix	12+
MapR Hive	1.2+
Microsoft Access	2013 2016
Microsoft Excel	Any version that uses XLSX files.
MonetDB	5+
MongoDB	3.2.5
MySQL	5.1+ 5.6+
Netezza	7
Pivotal HD Hive	NA
PostgreSQL	9.5+
Presto	NA
Salesforce	NA
Spark	1.6+ 2.0 2.1+
SQL Server	2008 2012 2016
Sybase ASE	16+
Sybase IQ	16+

Supported Data Source	Version
Teradata	14
	15
	16
	16.10
Teradata Aster	6.10+
Elastic Search	5.6.4+
JDBC	Generic JDBC driver support
OData	4.0+
ODBC	Generic ODBC driver support

## Limited Support for Some Databases

Data Visualization provides limited support for databases marked with the **Beta** label.

In the Create New Connection dialog, some of the databases might be marked **Beta**. The **Beta** label indicates that the database has been tested, but isn't fully supported. Data sources created from databases marked as **Beta** might contain undocumented limitations and you should use them as is.

## Oracle Applications Connector Support

Oracle Applications Connector supports only the following Oracle SaaS Applications.

- Oracle Sales Cloud
- Oracle Financials Cloud
- Oracle HCM Cloud
- Oracle Supply Chain Cloud
- Oracle Procurement Cloud
- Oracle Project Cloud
- Oracle Loyalty Cloud

## Data Visualization Supported and Unsupported Data Types

This section contains information about the data types that Data Visualization supports and doesn't support.

### Topics:

- [Unsupported Data Types](#)
- [Supported Base Data Types](#)
- [Supported Data Types by Database](#)

## Unsupported Data Types

Some data types aren't supported.

You'll see an error message if the data source contains data types that Data Visualization doesn't support.

## Supported Base Data Types

When reading from a data source, Data Visualization attempts to map incoming data types to the supported data types.

For example, a database column that contains only date values is formatted as a DATE, a spreadsheet column that contains a mix of numerical and string values is formatted as a VARCHAR, and a data column that contains numerical data with fractional values uses DOUBLE or FLOAT.

In some cases Data Visualization can't convert a source data type. To work around this data type issue, you can manually convert a data column to a supported type by entering SQL commands. In other cases, Data Visualization can't represent binary and complex data types such as BLOB, JSON, and XML.

Data Visualization supports the following base data types:

- **Number Types** — SMALLINT, SMALLUNIT, TINYINT, TINYUINT, UINT, BIT, FLOAT, INT, NUMERIC, DOUBLE
- **Date Types** — DATE, DATETIME, TIMESTAMP, TIME
- **String Types** — LONGVARCHAR, CHAR, VARCHAR

## Supported Data Types by Database

Data Visualization supports the following data types.

Database Type	Supported Data Types
Oracle	BINARY DOUBLE, BINARY FLOAT CHAR, NCHAR CLOB, NCLOB DATE FLOAT NUMBER, NUMBER (p,s), NVARCHAR2, VARCHAR2 ROWID TIMESTAMP, TIMESTAMP WITH LOCAL TIMEZONE, TIMESTAMP WITH TIMEZONE

Database Type	Supported Data Types
DB2	BIGINT CHAR, CLOB DATE, DECFLOAT, DECIMAL, DOUBLE FLOAT INTEGER LONGVAR NUMERIC REAL SMALLINT TIME, TIMESTAMP VARCHAR
SQL Server	BIGINT, BIT CHAR DATE, DATETIME, DATETIME2, DATETIMEOFFSET, DECIMAL FLOAT INT MONEY NCHAR, NTEXT, NUMERIC, NVARCHAR, NVARCHAR(MAX) REAL SMALLDATETIME, SMALLINT, SMALLMONEY TEXT, TIME, TINYINT VARCHAR, VARCHAR(MAX) XML
MySQL	BIGINT, BIGINT UNSIGNED CHAR DATE, DATETIME, DECIMAL, DECIMAL UNSIGNED, DOUBLE, DOUBLE UNSIGNED FLOAT, FLOAT UNSIGNED INTEGER, INTEGER UNSIGNED LONGTEXT MEDIUMINT, MEDIUMINT UNSIGNED, MEDIUMTEXT SMALLINT, SMALLINT UNSIGNED TEXT, TIME, TIMESTAMP, TINYINT, TINYINT UNSIGNED, TINYTEXT VARCHAR YEAR
Apache Spark	BIGINT, BOOLEAN DATE, DECIMAL, DOUBLE FLOAT INT SMALLINT, STRING TIMESTAMP, TINYINT VARCHAR



<b>Database Type</b>	<b>Supported Data Types</b>
Teradata	BIGINT, BYTE, BYTEINT CHAR, CLOB DATE, DECIMAL, DOUBLE FLOAT INTEGER NUMERIC REAL SMALLINT TIME, TIMESTAMP VARCHAR

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# E

## Expression Editor Reference

This topic describes the expression elements that you can use in the Expression Editor.

### Topics:

- [SQL Operators](#)
- [Conditional Expressions](#)
- [Functions](#)
- [Constants](#)
- [Types](#)

## SQL Operators

SQL operators are used to specify comparisons between expressions.

You can use various types of SQL operators.

Operator	Example	Description	Syntax
BETWEEN	"COSTS"."UNIT_COST" BETWEEN 100.0 AND 5000.0	Determines if a value is between two non-inclusive bounds.  BETWEEN can be preceded with NOT to negate the condition.	BETWEEN [LowerBound] AND [UpperBound]
IN	"COSTS"."UNIT_COST" IN(200, 600, 'A')	Determines if a value is present in a set of values.	IN ([Comma Separated List])
IS NULL	"PRODUCTS"."PROD_NAME" IS NULL	Determines if a value is null.	IS NULL
LIKE	"PRODUCTS"."PROD_NAME" LIKE 'prod%'	Determines if a value matches all or part of a string. Often used with wildcard characters to indicate any character string match of zero or more characters (%) or any single character match (_).	LIKE
+		Plus sign for addition.	+
-		Minus sign for subtraction.	-
* or X		Multiply sign for multiplication.	* X
/		Divide by sign for division.	/
%		Percentage	%

Operator	Example	Description	Syntax
		Character string concatenation.	
(		Open parenthesis.	(
)		Closed parenthesis.	)
>		Greater than sign, indicating values higher than the comparison.	>
<		Less than sign, indicating values lower than the comparison.	<
=		Equal sign, indicating the same value.	=
>=		Greater than or equal to sign, indicating values the same or higher than the comparison.	>=
<=		Less than or equal to sign, indicating values the same or lower than the comparison.	<=
<>		Not equal to, indicating values higher or lower, but different.	<>
,		Comma, used to separate elements in a list.	,

## 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.

Follow these rules:

- In `CASE` statements, `AND` has precedence over `OR`
- Strings must be in single quotes

Expression	Example	Description	Syntax
CASE (If)	<pre> CASE WHEN score-par &lt; 0 THEN 'Under Par' WHEN score-par = 0 THEN 'Par' WHEN score-par = 1 THEN 'Bogey' WHEN score-par = 2 THEN 'Double Bogey' ELSE 'Triple Bogey or Worse' END </pre>	<p>Evaluates each <code>WHEN</code> condition and if satisfied, assigns the value in the corresponding <code>THEN</code> expression.</p> <p>If none of the <code>WHEN</code> conditions are satisfied, it assigns the default value specified in the <code>ELSE</code> expression. If no <code>ELSE</code> expression is specified, the system automatically adds an <code>ELSE NULL</code>.</p>	<pre> CASE WHEN request_condition1 THEN expr1 ELSE expr2 END </pre>

Expression	Example	Description	Syntax
CASE (Switch)	<pre> CASE Score-par WHEN -5 THEN 'Birdie on Par 6' WHEN -4 THEN 'Must be Tiger' WHEN -3 THEN 'Three under par' WHEN -2 THEN 'Two under par' WHEN -1 THEN 'Birdie' WHEN 0 THEN 'Par' WHEN 1 THEN 'Bogey' WHEN 2 THEN 'Double Bogey' ELSE 'Triple Bogey or Worse' END </pre>	<p>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.</p> <p>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.</p> <p>If the first expression matches an expression in multiple WHEN clauses, only the expression following the first match is assigned.</p>	<pre> CASE expr1 WHEN expr2 THEN expr3 ELSE expr4 END </pre>
IfCase > Else			ELSE [expr]
IfCase > IfNull			IfNull([expr], [value])
IfCase > NullIf			NullIf([expr], [expr])
IfCase > When			WHEN [Condition] THEN [expr]
IfCase > Case			CASE WHEN [Condition] THEN [expr] END
SwitchCase > Else			ELSE [expr]
SwitchCase > IfNull			IfNull([expr], [value])
SwitchCase > NullIf			NullIf([expr], [expr])
SwitchCase > When			WHEN [Condition] THEN [expr]

## Functions

There are various types of functions that you can use in expressions.

### Topics:

- [Aggregate Functions](#)

- [Analytics Functions](#)
- [Calendar Functions](#)
- [Conversion Functions](#)
- [Display Functions](#)
- [Evaluate Functions](#)
- [Mathematical Functions](#)
- [Running Aggregate Functions](#)
- [String Functions](#)
- [System Functions](#)
- [Time Series Functions](#)

## Aggregate Functions

Aggregate functions perform operations on multiple values to create summary results.

Function	Example	Description	Syntax
Aggregate At	<code>AGGREGATE(sales AT month, region)</code>	This function aggregates columns based on the level or levels you specify. measure is the name of a measure column. level is the level at which you want to aggregate. You can optionally specify more than one level. You cannot specify a level from a dimension that contains levels that are being used as the measure level for the measure you specified in the first argument. For example, you cannot write the function as <code>AGGREGATE(yearly_sales AT month)</code> because "month" is from the same time dimension that is being used as the measure level for "yearly_sales".	<code>AGGREGATE(measure AT level [, level1, levelN])</code>
Avg	<code>Avg(Sales)</code>	Calculates the average (mean) of a numeric set of values.	<code>Avg(expr)</code>
AvgDistinct		Calculates the average (mean) of all distinct values of an expression.	<code>Avg(DISTINCT expr)</code>

Function	Example	Description	Syntax
Bin	<pre>BIN(revenue BY productid, year WHERE productid &gt; 2 INTO 4 BINS RETURNING RANGE_LOW)</pre>	The BIN function classifies a given numeric expression into a specified number of equal width buckets. The function can return either the bin number or one of the two end points of the bin interval. numeric_expr is the measure or numeric attribute to bin BY grain_expr1,..., grain_exprN is a list of expressions that define the grain at which the numeric_expr will be calculated. BY is required for measure expressions and is optional for attribute expressions. WHERE a filter to apply to the numeric_expr before the numeric values are assigned to bins INTO number_of_bins BINS is the number of bins to return BETWEEN min_value AND max_value is the min and max values used for the end points of the outermost bins RETURNING NUMBER indicates that the return value should be the bin number (1, 2, 3, 4, etc.). This is the default. RETURNING RANGE_LOW indicates the lower value of the bin interval RETURNING RANGE_HIGH indicates the higher value of the bin interval	<pre>BIN(numeric_expr [BY grain_expr1, ..., grain_exprN] [WHERE condition] INTO number_of_bins BINS [BETWEEN min_value AND max_value] [RETURNING {NUMBER   RANGE_LOW   RANGE_HIGH}])</pre>
BottomN		Ranks the lowest n values of the expression argument from 1 to n, 1 corresponding to the lowest numerical value.  expr is any expression that evaluates to a numerical value. integer is any positive integer. Represents the bottom number of rankings displayed in the result set, 1 being the lowest rank.	<pre>BottomN(expr, integer)</pre>
Count	<pre>Count(Products)</pre>	Determines the number of items with a non-null value.	<pre>COUNT(expr)</pre>
CountDistinct		Adds distinct processing to the Count function.  expr is any expression.	<pre>COUNT(DISTINCT expr)</pre>
Count*	<pre>SELECT COUNT(*) FROM Facts</pre>	Counts the number of rows.	<pre>COUNT(*)</pre>
First	<pre>First(Sales)</pre>	Selects the first non-null returned value of the expression argument. The First function operates at the most detailed level specified in your explicitly defined dimension.	<pre>First([NumericExpressi on])</pre>
Last	<pre>Last(Sales)</pre>	Selects the last non-null returned value of the expression.	<pre>Last([NumericExpressi on])</pre>
Mavg		Calculates a moving average (mean) for the last n rows of data in the result set, inclusive of the current row.  expr is any expression that evaluates to a numerical value. integer is any positive integer. Represents the average of the last n rows of data.	<pre>MAVG(expr, integer)</pre>

Function	Example	Description	Syntax
Max	Max(Revenue)	Calculates the maximum value (highest numeric value) of the rows satisfying the numeric expression argument.	MAX(expr)
Median	Median(Sales)	Calculates the median (middle) value of the rows satisfying the numeric expression argument. When there are an even number of rows, the median is the mean of the two middle rows. This function always returns a double.	MEDIAN(expr)
Min	Min(Revenue)	Calculates the minimum value (lowest numeric value) of the rows satisfying the numeric expression argument.	MIN(expr)
NTile		Determines the rank of a value in terms of a user-specified range. It returns integers to represent any range of ranks. NTile with numTiles=100 returns what is commonly called the "percentile" (with numbers ranging from 1 to 100, with 100 representing the high end of the sort).  expr is any expression that evaluates to a numerical value. numTiles is a positive, nonnull integer that represents the number of tiles.	NTILE(expr, numTiles)
Percentile		Calculates a percentile rank for each value satisfying the numeric expression argument. The percentile rank ranges are between 0 (0th percentile) to 1 (100th percentile).  expr is any expression that evaluates to a numerical value.	PERCENTILE(expr)
Rank	RANK(chronological_key, null, year_key_columns)	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...).  expr is any expression that evaluates to a numerical value.	RANK(expr)
StdDev	StdDev(Sales) StdDev(DISTINCT Sales)	Returns the standard deviation for a set of values. The return type is always a double.	STDDEV(expr)
StdDev_Pop	StdDev_Pop(Sales) StdDev_Pop(DISTINCT Sales)	Returns the standard deviation for a set of values using the computational formula for population variance and standard deviation.	StdDev_Pop([NumericExpression])
Sum	Sum(Revenue)	Calculates the sum obtained by adding up all values satisfying the numeric expression argument.	SUM(expr)

Function	Example	Description	Syntax
SumDistinct		Calculates the sum obtained by adding all of the distinct values satisfying the numeric expression argument.  expr is any expression that evaluates to a numerical value.	SUM(DISTINCT expr)
TopN		Ranks the highest n values of the expression argument from 1 to n, 1 corresponding to the highest numerical value.  expr is any expression that evaluates to a numerical value. integer is any positive integer. Represents the top number of rankings displayed in the result set, 1 being the highest rank.	TOPN(expr, integer)

## Analytics Functions

Analytics functions allow you to explore data using models such as trendline and cluster.

Function	Example	Description	Syntax
Trendline	TRENDLINE(revenue, (calendar_year, calendar_quarter, calendar_month) BY (product), 'LINEAR', 'VALUE')	Fits a linear or exponential model and returns the fitted values or model. The numeric_expr represents the Y value for the trend and the series (time columns) represent the X value.	TRENDLINE(numeric_expr, ([series]) BY ([partitionBy]), model_type, result_type)
Cluster	CLUSTER((product, company), (billed_quantity, revenue), 'clusterName', 'algorithm=k-means;numClusters=%1;maxIter=%2;useRandomSeed=FALSE;enablePartitioning=TRUE', 5, 10)	Collects a set of records into groups based on one or more input expressions using K-Means or Hierarchical Clustering.	CLUSTER((dimension_expr1, ... dimension_exprN), (expr1, ... exprN), output_column_name, options, [runtime_binded_options])
Outlier	OUTLIER((product, company), (billed_quantity, revenue), 'isOutlier', 'algorithm=kmeans')	This function classifies a record as Outlier based on one or more input expressions using K-Means or Hierarchical Clustering or Multi-Variate Outlier detection Algorithms.	OUTLIER((dimension_expr1, ... dimension_exprN), (expr1, ... exprN), output_column_name, options, [runtime_binded_options])



Function	Example	Description	Syntax
Regr	<pre>REGR(revenue, (discount_amount ), (product_type, brand), 'fitted', '')</pre>	Fits a linear model and returns the fitted values or model. This function can be used to fit a linear curve on two measures.	<pre>REGR(y_axis_measure_e xpr, (x_axis_expr), (category_expr1, ..., category_exprN), output_column_name, options, [runtime_binded_optio ns])</pre>
Evaluate_Script	<pre>EVALUATE_SCRIPT( 'filerepo:// obiee.Outliers.x ml', 'isOutlier', 'algorithm=kmean s;id=%1;arg1=%2; arg2=%3;useRando mSeed=False;', customer_number, expected_revenue , customer_age)</pre>	Executes a Python script as specified in the script_file_path, passing in one or more columns or literal expressions as input. The output of the function is determined by the output_column_name.	<pre>EVALUATE_SCRIPT(scrip t_file_path, output_column_name, runtime, [runtime_binded_optio ns])</pre>

## Calendar Functions

Calendar functions manipulate data of the data types DATE and DATETIME based on a calendar year.

Function	Example	Description	Syntax
Current_Date	<pre>Current_Date</pre>	Returns the current date. The date is determined by the system in which the Oracle BI is running.	<pre>CURRENT_DATE</pre>
Current_Time	<pre>Current_Time(3)</pre>	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.	<pre>CURRENT_TIME(expr)</pre>
Current_TimeStamp	<pre>Current_TimeStamp(3)</pre>	Returns the current date/timestamp to the specified number of digits of precision.	<pre>CURRENT_TIMESTAMP(exp r)</pre>
DayName	<pre>DayName(Order_Da te)</pre>	Returns the name of the day of the week for a specified date expression.	<pre>DAYNAME(expr)</pre>
DayOfMonth	<pre>DayOfMonth(Order _Date)</pre>	Returns the number corresponding to the day of the month for a specified date expression.	<pre>DAYOFMONTH(expr)</pre>
DayOfWeek	<pre>DayOfWeek(Order_ Date)</pre>	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.	<pre>DAYOFWEEK(expr)</pre>

Function	Example	Description	Syntax
DayOfYear	DayOfYear(Order_Date)	Returns the number (between 1 and 366) corresponding to the day of the year for a specified date expression.	DAYOFYEAR(expr)
Day_Of_Quarter	Day_Of_Quarter(Order_Date)	Returns a number (between 1 and 92) corresponding to the day of the quarter for the specified date expression.	DAY_OF_QUARTER(expr)
Hour	Hour(Order_Time)	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.	HOUR(expr)
Minute	Minute(Order_Time)	Returns a number (between 0 and 59) corresponding to the minute for a specified time expression.	MINUTE(expr)
Month	Month(Order_Time)	Returns the number (between 1 and 12) corresponding to the month for a specified date expression.	MONTH(expr)
MonthName	MonthName(Order_Time)	Returns the name of the month for a specified date expression.	MONTHNAME(expr)
Month_Of_Quarter	Month_Of_Quarter(Order_Date)	Returns the number (between 1 and 3) corresponding to the month in the quarter for a specified date expression.	MONTH_OF_QUARTER(expr)
Now	Now()	Returns the current timestamp. The Now function is equivalent to the Current_Timestamp function.	NOW()
Quarter_Of_Year	Quarter_Of_Year(Order_Date)	Returns the number (between 1 and 4) corresponding to the quarter of the year for a specified date expression.	QUARTER_OF_YEAR(expr)
Second	Second(Order_Time)	Returns the number (between 0 and 59) corresponding to the seconds for a specified time expression.	SECOND(expr)
TimeStampAdd	TimeStampAdd(SQL_TSI_MONTH, 12, Time."Order Date")	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	TIMESTAMPADD(interval, expr, timestamp)
TimeStampDiff	TimeStampDiff(SQL_TSI_MONTH, Time."Order Date", CURRENT_DATE)	Returns the total number of specified intervals between two timestamps. Use the same intervals as TimeStampAdd.	TIMESTAMPDIFF(interval, expr, timestamp2)
Week_Of_Quarter	Week_Of_Quarter(Order_Date)	Returns a number (between 1 and 13) corresponding to the week of the quarter for the specified date expression.	WEEK_OF_QUARTER(expr)
Week_Of_Year	Week_Of_Year(Order_Date)	Returns a number (between 1 and 53) corresponding to the week of the year for the specified date expression.	WEEK_OF_YEAR(expr)
Year	Year(Order_Date)	Returns the year for the specified date expression.	YEAR(expr)

## Conversion Functions

Conversion functions convert a value from one form to another.

Function	Example	Description	Syntax
Cast	<pre>Cast(hiredate AS CHAR(40)) FROM employee</pre>	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.  Don't use ToDate.	<code>CAST(expr AS type)</code>
IfNull	<pre>IfNull(Sales, 0)</pre>	Tests if an expression evaluates to a null value, and if it does, assigns the specified value to the expression.	<code>IFNULL(expr, value)</code>
IndexCol	<pre>SELECT IndexCol(VALUEOF (NQ_SESSION.GEOGRAPHY_LEVEL), Country, State, City), Revenue FROM Sales</pre>	Uses external information to return the appropriate column for the signed-in user to see.	<code>IndexCol([integer literal], [expr1] [, [expr2], ?-])</code>
NullIf	<pre>SELECT e.last_name, NULLIF(e.job_id, j.job_id) "Old Job ID" FROM employees e, job_history j WHERE e.employee_id = j.employee_id ORDER BY last_name, "Old Job ID";</pre>	Compares two expressions. If they're equal, then the function returns null. If they're not equal, then the function returns the first expression. You can't specify the literal NULL for the first expression.	<code>NullIf([expression], [expression])</code>
To_DateTime	<pre>SELECT To_DateTime ('2009-03-0301:01:00', 'yyyy-mm-dd hh:mi:ss') FROM sales</pre>	Converts string literals of date <code>Time</code> format to a <code>Date<code>Time</code></code> data type.	<code>To_DateTime([expression], [literal])</code>

## Display Functions

Display functions operate on the result set of a query.

Function	Example	Description	Syntax
BottomN	<pre>BottomN(Sales, 10)</pre>	Returns the <i>n</i> lowest values of expression, ranked from lowest to highest.	<code>BottomN([NumericExpression], [integer])</code>

Function	Example	Description	Syntax
Filter	Filter(Sales USING Product = 'widget')	Computes the expression using the given preaggregate filter.	FILTER(measure USING filter_expr)
Mavg	Mavg(Sales, 10)	Calculates a moving average (mean) for the last <i>n</i> rows of data in the result set, inclusive of the current row.	Mavg([NumericExpressi on], [integer])
Msum	SELECT Month, Revenue, Msum(Revenue, 3) as 3_MO_SUM FROM Sales	Calculates a moving sum for the last <i>n</i> 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 <i>n</i> th row is reached, the sum is calculated based on the last <i>n</i> rows of data.	Msum([NumericExpressi on], [integer])
NTile	Ntile(Sales, 100)	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.	NTile([NumericExpress ion], [integer])
Percentile	Percentile(Sales )	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.	Percentile([NumericEx pression])
Rank	Rank(Sales)	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...).	Rank([NumericExpressi on])
Rcount	SELECT month, profit, Rcount(profit) FROM sales WHERE profit > 200	Takes a set of records as input and counts the number of records encountered so far.	Rcount([NumericExpress ion])
Rmax	SELECT month, profit, Rmax(profit) FROM sales	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.	Rmax([NumericExpressi on])
Rmin	SELECT month, profit, Rmin(profit) FROM sales	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.	Rmin([NumericExpressi on])
Rsum	SELECT month, revenue, Rsum(revenue) as RUNNING_SUM FROM sales	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.	Rsum([NumericExpressi on])
TopN	TopN(Sales, 10)	Returns the <i>n</i> highest values of expression, ranked from highest to lowest.	TopN([NumericExpressi on], [integer])

## 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.

Function	Example	Description	Syntax
Evaluate	SELECT EVALUATE('instr( %1, %2)', address, 'Foster City') FROM employees	Passes the specified database function with optional referenced columns as parameters to the database for evaluation.	Evaluate([string expression], [comma separated expressions])
Evaluate_Aggr	EVALUATE_AGGR('R EGR_SLOPE(%1, %2)', sales.quantity, market.marketkey )	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.	EVALUATE_AGGR('db_agg _function(%1...%N)' [AS datatype] [, column1, columnN])

## Mathematical Functions

The mathematical functions described in this section perform mathematical operations.

Function	Example	Description	Syntax
Abs	Abs(Profit)	Calculates the absolute value of a numeric expression. expr is any expression that evaluates to a numerical value.	ABS(expr)
Acos	Acos(1)	Calculates the arc cosine of a numeric expression. expr is any expression that evaluates to a numerical value.	ACOS(expr)
Asin	Asin(1)	Calculates the arc sine of a numeric expression. expr is any expression that evaluates to a numerical value.	ASIN(expr)
Atan	Atan(1) expr is any expression that evaluates to a numerical value.	Calculates the arc tangent of a numeric expression.	ATAN(expr)
Atan2	Atan2(1, 2)	Calculates the arc tangent of $y/x$ , where $y$ is the first numeric expression and $x$ is the second numeric expression.	ATAN2(expr1, expr2)

Function	Example	Description	Syntax
Ceiling	Ceiling(Profit)	Rounds a non-integer numeric expression to the next highest integer. If the numeric expression evaluates to an integer, the CEILING function returns that integer.	CEILING(expr)
Cos	Cos(1)	Calculates the cosine of a numeric expression. expr is any expression that evaluates to a numerical value.	COS(expr)
Cot	Cot(1)	Calculates the cotangent of a numeric expression. expr is any expression that evaluates to a numerical value.	COT(expr)
Degrees	Degrees(1)	Converts an expression from radians to degrees. expr is any expression that evaluates to a numerical value.	DEGREES(expr)
Exp	Exp(4)	Sends the value to the power specified. Calculates e raised to the n-th power, where e is the base of the natural logarithm.	EXP(expr)
ExtractBit	Int ExtractBit(1, 5)	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.	ExtractBit([Source Number], [Digits])
Floor	Floor(Profit)	Rounds a non-integer numeric expression to the next lowest integer. If the numeric expression evaluates to an integer, the FLOOR function returns that integer.	FLOOR(expr)
Log	Log(1)	Calculates the natural logarithm of an expression. expr is any expression that evaluates to a numerical value.	LOG(expr)
Log10	Log10(1)	Calculates the base 10 logarithm of an expression. expr is any expression that evaluates to a numerical value.	LOG10(expr)
Mod	Mod(10, 3)	Divides the first numeric expression by the second numeric expression and returns the remainder portion of the quotient.	MOD(expr1, expr2)
Pi	Pi()	Returns the constant value of pi.	PI()
Power	Power(Profit, 2)	Takes the first numeric expression and raises it to the power specified in the second numeric expression.	POWER(expr1, expr2)
Radians	Radians(30)	Converts an expression from degrees to radians. expr is any expression that evaluates to a numerical value.	RADIANS(expr)
Rand	Rand()	Returns a pseudo-random number between 0 and 1.	RAND()

Function	Example	Description	Syntax
RandFromSeed	Rand(2)	Returns a pseudo-random number based on a seed value. For a given seed value, the same set of random numbers are generated.	RAND( <i>expr</i> )
Round	Round(2.166000, 2)	Rounds a numeric expression to <i>n</i> digits of precision.  <i>expr</i> is any expression that evaluates to a numerical value.  <i>integer</i> is any positive integer that represents the number of digits of precision.	ROUND( <i>expr</i> , <i>integer</i> )
Sign	Sign(Profit)	This function returns the following: <ul style="list-style-type: none"> <li>• 1 if the numeric expression evaluates to a positive number</li> <li>• -1 if the numeric expression evaluates to a negative number</li> <li>• 0 if the numeric expression evaluates to zero</li> </ul>	SIGN( <i>expr</i> )
Sin	Sin(1)	Calculates the sine of a numeric expression.	SIN( <i>expr</i> )
Sqrt	Sqrt(7)	Calculates the square root of the numeric expression argument. The numeric expression must evaluate to a nonnegative number.	SQRT( <i>expr</i> )
Tan	Tan(1)	Calculates the tangent of a numeric expression.  <i>expr</i> is any expression that evaluates to a numerical value.	TAN( <i>expr</i> )
Truncate	Truncate(45.1234, 2)	Truncates a decimal number to return a specified number of places from the decimal point.  <i>expr</i> is any expression that evaluates to a numerical value.  <i>integer</i> is any positive integer that represents the number of characters to the right of the decimal place to return.	TRUNCATE( <i>expr</i> , <i>integer</i> )

## Running Aggregate Functions

Running aggregate functions perform

Function	Example	Description	Syntax
Mavg		Calculates a moving average (mean) for the last <i>n</i> rows of data in the result set, inclusive of the current row.  <i>expr</i> is any expression that evaluates to a numerical value. <i>integer</i> is any positive integer. Represents the average of the last <i>n</i> rows of data.	MAVG ( <i>expr</i> , <i>integer</i> )

Function	Example	Description	Syntax
Msum	select month, revenue, MSUM(revenue, 3) as 3_MO_SUM from sales_subject_ar ea	This function calculates a moving sum for the last n rows of data, inclusive of the current row.  expr is any expression that evaluates to a numerical value. integer is any positive integer. Represents the sum of the last n rows of data.	MSUM(expr, integer)
Rsum	SELECT month, revenue, RSUM(revenue) as RUNNING_SUM from sales_subject_ar ea	This function calculates a running sum based on records encountered so far.  expr is any expression that evaluates to a numerical value.	RSUM(expr)
Rcount	select month, profit, RCOUNT(profit) from sales_subject_ar ea where profit > 200	This function takes a set of records as input and counts the number of records encountered so far.  expr is an expression of any datatype.	RCOUNT(expr)
Rmax	SELECT month, profit,RMAX(prof it) from sales_subject_ar ea	This function takes a set of records as input and shows the maximum value based on records encountered so far.  expr is an expression of any datatype.	RMAX(expr)
Rmin	select month, profit,RMIN(prof it) from sales_subject_ar ea	This function takes a set of records as input and shows the minimum value based on records encountered so far.  expr is an expression of any datatype.	RMIN(expr)

## String Functions

String functions perform various character manipulations. They operate on character strings.

Function	Example	Description	Syntax
Ascii	Ascii('a')	Converts a single character string to its corresponding ASCII code, between 0 and 255. If the character expression evaluates to multiple characters, the ASCII code corresponding to the first character in the expression is returned.  expr is any expression that evaluates to a character string.	ASCII(expr)



Function	Example	Description	Syntax
Bit_Length	Bit_Length('abcdef')	Returns the length, in bits, of a specified string. Each Unicode character is 2 bytes in length (equal to 16 bits).  expr is any expression that evaluates to a character string.	BIT_LENGTH(expr)
Char	Char(35)	Converts a numeric value between 0 and 255 to the character value corresponding to the ASCII code.  expr is any expression that evaluates to a numerical value between 0 and 255.	CHAR(expr)
Char_Length	Char_Length(Customer_Name)	Returns the length, in number of characters, of a specified string. Leading and trailing blanks aren't counted in the length of the string.  expr is any expression that evaluates to a character string.	CHAR_LENGTH(expr)
Concat	SELECT DISTINCT Concat('abc', 'def') FROM employee	Concatenates two character strings.  exprs are expressions that evaluate to character strings, separated by commas.	CONCAT(expr1, expr2)
Insert	SELECT Insert('123456', 2, 3, 'abcd') FROM table	Inserts a specified character string into a specified location in another character string.  expr1 is any expression that evaluates to a character string. Identifies the target character string.  integer1 is any positive integer that represents the number of characters from the beginning of the target string where the second string is to be inserted.  integer2 is any positive integer that represents the number of characters in the target string to be replaced by the second string.  expr2 is any expression that evaluates to a character string. Identifies the character string to be inserted into the target string.	INSERT(expr1, integer1, integer2, expr2)
Left	SELECT Left('123456', 3) FROM table	Returns a specified number of characters from the left of a string.  expr is any expression that evaluates to a character string  integer is any positive integer that represents the number of characters from the left of the string to return.	LEFT(expr, integer)
Length	Length(Customer_Name)	Returns the length, in number of characters, of a specified string. The length is returned excluding any trailing blank characters.  expr is any expression that evaluates to a character string.	LENGTH(expr)

Function	Example	Description	Syntax
Locate	Locate('d' 'abcdef')	Returns the numeric position of a character string in another character string. If the character string isn't found in the string being searched, the function returns a value of 0.  expr1 is any expression that evaluates to a character string. Identifies the string for which to search.  expr2 is any expression that evaluates to a character string.  Identifies the string to be searched.	LOCATE(expr1, expr2)
LocateN	Locate('d' 'abcdef', 3)	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.  expr1 is any expression that evaluates to a character string. Identifies the string for which to search.  expr2 is any expression that evaluates to a character string. Identifies the string to be searched. intergeris any positive (nonzero) integer that represents the starting position to begin to look for the character string.	LOCATEN(expr1, expr2, integer)
Lower	Lower(Customer_Name)	Converts a character string to lowercase.  expr is any expression that evaluates to a character string.	LOWER(expr)
Octet_Length	Octet_Length('abcdef')	Returns the number of bytes of a specified string.  expr is any expression that evaluates to a character string.	OCTET_LENGTH(expr)
Position	Position('d', 'abcdef')	Returns the numeric position of <i>strExpr1</i> in a character expression. If <i>strExpr1</i> isn't found, the function returns 0.  expr1 is any expression that evaluates to a character string. Identifies the string to search for in the target string.  expr2 is any expression that evaluates to a character string. Identifies the target string to be searched.	POSITION(expr1 IN expr2)
Repeat	Repeat('abc', 4)	Repeats a specified expression <i>n</i> times.  expr is any expression that evaluates to a character string  integer is any positive integer that represents the number of times to repeat the character string.	REPEAT(expr, integer)

Function	Example	Description	Syntax
Replace	<code>Replace('abcd1234', '123', 'zz')</code>	Replaces one or more characters from a specified character expression with one or more other characters.  expr1 is any expression that evaluates to a character string. This is the string in which characters are to be replaced.  expr2 is any expression that evaluates to a character string. This second string identifies the characters from the first string that are to be replaced.  expr3 is any expression that evaluates to a character string. This third string specifies the characters to substitute into the first string.	<code>REPLACE(expr1, expr2, expr3)</code>
Right	<code>SELECT Right('123456', 3) FROM table</code>	Returns a specified number of characters from the right of a string.  expr is any expression that evaluates to a character string.  integer is any positive integer that represents the number of characters from the right of the string to return	<code>RIGHT(expr, integer)</code>
Space	<code>Space(2)</code>	Inserts blank spaces.  integer is any positive integer that indicates the number of spaces to insert.	<code>SPACE(expr)</code>
Substring	<code>Substring('abcdef' FROM 2)</code>	Creates a new string starting from a fixed number of characters into the original string.  expr is any expression that evaluates to a character string.  startPos is any positive integer that represents the number of characters from the start of the left side of the string where the result is to begin.	<code>Substring([SourceString] FROM [StartPosition])</code>
SubstringN	<code>Substring('abcdef' FROM 2 FOR 3)</code>	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.  xpr is any expression that evaluates to a character string.  startPos is any positive integer that represents the number of characters from the start of the left side of the string where the result is to begin.	<code>SUBSTRING(expr FROM startPos FOR length)</code>

Function	Example	Description	Syntax
TrimBoth	Trim(BOTH '_' FROM '_abcdef_')	Strips specified leading and trailing characters from a character string.  char is any single character. If you omit this specification (and the required single quotes), a blank character is used as the default.  expr is any expression that evaluates to a character string.	TRIM(BOTH char FROM expr)
TrimLeading	Trim(LEADING '_' FROM '_abcdef')	Strips specified leading characters from a character string.  char is any single character. If you omit this specification (and the required single quotes), a blank character is used as the default.  expr is any expression that evaluates to a character string.	TRIM(LEADING char FROM expr)
TrimTrailing	Trim(TRAILING _'_' FROM 'abcdef_')	Strips specified trailing characters from a character string.  char is any single character. If you omit this specification (and the required single quotes), a blank character is used as the default.  expr is any expression that evaluates to a character string.	TRIM(TRAILING char FROM expr)
Upper	Upper(Customer_N ame)	Converts a character string to uppercase. Expr is any expression that evaluates to a character string.	UPPER(expr)

## System Functions

The `USER` system function returns values relating to the session.

It returns the user name you signed in with.

Function	Example	Description	Syntax
Database		Returns the name of the Oracle BI subject area to which you are logged on.	DATABASE( )
User		Returns the user name for the Oracle BI Repository to which you are logged on.	USER( )

## 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.

Function	Example	Description	Syntax
Ago	SELECT Year_ID, Ago(sales, year, 1)	Calculates the aggregated value of a measure from the current time to a specified time period in the past. For example, AGO can produce sales for every month of the current quarter and the corresponding quarter-ago sales.	AGO(expr, time_level, offset)
Periodrolling	SELECT Month_ID, Periodrolling (monthly_sales, -1, 1)	Computes the aggregate of a measure over the period starting <i>x</i> units of time and ending <i>y</i> units of time from the current time. For example, PERIODROLLING can compute sales for a period that starts at a quarter before and ends at a quarter after the current quarter.  measure is the name of a measure column.  <i>x</i> is an integer that specifies the offset from the current time.  <i>y</i> specifies the number of time units over which the function will compute.  hierarchy is an optional argument that specifies the name of a hierarchy in a time dimension, such as yr, mon, day, that you want to use to compute the time window.	PERIODROLLING(measure, x [,y])
ToDate	SELECT Year_ID, Month_ID, ToDate (sales, year)	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.  expr is an expression that references at least one measure column.  time_level is the type of time period, such as quarter, month, or year.	TODATE(expr, time_level)
Forecast	FORECAST(numeric_expr, ([series]), output_column_name, options, [runtime_binded_options])	Creates a time-series model of the specified measure over the series using either Exponential Smoothing or ARMIA and outputs a forecast for a set of periods as specified by numPeriods.  numeric_expr represents the measure to forecast.  series is the time grain at which the forecast model is built. It is a list of one or more time dimension columns. If series is omitted, the time grain is determined from the query.  output_column_name is the output column. The valid values are 'forecast', 'low', 'high', 'predictionInterval'.  options is a string list of name=value pairs separated by ';'. The value can include %1 ... %N, which can be specified using runtime_binded_options.  runtime_binded_options is an optional comma separated list of runtime binded columns or literal expressions.	FORECAST(numeric_expr, ([series]), output_column_name, options, [runtime_binded_options])

## Constants

You can use constants in expressions.

Available constants include Date, Time, and Timestamp.

Constant	Example	Description	Syntax
Date	DATE [2014-04-09]	Inserts a specific date.	DATE [yyyy-mm-dd]
Time	TIME [12:00:00]	Inserts a specific time.	TIME [hh:mi:ss]
TimeStamp	TIMESTAMP [2014-04-09 12:00:00]	Inserts a specific timestamp.	TIMESTAMP [yyyy-mm-dd hh:mi:ss]

## 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.