

Oracle® Fusion Middleware

User's Guide for Oracle Data Visualization Desktop



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Preface

Learn how to explore data using Oracle Data Visualization Desktop.

Topics

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

Audience

User's Guide for Oracle Data Visualization Desktop is intended for business users who use Oracle Data Visualization Desktop to upload and query data, analyze data within visualizations, work with their favorite projects, and import and export their projects.

Documentation Accessibility

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Related Resources

These related Oracle resources provide more information.

- [Oracle Business Analytics Product Information](#)
- [Oracle Community Forum](#)
- [Oracle Data Visualization Desktop Installation Download](#)
- [Oracle Analytics Library](#)

Conventions

Conventions used in this document are described in this topic.

Text Conventions

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

Videos and Images

Your company can use skins and styles to customize the look of the Oracle Business Intelligence application, dashboards, reports, and other objects. It is possible that the videos and images included in the product documentation look different than the skins and styles your company uses.

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1

Get Started with Oracle Data Visualization Desktop

This topic describes the benefits of using Data Visualization Desktop and explains how to get started using the samples provided.



Topics:

- [About Oracle Data Visualization Desktop](#)
- [Get Started with Samples](#)

About Oracle Data Visualization Desktop

Data Visualization Desktop provides powerful personal data exploration and visualization in a simple per-user desktop download. Data Visualization Desktop is the perfect tool for quick exploration of sample data from multiple sources or for rapid analyses and investigation of your own local data sets.

Data Visualization Desktop 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 Data Visualization Desktop find the best way to visualize it. Choose from a variety of visualizations to look at data in a specific way.

Data Visualization Desktop also gives you a preview of the self-service visualization capabilities included in Oracle Analytics Cloud, Oracle's industrial-strength cloud analytics platform. Oracle Analytics Cloud extends the data exploration and visualization experience by offering secure sharing and collaboration across the enterprise, additional data sources, greater scale, and a full mobile experience including proactive self-learning analytics delivered to your device. Try Data Visualization Desktop for personal analytics and to sample a taste of Oracle's broader analytics portfolio.

Data Visualization Desktop's benefits include:

- A personal, single-user desktop 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.

Get Started with Samples

Use the samples provided to discover all the capabilities of Oracle Data Visualization Desktop, and to learn the 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 Data Visualization Desktop. Your personal data isn't deleted if you uninstall and reinstall Data Visualization Desktop.

2

Explore, Visualize, and Analyze Data

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



Topics:

- [Typical Workflow to Visualize Data](#)
- [Create a Project and Add Data Sets](#)
- [Build a Visualization by Adding Data from Data Panel](#)
- [Use Advanced Analytics Functions](#)
- [Create Calculated Data Elements in a Data Set](#)
- [Undo and Redo Edits](#)
- [Refresh Data in a Project](#)
- [Pause Data Queries in a Project](#)
- [Adjust the Visualization Canvas Layout](#)
- [Change Visualization Types](#)
- [Adjust Visualization Properties](#)
- [Apply Color to Visualizations](#)
- [Format Numeric Values of Columns](#)
- [Format Numeric Values of Visualizations](#)
- [Apply Map Backgrounds and Map Layers to Enhance Visualizations](#)
- [Sort and Select Data in Visualization Canvases](#)
- [Replace a Data Set in a Project](#)
- [Remove a Data Set from a Project](#)
- [Analyze Your Data Set Using Machine Learning](#)
- [About Warnings for Data Issues in Visualizations](#)

Typical Workflow to Visualize Data

Here are the common tasks for visualizing 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 include in the project.	Create a Project and Add Data Sets

Task	Description	More Information
Add data elements	Add data elements (for example, data columns or calculations) from the selected data set to the visualizations on the Visualize canvas.	Build a Visualization by Adding Data from Data Panel
Adjust the canvas layout	Add, remove, and rearrange visualizations.	Adjust the Visualization Canvas Layout
Filter content	Specify how many results and which items to include in the visualizations.	Create and Apply Filters to Visualize Data
Deploy machine learning and Explain	Use Diagnostic Analytics (Explain) to show patterns and uncover insights in your data set, and add the visualizations that Explain provides to your projects.	Analyze Your Data Set Using Machine Learning

Create a Project and Add Data Sets

Projects contain visualizations that help you to analyze your data in a productive and meaningful ways.

When you create a project, you add one or more data sets containing the data that you want to visualize and explore. Data sets contain data from Oracle Applications, databases, or uploaded data files such as spreadsheets. You can also add multiple data sets to your existing projects.

Tutorial

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

- To create a new project, go to the Home Page, click **Create**, then click **Project**.
 - Alternatively, go to the Data page and click **Data Sets**. Select a data set you want to analyze in a project and click **Action menu** or right-click. Select **Create Project**.
 - Alternatively, to open an existing project, on the Home page, click **Navigator**, then select **Projects**. Locate an existing project in the My Folders, Shared Folders, Projects, or Favorites page. 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 **Action menu**, then click **Open**.
- You can add data to a project using one of the following options:
 - If you're working with a new project, then in the Add Data Set dialog browse and select the data sources that you want to analyze, then click **Add to Project**.
 - If you're working with an existing project, then in the Data Panel click **Add (+)**, then **Add Data Set** to display the Add Data Set dialog and add a data source.
 - You can also create a new data source based on a file or connection using the Create Data Set dialog, then add it to your projects. See Add Data Sources to Analyze and Explore Data.
- To visualize data from multiple data set in the same project, in the Data Panel click **Add**, and then select **Add Data Set**.

When you've multiple data set in a project, click **Data Sets** in the properties pane to change the default data blending options. See [Blend Data that You Added](#).

4. Drag the data elements that you want to visualize from the Data Panel onto the visualization canvas, and start building your project. .
 - You can transform your data set to improve the quality of your analysis and visualization using data preparation script in the Prepare canvas. See [Prepare Your Data Set for Analysis](#).

Build a Visualization by Adding Data from Data Panel

You can build visualizations by adding data elements such as measure, text, or attribute from the Data Panel to a canvas.

As you build the visualization, you add as many data elements as required or move them to specific areas on the canvas to explore and analyze your data.

Topics:

- [Different Methods to Add Data](#)
- [Automatically Create Best Visualization](#)
- [Add Data to the Visualization Using Grammar Panel](#)
- [Add Data to the Visualization Using Assignments Panel](#)
- [Modify a Visualization's Tooltips](#)

Different Methods to Add Data

You can use different methods to add data from the Data Panel to create or update visualizations on a canvas.

Use one of the following methods to add data from the Data Panel:

- Drag data elements from the Data Panel and drop them onto the canvas.
- Select a data element or use Shift-click or Ctrl-click to select multiple data elements in the Data Panel, then right-click to select either a particular visualization type or the option to create a visualization automatically.
- Double-click a data element or use Shift-click or Ctrl-click to select multiple data elements in the Data Panel, then right-click to add them to the canvas.

When you update an existing visualization, you can add data from the Data Panel onto the Grammar Panel or Assignments Pane on the canvas. You can move the data elements from one area to another in the Grammar Panel or Assignments Pane. The visualization is updated based on your selection.

You can create a visualization by selecting a visualization type from the Visualization tab of the Data Panel and adding data elements to the canvas.

Automatically Create Best Visualization

You can automatically create the best visualization on the canvas based on a set of data elements.

1. Confirm that you're working in the Visualize canvas.

2. To automatically create a visualization on the canvas, do one of the following:
 - Drag data elements from the Data Panel and drop them directly onto the canvas.
 - Right-click data elements on the Data Panel and click **Create Best Visualization**.
 - Double-click data elements to add it to the canvas.

A visualization is automatically created on the canvas, and the best visualization type is selected based on the preconfigured logic. The selected data element is also positioned on a specific area of the Grammar Panel. For example, if you add a revenue measure to the canvas, the data element is placed in the Values area of the Grammar Panel, and **Tile** is selected as the visualization type.

3. Continue adding data elements directly to the canvas to build your visualization.

The visualization type and the position of the data elements on the Grammar Panel might change when you add more data elements to the canvas.

You turn off the mode to automatically create visualizations when you perform actions such as:

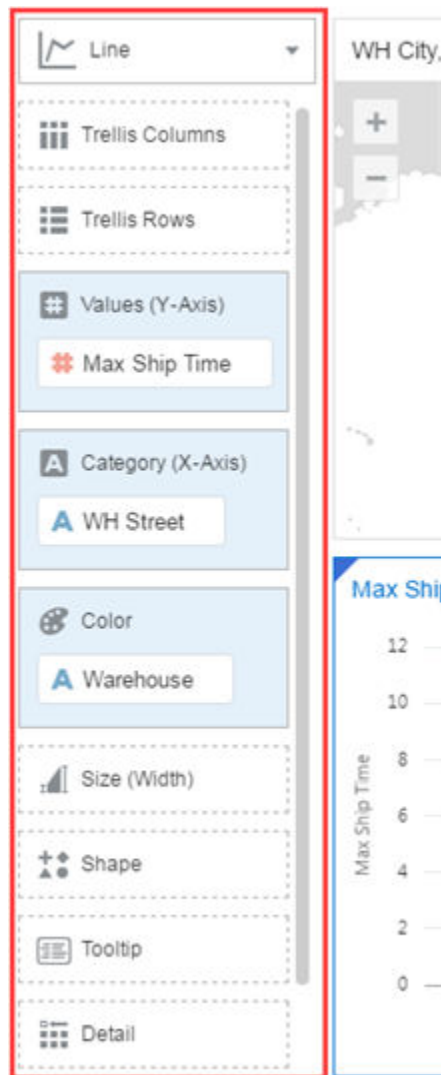
- Changing the visualization properties such as type.
- Adding or removing analyses from the Analytics tab in the Data Panel.
- Dropping a data element onto a specific area of the Grammar Panel or Assignments Pane.
- Changing the filter setting.

When the automatically create visualization mode is turned off, you can select the wizard icon or **Auto Visualization** in the visualization type list to turn on the automatically create mode.

Add Data to the Visualization Using Grammar Panel

After you've 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 Grammar Panel in the Visualize canvas. Based on your selections, visualizations are created on the canvas. The Grammar Panel contains sections such as Columns, Rows, Values, and Category.



1. Open or create a project.
2. If you created a project, then add a data set to it.
3. Confirm that you're working in the Visualize canvas.

Use one of the following methods to add data elements to the Grammar Panel:

You can only drop data elements based on attribute and type onto a specific Grammar Panel section.

- Drag and drop one or more data elements from the Data Panel to the Grammar Panel in the Visualize canvas. The data elements are automatically positioned, and if necessary the visualization changes to optimize its layout.
- Replace a data element by dragging it from the Data Panel 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 Grammar Panel section (for example, Columns, Rows, Values) to optimize the visualization, if you've multiple data elements in the Grammar Panel section.
- Remove a data element by selecting a data element in the Grammar Panel, and click **X**.

Add Data to the Visualization Using Assignments Panel

You can use the Assignment Panel 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 Assignment Panel. The sections in the Assignment Panel are the same as in the Grammar Panel.

1. Confirm that you're working on the Visualize canvas.
2. Select a visualization on the canvas.

Alternatively, drag and drop a data element to the blank canvas or between visualizations on the canvas to create a new visualization.

3. Drag a data element to the visualization (but not to a specific drop target); you'll see a blue outline around the recommended assignments in the visualization.

Hover the data element on the Assignment Panel to identify other valid assignments.

4. Drop the data element on the selected assignment.

To display the Assignment Panel, click **Show Assignments** on the visualization toolbar.

Modify a Visualization's Tooltips

By default when you hover over a data point in a visualization, a tooltip displays and provides specific information about the data point. You can choose to see all tooltips or only the measures included in the Tooltip section of the Grammar Panel.

For example, if you create a simple bar chart visualization that shows revenue for countries in the Americas region, the tooltip displays the region's name, the country's name, and exact revenue amount. If you add Target Revenue to the Tooltip section of the Grammar Panel, then the target revenue amount is displayed in the tooltip and the user can easily compare the actual revenues with the target revenues. Set the **Tooltip** field in the General Properties Pane to **Off** if you want the tool tip to contain only the target revenue amount.

Note the following restrictions:

- You can drag and drop only measure columns to the Tooltip section in the Grammar Panel.
 - The Tooltip section in the Grammar Panel doesn't display for all visualization types.
1. Confirm that you're working on the Visualize canvas and select a visualization.
 2. Drag and drop one or more measure columns from the Data Panel to the Tooltip section in the Grammar Panel.

Hover the mouse pointer over a data point on the visualization to display the tooltip. The tooltip contains the data point's values for all columns included in the visualization. The data values for the columns that you added to the Tooltip section are displayed at the bottom of the tooltip.

3. (Optional) Use the **Tooltip** field to display only the data values that you want or to turn off the tooltip.
 - If you want the tooltip to display data values for only the columns you dragged to the Tooltip section, then set the **Tooltip** field to **Off**.
 - If you don't want the tooltip to be displayed, then confirm that there are no columns in the Tooltip section and set the **Tooltip** field to **Off**.

Use Advanced Analytics Functions

Advanced analytics are statistical functions that you apply to enhance the data displayed in visualizations.

The Analytics area in the Data Panel contains standard analytics functions (for example, Clusters and Trend Line). You can use analytics functions as they are, or use them to create your own calculated columns that reference statistical scripts.

Topics:

- [Add Advanced Analytics Functions to Visualizations](#)
- [Add Reference Lines to Visualizations](#)

Add Advanced Analytics Functions to Visualizations

You can easily apply advanced analytics functions to a project to augment its visualizations.

Before you can use analytic functions in Data Visualization:

- Install DVML and related packages ready to be used by Data Visualization Desktop .

For example, on Windows use the Install DVML **Start** menu option, or on Mac double-click the application **Oracle Data Visualization Desktop Install DVML** in Finder under Applications or in Launchpad.
 - Create a project or visualization to which you can apply one or more analytic functions.
1. Confirm that you're working in the Visualize canvas.
 2. To display the available advanced analytic functions, click the **Analytics** icon in the Data Panel.
 3. To edit the applied advanced analytics in a visualization, highlight the visualization, and in the properties pane click the **Analytics** icon.
 4. To add advanced analytic functions to a visualization, do one of the following:
 - Drag and drop an advanced analytic function (such as Clusters, Outliers, Reference Line) from the **Analytics** pane to a visualization.
 - Right-click a visualization, and select an advanced analytic function.

- In the properties pane select the **Analytics** icon and click **Add (+)**, then select a function such as **Add Clusters** or **Add Outliers**.

Add Reference Lines to Visualizations

You can use advanced analytics reference lines to identify the range of data element values in a visualization.

1. Confirm that you're working on the Visualize canvas.
2. In the Data Panel, click the **Analytics** icon.
3. Drag and drop **Reference Line** into a visualization. Alternatively, you can double-click **Reference Line** to add it to the selected visualization.
4. In the properties pane select the **Analytics** tab and do the following:
 - a. Click the current **Method** and select **Line** or **Band**.
 - b. Click the current reference **Function** (for example, **Average** and **Custom**) and select the reference function that you want to use.
 - c. If you choose the **Line** method, you can select reference functions such as **Median**, **Percentile**, **Top N**, and **Constant**.
 - **Percentile** - Percentile rank number ranks the percentile of the data element added to the visualization.
 - **Top N** - N value marks the highest values (ranked from highest to lowest) of the data element added to the visualization.
 - **Bottom N** - N value marks the lowest values (ranked from highest to lowest) of the data element added to the visualization.
 - d. If you choose the **Band** method, you can select either **Custom** or **Standard Deviation** as the reference function.
 - **Custom** - Select the *to and from* range of the data element values (such as **Median** to **Average**).
 - **Standard Deviation** - Select a value from 1 to 3 to show the standard deviation for the selected value of the data element.
5. Click **Save**.

Based on the selected **Method** or reference **Function**, a line is displayed in the visualization to highlight the value.

Create 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.

The calculated data elements are stored in the data set's My Calculations folder and not in the project. In a project with a single data set only one My Calculations folder is available and the new calculated data elements are added to it. In a project with multiple data sets My Calculations folder is available for each set of joined and not-joined data sets. Ensure that you're creating the calculated data elements for the required data set or joined data set. The new calculated data elements are added to the My Calculations folder of the data sets (joined and non-joined) that you create the calculation for.

1. In the Visualize canvas navigate to the bottom of the Data Panel, right-click My Calculations, and click **Add Calculation** to open the New Calculation dialog.
2. In the expression builder pane, compose and edit an expression. See [About Composing Expressions](#).
You can drag and drop a column into the expression builder pane only if the column is joined to the data set.
3. Click **Validate**.
4. Specify a name, then click **Save**.

Undo and Redo 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.

The undo and redo options are useful as you experiment with different visualizations. You can undo all the edits you've made since you last saved a project. However, in some cases, you can't undo and then redo an edit. For example, in the Create Data Set page, you've selected an analysis from an Oracle Application data source to use as a data set in the project. In the next step, if you use the undo option to remove the data set, you can't redo this change.

- To undo or redo an edit, go to the toolbar for the project or the data set and click **Undo Last Edit** or **Redo Last Edit**. You can use these options only if you haven't saved the project since making the changes.



- When you're working on a project, click **Menu** on the project toolbar and select **Revert to Saved** to undo all the edits you've made since you last saved your project. **Revert to Saved** is enabled after you've saved the project for the first time. This option is automatically disabled if you select the **Auto Save** option.

Refresh Data in a Project

Refresh ensures that you see the most up-to-date data in your projects.

- On the Visualize canvas, click **Menu**, then click **Refresh Data**. This option ensures that you see the most up-to-date data by re-executing the visualization queries for all views in your project.

Pause Data Queries in a Project

You can disable the Auto Apply Data option to pause issuing new queries as you change visualization content in a project.

You can quickly configure a visualization without having to wait for data updates after each change.

1. Open or create a project.
2. If you've created a project, then add a data set to it.

3. Confirm that you're working in the Visualize canvas.
4. Click the **Auto Apply Data** button to pause data queries.
Data queries are temporarily disabled.
5. Make changes to a visualization in the project.
Your changes are displayed but data isn't updated, and a bubble is displayed indicating the number of data requests that have been skipped.
6. Click the bubble if you want to refresh the data now.
Data queries are still disabled.
7. Click the **Auto Apply Data** button to re-enable data queries.

Adjust 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. You can also copy selected visualization data to the clipboard.

Here are the options available to alter or modify the format of the visualization canvas.

Option	Location	Description
Canvas Properties	Right-click a canvas tab	Change the name, layout, width, and height of the canvas in the Canvas Properties dialog. Use the Synchronize Visualizations setting to specify how the visualizations on your canvas interact.

Option	Location	Description
Canvas Layout	Right-click a canvas tab	<p>Select Canvas Properties, Layout, and one of the following:</p> <ul style="list-style-type: none"> • Freeform – If you select Freeform, you can perform the following functions: <ul style="list-style-type: none"> – Click Select All Visualizations to select all the visualizations on a canvas, and then copy them. – Select one of the following Order Visualization options: Bring to Front, Bring Forward, Send Backward, or Send to Back to move a visualization on a canvas with multiple visualizations. – 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. – Resize a visualization by dragging its edges to the appropriate dimensions. • Autofit – Auto-arrange or correctly align the visualizations on a canvas with multiple visualizations.
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.
Rename	Right-click a canvas tab	Rename a selected canvas.
Duplicate Canvas	Right-click a canvas tab	Add a copy of a selected canvas to the project's row of canvas tabs.
Clear Canvas	Right-click a canvas tab	Remove all the visualizations on the canvas.
Delete Canvas	Right-click a canvas tab	Delete a specific canvas of a project.
Duplicate Visualization	Visualization Menu, Edit or right-click a visualization	Add a copy of a selected visualization to the canvas.
Copy Visualization	Visualization Menu, Edit or right-click a visualization	Copy a visualization on the canvas.
Paste Visualization	Visualization Menu, Edit , or right-click a visualization or blank canvas	Paste a copied visualization into the current canvas or another canvas.
Copy Data	Visualization Menu, Edit , or right-click a visualization	Copy selected data to the clipboard.
Delete Visualization	Visualization Menu or right-click a visualization	Delete a visualization from the canvas.

Change Visualization Types

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

When you create a project and add data elements to the canvas, Auto Visualization mode chooses the most appropriate visualization type based on the selected data element. The Auto Visualization mode is on (selected) by default. If you add more data elements, the visualization type is automatically updated, and the best type is selected based on the data elements.

If you want to use a different visualization type, then you need to select it from the visualization type list. When you change the visualization type, Auto Visualization mode is turned off. When the Auto Visualization mode is off (deselected), adding more data elements to the canvas won't change the visualization type automatically.

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, select Treemap to 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 Grammar Panel section labeled **Unused**. You can then move them to the Grammar Panel section you prefer.

Adjust Visualization Properties

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

The **Auto Visualization** mode is turned off if you change the visualization properties.

1. In the Visualize canvas, select a visualization to display the properties in the properties pane.
2. In the properties pane tabs, adjust the visualization properties as needed:

Properties Pane Tab	Description
General	Format the title, legend, and selection effect and customize descriptions.
Axis	Set the axis labels for horizontal and vertical values and the axis values to start and end.
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 Dictate button (microphone) that you can use to record an audio description.
Style	Set the background and border color for Text visualizations.

Properties Pane Tab	Description
Values	Specify display options for data values including the aggregation method such as sum or average, and number formatting such as percent or currency. Specify the format for each value data element in the visualization; for example, aggregation method, currency, data, or number format.
Date/Time	Specify display options for date and time including how you show the date or time (for example as Year, Quarter, Month, Week) and what format to use (for example, Auto or Custom).
Analytics	Add reference lines, trend lines, and bands to display at the minimum or maximum values of a measure included in the visualization.

Apply Color to Visualizations

Use color to enhance visualizations.

Topics:

- [About Color Assignments in Visualizations](#)
- [Access Color Options](#)
- [Change the Color Palette](#)
- [Assign Colors to Columns](#)

About Color Assignments in 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).

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.

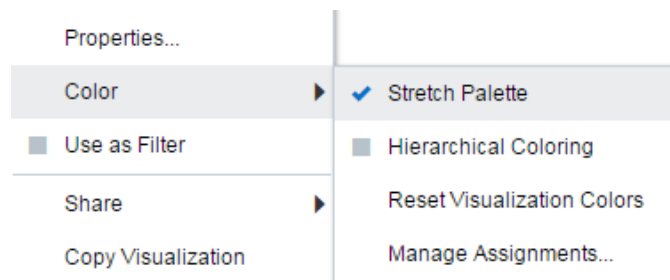
The **Visualize** canvas has a Color section in the Grammar Panel where you can put a measure column, attribute column, or set of attributes columns. Note how the canvas assigns color to the columns that are included in the Color section:

- 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've 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've 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've selected Hierarchical Palette, then in your visualization, each brand has its own color, and within that color, each product has its own shade.

Access Color Options

You can set color options for your project and for individual visualizations within your project.

1. If you want to edit color options for the whole project.
 - a. Click **Menu** on the project toolbar and select **Project Properties**.
 - b. Use the **General** tab to edit the color series or continuous coloring.
2. If you want to edit color options for a visualization.
 - a. Select the visualization and click **Menu** or right-click.
 - b. Select **Color**. The available color options depend on how the measures and attributes are set up in your visualization.



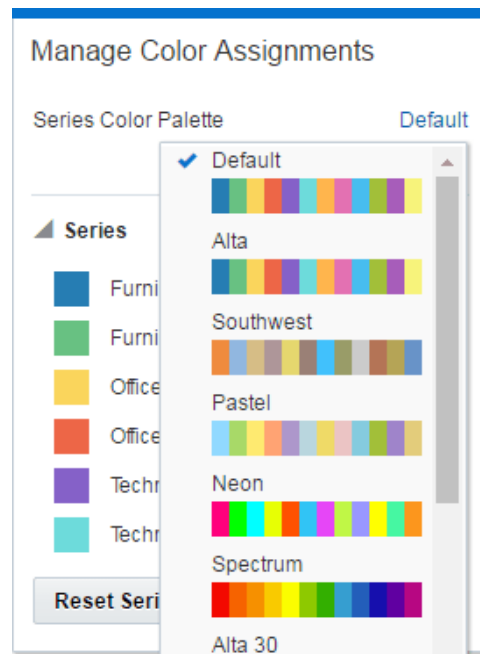
- c. You can experiment with visualization colors and select **Reset Visualization Colors** to revert to the original colors.
- d. Select **Stretch Palette** to turn this option on or off. Color palettes have a set number of colors, and if your visualization contains more values than the number of color 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.

Change the Color Palette

You can switch between the various color palettes until you find the one you want.

Each color palette contains 12 colors that you can apply to a visualization.

1. Select the visualization that you want to change the color palette for.
2. Click **Menu** or right-click and select **Color**, then select **Manage Assignments**.
3. Locate the **Series Color Palette** and click the color palette that's currently used in the visualization (for example, Default or Alta).

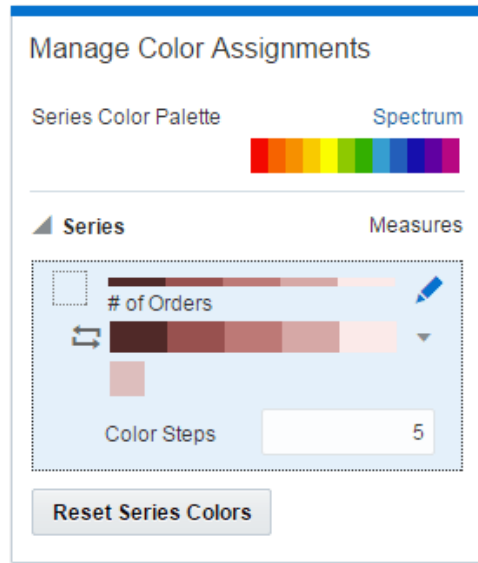


4. From the list, select the color palette that you want to apply to the visualization.

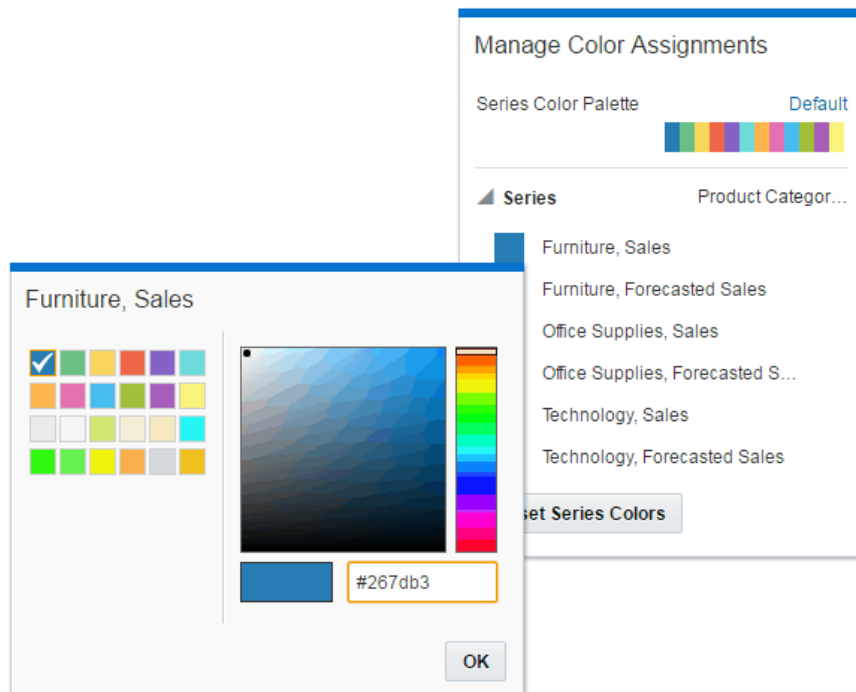
Assign Colors to Columns

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

1. Select the visualization that you want to manage the colors for.
2. Click **Menu** on the visualization toolbar or right-click and select **Color**, then select **Manage Assignments**.
3. 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).



4. 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**.



Format Numeric Values of Columns

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

1. Create or open the project that contains the numeric column whose properties you want to change.
2. In the Data Panel, select the column.
3. In the properties pane for the selected column, use the **General** or **Number Format** tabs to change the numeric properties.
 - **General** - Change the column name, data type, treat as (measure or attribute), and aggregation type. For example, to change how a number is aggregated, use the **Aggregation** option.
 - **Number Format** - Change the default format of a number column.
4. Click **Save**.

Format Numeric Values of Visualizations

You can format numeric properties of a visualization using a wide range of ready-to-use formats. For example, you might change the aggregation type from Sum to Average.

1. Create or open the project that contains the visualization whose properties you want to change.
2. In the Visualize canvas, select the visualization.
3. In the properties pane for the selected visualization, use the **Values** tab to change the numeric properties.

For example, to change how a number is aggregated, use the **Aggregation Method** option.
4. Click **Save**.

Set Currency Symbols for Visualizations

You can set measure values in a visualization to display an appropriate currency symbol.

You can configure a measure to use a custom currency to display the symbol associated with a currency. For example, if you set a canvas filter to display a European Ledger, then the Euro symbol is displayed for each measure value that's associated with the custom currency property. The project data must contain a currency code column, for example, a Ledger Currency column. The currency code column enables the display of an appropriate currency symbol for the measure column, for example, a Profit column.

1. Create or open the project.

2. In the Properties panel for a selected measure, click the **Values** tab, click **Number Format**, and select **Currency**.
3. In the **Currency** field, click the currently displayed value and select **Custom**.
4. In the **Custom** field, add the column that determines the currency code.
5. Click **Save**.

Apply Map Backgrounds and Map Layers to Enhance Visualizations

You can use geographical information to enhance the analysis of your data.

Topics:

- [About Map Backgrounds](#)
- [Enhance Visualizations with Map Backgrounds](#)
- [Use Different Map Backgrounds in a Project](#)
- [Interpret Data Values with Color and Size in Map Visualizations](#)
- [Add Custom Map Layers](#)
- [Update Custom Map Layers](#)
- [Apply Multiple Data Layers to a Single Map Visualization](#)
- [Create Heatmap Layers on a Map Visualization](#)
- [Create Cluster Layers on a Map Visualization](#)
- [Represent Point Data With Custom Icons on a Map](#)
- [Select Points or Area on a Map](#)
- [Represent Line Data Using Size and Color on a Map](#)
- [Make Maps Available to Users](#)
- [Make Map Backgrounds Available to Users](#)

About Map Backgrounds

You can enhance map visualizations in projects by adding and maintaining map backgrounds.

Oracle Data Visualization includes ready-to-use map backgrounds that you can easily apply to a project. You can also add backgrounds from the available list of Web Map Service (WMS) providers such as Google Maps and Baidu Maps. Background maps from these providers offer details and language support (such as city or region name) that certain geographic regions (such as Asian countries) require. You can enhance backgrounds in these ways:

- Modify the background parameters such as map type, format, language and API keys. The parameters are different for each WMS provider.
- Assign or change the default background in a project.
- Reverse the inherited default background settings in a project.

You can add a WMS provider and perform the following types of functions:

- Add the WMS map servers, and make them available as additional map background options.
- Select one or more map backgrounds available from the WMS provider.
- Assign an added WMS provider's map as the default map background.

Enhance Visualizations with Map Backgrounds

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

Tutorial

Based on the column values a specific set of dimensions and metrics is displayed on the map visualization. Data Visualization displays either the default map background or an existing Oracle map background if no default is set.

1. Create or open a project and confirm that you're working in the Visualize canvas.
2. To select a column and render it in a map view, do one of the following:
 - Right-click a map-related column in the Data Element pane and click **Pick Visualization**, then select **Map**.
 - Drag and drop a map-related column from the Data Element pane to the blank canvas, or between visualizations on the canvas. On the visualization toolbar, click **Change Visualization Type** and select **Map**.

The selected column or attribute is displayed as a data layer in the Category (Geography) section of the Grammar Panel and in the Data Layers tab of the properties pane.

3. In the properties pane, click **Map** and specify the visualization properties.
4. If you want to use a different map background, click the **Background Map** value in the properties pane and select a background. For example, select Google Maps, and the visualization displays Google Maps as the map background.
 - If you want to see the list of available map backgrounds or change the backgrounds that you can use, do one of the following:
 - Click the **Background Map** value and select **Manage Map Backgrounds** to display the Map Background tab.
 - Open the Console page, click **Maps** and select the Backgrounds tab.
 - Optionally, select another map background such as Satellite, Road, Hybrid, or Terrain.
5. Click **Save**.

Use Different Map Backgrounds in a Project

As an author you can use different map backgrounds in map visualizations.

Here is an example of how you might use a map background in a project.

1. On the Home page click **Create**, then click **Project**.
2. Select a data set in the Add Data Set dialog.
3. Click **Add to Project**.

The Project pane and list of Data Elements is displayed.

4. Select a map-related data element (for example, click **City**), and click **Pick Visualization**.
5. Select **Map** from the list of available visualizations.
Data Visualization displays either the default map background or an existing Oracle map background if no default is set.
6. In the visualization properties pane, select the **Map** tab.
7. Click the **Background Map** value and select a map from the drop-down list.
For example, select Google Maps, and Data Visualization displays Google Maps as the map background.
8. (Optional) Click another value to change the type of map (such as Satellite, Road, Hybrid, or Terrain).
9. (Optional) Click **Manage Map Backgrounds** from the **Background Map** options to display the Map Backgrounds pane.

Use this option to maintain the map backgrounds that you want to use.

Interpret Data Values with Color and Size in Map Visualizations

You can use the color and size of a shape such as a polygon or a bubble, to interpret values in a map visualization.

1. Create or open a project and confirm that you're working in the Visualize canvas.
2. Select a column and render it in a map view, doing one of the following:
 - Right-click a map-related column in the Data Element pane and click **Pick Visualization**, then select **Map**.
 - Drag and drop a map-related column from the Data Element pane to the blank canvas, or between visualizations on the canvas. On the visualization toolbar, click **Change Visualization Type** and select **Map**.
3. Drag and drop columns to the following sections on the Visualization Grammar Pane:

Section	Description
Color	Change the color for geometries displayed in the corresponding map layer (for example, polygon fill color, bubble color) 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've 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 to interpret measure columns and attribute values:

- **Legend** - If a measure column or an attribute has multiple values, then the legend is displayed that shows values by size or color.
- **Tooltip** - If you hover the mouse pointer over a color bubble or data point, then the values are displayed in a tooltip.

Add 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": {
    "adm1_code": "MEX-2706",
    "OBJECTID_1": 745,
    "diss_me": 2706,
    "adm1_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.

You can perform the following actions when managing System Map Layers and Custom Map Layers.

What action can I perform?	System Map Layer	Custom Map Layer
Enable	Yes	Yes
Disable	Yes	Yes
Create	No	Yes
Delete	No	Yes

- 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.
- 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>.

Custom layers that use the Line String geometry type aren't fully supported. The Color and Size section on Visualization Grammar pane doesn't apply to line geometries.

- Click **Open** to display the Map Layer dialog.
- Enter a **Name** and an optional **Description**.
- 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.

- Click **Add**. A success message is displayed when the process is complete and the layer is added.

Update Custom Map Layers

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

- Open the Console page and click **Maps** to display the Map Layers page.
- In the Custom Map Layers section, right-click the map layer and click **Options**, then do the following:
 - 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.
 - 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.
- Click the map layer to enable or disable it. For example, if you want to exclude us_states_hexagon_geo on the map, click the layer to disable it and remove it from searches.
- To switch from using one map layer to another, do the following:
 - In the properties pane, select the **Map** tab to display the map properties.

- b. Click the current **Map Layer** for example Mexican States. This displays a list of available custom map layers that you can choose from.
- c. Click the map layer that you want to use to match your data points.

Apply Multiple Data Layers to a Single Map Visualization

You can use the data layer feature to display multiple data series (different sets of dimensions and metrics) on a single map visualization. The data layers are overlaid on one another in a single map visualization.

1. Create or open the project where you want to display multiple data layer overlays on a single map visualization. Confirm that you're working in the Visualize canvas.

2. Drag and drop a measure or attribute columns containing map-related data from the Data Panel to the Category (Geography) section on the Grammar Panel.

If you're creating a map visualization, in the Data Panel, right-click an attribute column and click **Pick Visualization** then select **Map**.

3. Click **Layer options** in the Category (Geography) section of the Grammar Panel and click **Add Layer** to add a new data layer (for example, Layer 2).

Alternatively in the Data Layers tab click **Add Layer (+)**.

4. Drag and drop a column to the Category (Geography) section. Based on the column values the map visualization automatically updates with a different set of dimensions, and it overlays on the previous layer.

5. Repeat step 3 and 4 to add multiple data layers on the map visualization.

6. Click **Layer options** to use other options such as Order Layer, Hide Layer, and Manage Layers.

7. In the Data Layers tab of the properties pane, you can specify the options for a layer such as Layer Type, Map Layer, Transparency, and Show Layer.

8. To refine the data shown for the measure and attribute columns in all the data layers, you can apply a filter such as a Range Filter or List Filter, to the map visualization. For example, you can select a measure or attribute for a layer, then apply filter to reduce the amount of data shown, and add the same measure or attribute to the Color section on the Grammar Panel.

Create Heatmap Layers on a Map Visualization

You can use a heatmap as a data layer type on a map visualization to identify the density or high concentration of point values or metric values associated with the points. For example, you can use a heatmap to identify the high profit stores in a geographic region or country.

You can create two types of heatmap layers:

- **Density heatmap** - Uses only map-related column data (such as latitude and longitude columns). Density heatmap layers show the cumulative sum of a point, where each point carries a specific weight. A point has a radius of influence around it, such that other points that fall in the same area also contribute to the total cumulative result of a point.
- **Metric heatmap** - Uses measure column data in the same layer. For example, if you add a measure column to the Color section on the Grammar Panel the heatmap is updated to show interpolated metric values.

1. Create or open the project where you want to use a heatmap layer on a map visualization. Confirm that you're working in the Visualize canvas.
2. Create an empty map visualization.
3. Drag and drop attribute columns containing map-related data from the Data Panel to the Category (Geography) section on the Grammar Panel.
 - If you're creating a project with a map visualization, in the Data Panel, right-click an attribute column and click **Pick Visualization** then select **Map**.
4. Go to the Data Layers tab of the properties pane.
 - Alternatively, click **Layer options** in the Category (Geography) section and click **Manage Layers**.
5. To create a density heatmap, click **Layer Type** value and select **Heatmap**.
 - Alternatively, you can add a new map layer, change the layer type to **Heatmap**, then add attribute columns to the Category (Geography) section.
6. To create a metric heatmap, drag and drop a metric column from the Data Panel to the Color section. The heatmap visualization changes from density to metric.
7. In the Data Layers tab of the properties pane, specify the options for the heatmap layer such as Radius, Interpolation, Transparency, and Color.
 - The default interpolation method is automatically selected based on the aggregation rule of the metric column or value that you've selected for the layer.
 - You can select the radius value in pixels (px). The radius value is the extent of influence of a measure around a point value on a map.

The heatmap is automatically updated based on the options selected in the Data Layers tab.

Create Cluster Layers on a Map Visualization

You can use a cluster layer as a type of data layer on a map visualization. In a cluster layer, points that are positioned near each other are grouped together into a common bubble.

The number of points clustered in the group is indicated in the bubble's label. If selected points are grouped with unselected points, the circle is dotted to indicate a partial selection. Individual points are displayed as pin icons to emphasize the distinction between grouped and ungrouped points. Points are grouped based on their proximity in pixels and on the map's zoom factor.

1. Create or open the project where you want to use a point cluster layer on a map visualization. Confirm that you're working in the Visualize canvas.
2. Create an empty map visualization by dragging the Map visualization from the Data Panel to the canvas.
3. Drag and drop attribute columns containing map-related data from the Data Panel to the Category (Geography) section on the Grammar Panel.

If you're creating a project with a map visualization, in the Data Panel, right-click an attribute column and click **Pick Visualization** then select **Map**.
4. Click the Data Layers tab of the properties pane.

Alternatively, click **Layer options** in the Category (Geography) section and click **Manage Layers**.

5. To create a point cluster, click **Layer Type** value and select **Cluster**.

Alternatively, you can add a new map layer, change the layer type to **Cluster**, then add attribute columns to the Category (Geography) section.

The point cluster is automatically updated based on the zoom level.

Represent Point Data With Custom Icons on a Map

You can use the Shapes edge to represent point data with custom icons in a map visualization.

You can associate a column with the Shape edge to display a custom shape for point data. For example, you can distinguish between cities by displaying them using custom shapes (for example, a square, a triangle, or a currency symbol). You can also change which custom shape you want to apply to one or more data points.

1. Create or open the project with a map visualization that contains point data and confirm that you're working on the Visualize canvas.
2. Drag and drop an attribute column containing point data (for example, city) from the Data Panel to the Category (Geography) edge on the Grammar Panel.
3. Drag and drop a column from the Data Panel to the **Shapes** edge and optionally to the **Color** edge on the Grammar Panel.

The map visualization automatically updates based on your selection and overlays the previous layer.

4. (Optional) You can change how you assign custom shapes to data points and to the map legend.
 - a. Highlight one or more data points on the map using one of the selection tools, or use Ctrl-click to select one or more data points.
 - b. Right-click one of the multiple-selected data points, select **Custom Shapes** and then select **Series** or **Data Point**.
 - c. Select a custom shape and click **Done**.

Custom shapes are applied as follows:

- **Series dialog** - custom data point shape not previously set
Replaces highlighted data points and series items with the custom shape.
 - **Series dialog** - custom data point shape previously set
Replaces only corresponding series items with the custom shape.
 - **Data Point dialog**
Replaces only highlighted data points with the custom shape.
5. If you want to reassign the custom shape for a data point:
 - a. Right-click any data point, select **Shape**, and click **Custom Shapes**.
 - b. To change the custom shape assigned to a data point, click the shape corresponding to the data point that you want to change.
 - c. Select a new custom shape and click **Done**, then click **Done** again.

6. If you want to reset all of the custom shapes currently applied to data points on a map visualization, right-click any data point, select **Shape**, and click **Reset Custom Shapes**.

This resets all of the shapes applied to data points on the map to the default setting.

Select Points or Area on a Map

You can select multiple points on the map in a specific area that you define using the selection tools.

1. Create or open the project with map visualizations and confirm that you're working on the Visualize canvas
2. Select the map visualization.
3. On the visualization toolbar, do one of the following:
 - Click the **Rectangle Selection** tool and drag a rectangle on the map to select the points or area you want.
 - Click the **Radial Selection** tool and select a point on the map, then drag outward to create a circle. The unit shows the total distance covered on the map.
 - Click the **Polygon Selection** tool and drag a freehand border around the points or area you want to select on the map.

The selected points or area is highlighted on the map.

Represent Line Data Using Size and Color on a Map

You can represent the weight of line data through thickness and color in a map visualization.

You can associate a measure with the Size edge to indicate the relative weight of a line. For example, to compare delays in airline routes, you can display flight routes with varying line thickness, where a thicker line and a darker color correspond to a higher number of delays.

1. Create or open the project with a map visualization that contains line data and confirm that you're working on the Visualize canvas.
2. Select the map visualization that displays the line data.
3. Drag and drop a column containing line data (for example airline routes) from the Data Panel to the Category (Geography) edge on the Grammar Panel.
4. Drag and drop a line measure column from the Data Panel to the **Size** edge and optionally to the **Color** edge on the Grammar Panel.

The map visualization automatically updates based on your selection and overlays the previous layer.

Make 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.

Make Map Backgrounds Available to Users

Oracle provides two preconfigured map backgrounds with Data Visualization. As an administrator, you can add map backgrounds for use in map visualizations.

1. On the Home page, click **Console**, select **Maps**, and then click **Backgrounds**.
 - To set a background as the default map background, click the **Default** column.
 - To include or exclude a map background as an available option to users, click the **Include** column.
2. To add a map background, click **Add Background** and select a map background from the list.

Oracle Maps are preconfigured and shipped with the product. Other background maps that you can add are Google Maps and Baidu Maps. For a map provider other than Oracle (for example, Google or Baidu), you must obtain a Map API access key for which you may be charged based on your usage.

3. Copy and paste in the appropriate Maps API access key.

You must sign up with the provider to be able to add and use any of these map types.

- To use the Google Maps tiles, you must obtain a Google Maps API access key from Google. Google prompts you to enter your Maps API access key and, when applicable, your Google “Client ID”. Usage of the tiles must meet the terms of service specified by Google in the Google Developers Site Terms of Service.
 - To use the Baidu Maps tiles, you must obtain a Baidu Maps API access key from Baidu. Baidu prompts you to enter your Maps API access key. Usage of the tiles must meet the terms of service specified by Baidu in the Baidu User Agreement.
4. Select a default map type if applicable and enter a helpful description if needed.
 5. Click **Add** to include the map in the list of available map backgrounds.

Data Visualization displays a message when the map background is successfully added.

Sort and Select 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 and click **Menu** or right-click, then select one of the following analytics actions:

- 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 only 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** to add a reference line to highlight an important fact depicted in the visualization, such as a minimum or maximum value. For example, you can add a reference line across the visualization at the height of the maximum revenue amount.

Replace a Data Set in a Project

You can replace a data set by re-mapping columns used in the data visualization project to columns from a different data set. As part of replacing a data set, you can review and re-map only those columns that are used in the project and replace them with columns of the same data type in the replacement data set. For example, you can replace a test data set with a production data set, or use a project as a template in which you can replace the data but maintain the added structures, visualizations, and calculations.

The **Replace Data Set** option is available only for projects using a single data set. The option isn't available for projects that use multiple data sets.

1. Create or open the Data Visualization project in which you want to replace the data set.
Confirm that you're working in the **Visualize** canvas.
2. In the Data Panel pane, right-click the data set and select **Replace Data Set**.
3. In the Replace Data Set dialog, perform the following tasks:
 - Select the data set that replaces the existing data set in the project and click **Select**.
 - Review the mapping of the data between the existing and the new data sets in the data-mapping table. The data-mapping table includes all the data elements used in the project's visualizations, calculations, and filters. The data elements with similar type and names in the two data sets are automatically mapped. In the table, based on data types, the data elements are grouped and sorted alphabetically.

- In the new data set column, click the drop-down arrow in a cell and select a specific data element to adjust the mapping of the data.
 - Only data elements of the same type are displayed in the data element selection dialog.
 - You can navigate back to select a different data set.

4. Click **Replace**.

The new data set replaces the existing data set in the project. You see a notification if you've selected a data set that is joined to other data sets in the project. Review and adjust the joins in the project's **Data Diagram**.

In the data-mapping table based on the selection, the data is updated throughout the project. For example, if you map a data element to **None**, the specific data is removed from the visualizations, calculations, and filters.

Remove a Data Set from a Project

You can remove a data set from a project.

Removing data from a project differs from deleting the data set from Data Visualization.

1. Open your project and in the Data Panel, select the data set that you want to remove.
2. Right-click and select **Remove from Project**.

Analyze Your Data Set Using Machine Learning

Machine learning analyzes the data in your data set to provide insights that enable you to explain the various aspects of that data.

Topics:

- [Use Machine Learning to Discover Data Insights](#)
- [Add Data Insights to Visualizations](#)

Use Machine Learning to Discover Data Insights

Machine learning analyzes the data to recognize the patterns and trends in your data set to provide visual insights and enhanced statistical analysis. You can subsequently use these visual insights and statistical analysis in your project visualization canvas to interpret the data in your data set.



Machine learning provides accurate, fast, and powerful data insights because it analyzes and processes technical and statistical complexity and the volume and variety of the data in your data set. Because of machine learning's accuracy, speed, and scale, it's cheaper and more powerful than the traditional method of analyzing data.

To discover data insights, you simply select an attribute in your data set. Machine learning provides you with narratives, visual insights, and statistical analyses such as

charts. You can select specific charts and include them as visualizations in your project visualization canvas. You manage these visualizations as you do any other visualizations in your project. With machine learning, you don't have to waste time guessing and dropping random data elements on the canvas to create a visualization for data insight.

Before you start, install machine learning on the Windows or Mac machine where you installed Data Visualization Desktop. See [How do I install Machine Learning for Desktop?](#)

After you've installed machine learning, you can start uncovering insights in your data. See [Add Data Insights to Visualizations](#).

Add Data Insights to Visualizations

You can select specific data insights charts provided by machine learning and add them directly as a visualization in your project's visualization canvas.

Tutorial

You must install the Data Visualization machine learning component to display the **Explain** option.

1. Create or open a data visualization project. Confirm that you're working in the Visualize canvas.
2. In the Data Panel, right-click a data element (attribute or measure) and select **Explain <Data Element>** to display the Explain <Data Element> dialog tabs:
 - **Basic Facts about <Data Element>** - Shows the basic distribution of the data element (attribute or measure) values across the data set and its breakdown against each one of the measures in the data set.
 - **Key Drivers of <Data Element>** - Shows data elements (attributes or measures) that are more highly correlated to the outcome for the selected data. The charts showing the distribution of the selected attribute value across each of the correlated attributes values is displayed.
 - **Segments that Explain <Data Element>** - Shows the segments or group in the data set, after examining all the records, that can predict the value of the selected data element. You can select a particular segment or group and then continue to analyze it.
 - **Anomalies of <Data Element>** - Shows the group of anomalies or unusual values in the data set that you can relate to the selected data element (attribute or measure). You can review and select particular group of anomalies.
3. Use the Explain dialog to help you configure your visualizations.
 - When you click a data element (attribute or measure), information for the selected data element is highlighted in the segments below.
 - You can select more than one data element (attribute or measure) at the same time to see results in the segments.
 - You can also sort how the information is displayed in the Segments (High to Low, or Low to High, group by Color, or sort by data element Value).
 - For each Segment in the decision tree, summary rules for the percentage of the data element and other metadata about the section are displayed. For

example, a certain Segment might show that a particular percentage of the selected attribute (data element) belongs to a specific group like location, data point, another attribute, or measure. You can then select a specific group, like location, to analyze the selected attribute.

- The Anomalies section finds data points that don't fit the expected pattern.
4. Click the check mark when you hover the mouse pointer over any of the data insight charts to select a specific chart.
 5. Click **Add Selected** to add the charts you've selected as different visualizations in your project's visualization canvas. You can manage data insight visualizations like any other visualizations you've manually created on the canvas.

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 or Insights.

- 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

Create and Apply Filters to Visualize Data

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

Topics:

- [Typical Workflow to Create and Apply Filters](#)
- [About Filters and Filter Types](#)
- [How Data Sets Interact with Filters](#)
- [How the Number of Data Sets Affects Filters](#)
- [Synchronize Visualizations in a Project](#)
- [About Automatically Applied Filters](#)
- [Create Filters on a Project](#)
- [Create Filters on a Visualization](#)
- [Move Filter Panels](#)
- [Apply Range Filters](#)
- [Apply Top Bottom N Filters](#)
- [Apply List Filters](#)
- [Apply Date Range Filters](#)
- [Apply Relative Time Filters](#)
- [Build Expression Filters](#)

Typical Workflow to Create and Apply 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.	Apply Range Filters Apply Top Bottom N Filters Apply List Filters Apply Date Range Filters
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.	Create Filters on a Project Create Filters on a Visualization
Build and use expression filters	You can build and use expression filters to define more complex filters using SQL expressions.	Build Expression Filters

Task	Description	More Information
Set visualization interaction properties	Define how you want visualizations to affect each other.	How Data Sets Interact with Filters

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 [Apply Range Filters](#).
- **List filters** - Applied to data elements that are text data types and number data types that aren't aggregatable. See [Apply 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 [Apply Date Range Filters](#).
- **Expression filters** - Let you define more complex filters using SQL expressions. See [Build Expression Filters](#).

How Data Sets Interact with Filters

There are several ways that data sets can interact with filters 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.

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 Affects Filters

Filters can interact differently with visualizations depending on the number of data sets, whether the data sets are joined, and what the filters are applied to.

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

Single Data Set	Filter Interaction
Add a filter to the filter bar	It applies to all visualizations in the project.
Add a filter to a visualization	It is applied after filters on the filter bar are applied.
Add multiple filters	By default filters restrict each other based on the values that you select.
Multiple Data Sets	Filter Interaction
If you add filters to the filter bar.	<ul style="list-style-type: none"> 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. 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. 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. You can select Pin to All Canvases of a filter, to apply a filter to all canvases in the project.
If you 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.
If you add filters to visualizations	<ul style="list-style-type: none"> If you specify a filter on an individual visualization, that filter applies to that visualization after the filters on the filter bar are applied. If you select the Use as Filter 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.

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

Synchronize Visualizations in a Project

You can specify whether or not to synchronize Visualizations in a canvas.

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.

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.

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.

Create 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.

Instead of or in addition to adding filters to the project or to an individual canvas, you can add filters to an individual visualization.

1. Click **+ Add Filter**, and select a data element. Alternatively, drag and drop a data element from the Data Panel 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.

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.
 - Apply a list filter to filter on columns such as Product Category or Product Name.
 - Apply a date filter to filters on columns such as Ship Date or Order Date.
3. Optionally, click the filter bar menu or right-click, then select **Add Expression Filter**.
4. Optionally, click the filter **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've 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. Optionally, click the filter bar menu or right-click and 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 and select **Pin to All canvases** of a filter to apply a filter to all canvases in the project.

You can also go to the filter bar and perform the following steps:

- Select a filter and right-click, then select **Delete** to remove it from the project.
- Right-click and select **Clear All Filter Selections** to clear the selection list of all the filters in the filter bar.
- Right-click and select **Remove All Filters** to remove all the filters in the filter bar.

Create Filters on a Visualization

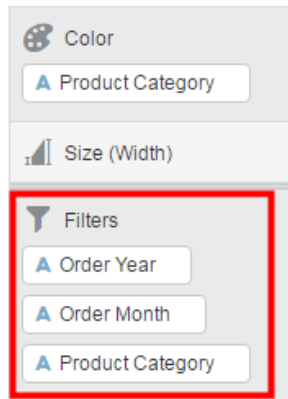
You can add filters to limit the data that's displayed in a specific visualization on the canvas.

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.

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

Instead of or in addition to adding filters to an individual visualization, you can add filters to the project or to an individual canvas. Any filters included on the canvas are applied before the filters that you add to an individual visualization.

1. Confirm that you're working in the Visualize canvas.
2. Select the visualization that you want to add a filter to.
3. Drag and drop one or more data element from the Data Panel to the Filter drop target in the Grammar Panel.



To use data elements of a data set as a filter in the visualization of another data set, you've to join both the data set, before using the data elements as filters.

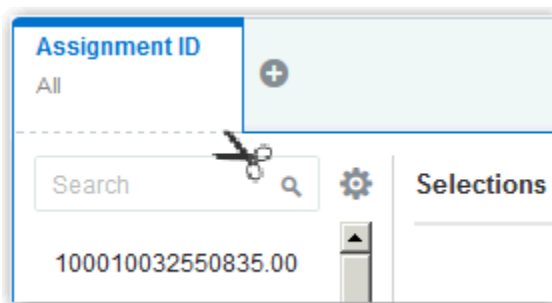
4. Set the filter values. How you set the values depends upon the data type that you're filtering.
 - To set filters on columns such as Cost or Quantity Ordered, see [Apply Range Filters](#).
 - To set filters on columns such as Product Category or Product Name, see [Apply List Filters](#).
 - To set filters on columns such as Ship Date or Order Date, see [Apply Date Range Filters](#).
5. (Optional) Click the filter bar menu or right-click and click **Auto-Apply Filters**, then select **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.

Move Filter Panels

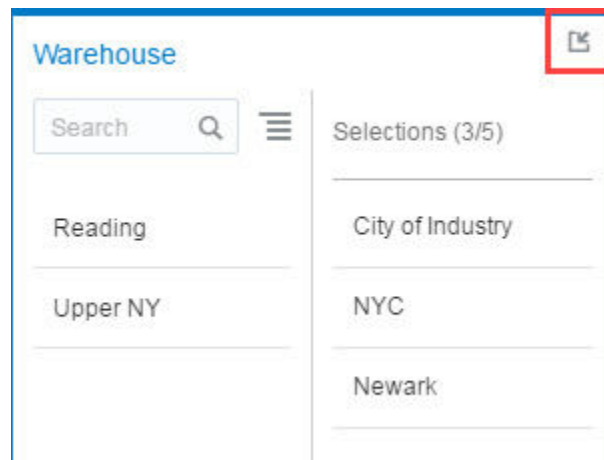
You can move filter panels from the filter bar to a different spot on the canvas.

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.

1. 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.



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



Apply Range Filters

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

Range filters are applied only to measure columns and limits data to a range of contiguous values, such as revenue of \$100,000 to \$500,000. Alternatively, 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 of 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. You can optionally perform any of the following steps:
 - Click a member to remove or add it to the selected list.
 - Click the **Plus (+)** icon to add a new member to the selected list.
 - Set the range that you want to filter on by moving the sliders in the histogram.
3. Click outside of the filter to close the filter panel.

Apply Top 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, select a filter in the filter bar.
 - b. Click the filter menu or right-click and select **Filter Type**, then click **Top Bottom N**. You can only convert a range filter to Top Bottom N filter
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, select the visualization to which you want to apply the filter.
 - b. In the Grammar Panel go to the **Filters** drop target.
 - c. Select a measure, then right-click and select **Filter Type**, then click **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.

Apply 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 select a filter to view the Selections list.
2. Locate the member you want to include and click it to add it to the Selections list. Alternatively, use the **Search** field to find a member you want to add to the filter. Use the wildcards * and ? for searching.
3. Optionally, you can also perform 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 to close the filter panel.

Apply Date Range Filters

Date range 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. Optionally, to start over and select different dates, right-click the filter in the filter bar and select **Clear Filter Selections**.
5. Click outside of the filter to close the filter panel.

Apply Relative Time Filters

Use the relative time filter on a Date or Date/Time column to display data for a specified time period based upon the current date and time.

You can specify a relative time period as either an explicit number of past or future time units (for example 2 years), or you can specify a previous period. For example, Year To Date which includes data from 1-January this year to the current date, and Month To Date which includes data from the beginning of the month to the current date.

You can apply a Relative Time filter only to date columns that already exist in the data source, and not to derived columns such as Year, or Quarter. The Relative Time filter type supports Date (with no time of day portion) and DateTime (that is, TIMESTAMP with both date and time of day) column types.

The current date and time used in queries is the Oracle Business Intelligence Server host's date and time in the server's timezone (not the browser host's time or timezone). The starting day of the week (Sunday versus Monday) is based on the locale of the Oracle Business Intelligence Server which is set using the server configuration setting NLS_TERRITORY.

1. In the Visualize canvas, go to the filter bar and add a date range filter.
2. Click the filter context menu, select **Filter Type**, and **Relative Time** to switch to a relative time filter.
3. In the **Relative Time** filter, select a **Type** that defines the range that you want to filter.
 - **Last** - You specify a **Period** to apply to the selected **Time Level** (Years, Quarters, Months, Weeks, Days, and includes Hours, Minutes, and Seconds if the column time is TIMESTAMP) relative to today's date, to display records for the date values for that period.
Last filters that are based on a DateTime column and which have a grain of Day or longer (for example, Year, Quarter, Month, Week, Day), retrieve data from the same time of day on the starting day. For example, if the Oracle

Business Intelligence server date/time is currently Thursday 3:15pm , a Last 2 Days filter on a DateTime column retrieves data with timestamps between Tuesday 3:15pm and Thursday 3:15pm in the server's timezone. Filter queries that are based on a DATE column type (which by definition have no time of day associated) only depend on the server host's date, not the time of day.

- **Next** - You specify a future **Period** number to apply to the selected **Time Level** (Years, Quarters, Months, Weeks, Days, also Hours, Minutes, and Seconds if the column time is TIMESTAMP) relative to today's date, to display records for the date values for that period.
 - **To Date** - You specify a past **Time Level** (Year, Quarter, Month, Week, Day, also includes Hour, and Minute if the column time is TIMESTAMP) relative to today's date, that you want to apply to the date values in the visualization. A To Date filter retrieves data from the beginning of the chosen period, for example, Month to Date retrieves data from midnight of the first day of this month up until the current date and time (that is, Today or Now).
4. Click outside of the filter to close the filter panel.

Build 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 Visualize canvas, mouse-over the filter bar at the top of the pane and click **Menu**, then select **Add Expression Filter**.
2. In the Expression Filter panel, compose an expression.
3. In the **Label** field, give the expression a name.
4. Click **Validate** to check if the syntax is correct.
5. When the expression filter is valid, then click **Apply**. The expression is applied to the visualizations on the canvas.

4

Use Other Functions to Visualize Data

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

Topics:

- [Typical Workflow to Prepare, Connect and Search Artifacts](#)
- [Build Stories](#)
- [Add Notes](#)
- [Identify Content with Thumbnails](#)
- [Manage Custom Plug-ins](#)
- [Compose Expressions](#)
- [Use Data Actions to Connect to Canvases and External URLs and Use in External Containers](#)
- [Search Data, Projects, and Visualizations](#)
- [Save Your Changes Automatically](#)
- [Sort the Items in a Page](#)

Typical Workflow to Prepare, Connect and Search Artifacts

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

Task	Description	More Information
Build stories	Capture the insights that you discover in your visualizations into a story that you can revisit later, include in a presentation, or share with team members.	Build Stories
Manage custom plug-ins	Upload, download, search for, and delete custom plug-ins that you can use to customize various objects such as visualizations types or projects.	Manage Custom Plug-ins
Compose expressions	Compose expressions to use in filters or in calculations.	Compose Expressions
Create and apply data actions	Create data action links to pass context values from canvases to URLs or project filters.	Use Data Actions to Connect to Canvases and External URLs and Use in External Containers
Search artifacts	Search for projects, visualizations, and columns. Use BI Ask to quickly build visualizations.	Search Data, Projects, and Visualizations

Build Stories

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

Topics:

- [Capture Insights](#)
- [Create Stories](#)
- [View Streamlined Content](#)

Capture Insights

As you explore data in visualizations, you can capture memorable information in one or more insights, which 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.

Tutorial

Using insights, you can take a snapshot of any information that you see in a visualization and keep track of any moments of sudden realization while you work with the data. You can share insights in the form of a story, but you don't have to. Your insights can remain a list of personal moments of realization that you can go back to, and perhaps explore more. You can combine multiple insights in a story. You can also link insights to visualizations using the Interaction property.

Insights don't take a snapshot of data. They take a snapshot of the project definition at a certain point in time.

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 insights, such as 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 select **Synchronize Visualizations**. Alternatively, click **Canvas Properties** and select this option.
 - To synchronize your story canvases with your visualizations, display the Visualize pane and right-click the canvas tabs to select **Canvas Properties**, then change the **Synchronize Visualizations** setting to on (selected).
2. Continue adding insights to build a story about your data exploration.

The story builds in the Narrate canvas. Each insight has a tab.

Create Stories

After you begin creating insights within a story, you can cultivate the look and feel of that story. For example, you can rearrange insights, include another insight, or hide an insight title. 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 with insights, 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 an insight, click or hover the mouse pointer over the insight, click the menu icon, and select from the editing options.
 - To include or exclude an insight, right-click the insight and use the **Display** or **Hide** options. To display insights, on the canvas property pane, click **Notes**, then **Show All Notes**.
 - To show or hide insight titles or descriptions, on the canvas property pane, click **General**, and use the **Hide Page** and **Description** options.
 - To rearrange insights, 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 insights use the **Show Notes** option.

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

View 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**.

2. To return to the interaction mode, click **X**.

Add Notes

You can add notes to a canvas on the Narrate pane to refer to a specific spot or data point such as a column in a table, a particular horizontal bar, or a cluster in a Scatter plot.

1. In your project, click **Narrate** and select the canvas where you want to add notes. Alternatively, in the Canvases Panel, select a canvas and click **Canvases List** or right-click, then click **Add to Story**. You can also drag and drop the canvas from the Canvases Panel to the Story page.
2. Select a data point or spot on the visualization where you want to add a data reference annotation and click **Add Note**. Alternatively, click **Add Note** to annotate your canvas with insights.
3. Enter the text you want to show in the note.
4. In the format text dialog, do the following:
 - Define the format of the note text.
 - Click **Link** if you want to insert a web address in the note. In the Hyperlink dialog, enter the web address and click **OK**.
5. Continue adding notes to your canvas.

A connector or line connects the note to the data point or spot on the visualization. If you select more than ten data points, the connectors won't be displayed. To show the connectors select the note body and click the drop-down arrow, then select **Show Connector**. If you change or remove a data point on the Visualize canvas, the note attached to that data point is automatically hidden.

You can't connect a note to a data point or spot on the following visualization types:

- List
- Tile
- Correlation Matrix
- Map
- Parallel Coordinates
- Chord Diagram

Edit a Note

You can edit the text or web addresses inserted in notes.

1. Select the canvas where you added the note you want to edit.
2. Click the note on the visualization. Alternatively, select the note body and click the drop-down arrow, then click **Edit**.
3. Edit the text or web address in the note.
4. Click outside of the note body.

Adjust a Note

You can adjust a note after you add it to a canvas on the Narrate pane. For example, you can move the note around on the canvas, connect or detach it from a data point, resize it, or hide it.

1. In the Narrate pane, select the canvas where you added the note that you want to adjust.
2. Select the note body and click the drop-down arrow, then select the appropriate option such as **Duplicate**, **Show Connector**, or **Hide Note**.
3. In the properties pane, click the **Note** tab, and use the options to hide or delete the note.
4. To connect the note to a data point, hover the mouse pointer over the note to see the connection dots be displayed on the note body.
Click a connection dot and drag the cursor to a data point on the visualization.
5. To alter the data points attached to the note, do the following:
 - a. Select the note body and click the drop-down arrow, then select **Detach from Data**.
 - b. Select a connection dot and drag the cursor to the new data points.
6. Select a note body and perform the following actions:
 - Drag the selected note to a new position.
 - Drag the note body sizing handle left and right or up and down.

Identify 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.

Manage Custom Plug-ins

You can upload, download, search for, and delete custom plug-ins in Data Visualization. Plug-ins are custom visualization types that you create externally and import into Data Visualization.

For example, you can upload a custom plug-in that provides a visualization type that you can use in projects.

 [Tutorial](#)

1. Navigate to Console and click **Extensions**. You use this page to upload, search for, delete, or download a custom plug-in.
2. To upload a custom plug-in, click **Upload Extension** and perform one of the following actions.

- Browse to the required plug-in file in your file system, and click **Open** to select the plug-in.
- Drag the required plug-in file to the **Upload Custom Plugin** object.

If the uploaded custom plug-in file name is the same as an existing custom plug-in, then the uploaded file replaces the existing one and is displayed in visualizations.

3. Perform any of the following tasks.

- If the plug-in provides a visualization type, you can select that type from the list of available types when you create or switch the type of a visualization.
- To search for a custom plug-in, enter your search criteria in the **Search** field and click **Return** to display search results.
- To delete a custom plug-in, click **Options** on the custom plug-in and select **Delete**, and click **Yes** to delete the custom plug-in.
If you delete a custom visualization type that's used in a project, then that project displays an error message in place of the visualization. Either click **Delete** to remove the visualization, or upload the same custom plug-in so that the visualization renders correctly.
- To download a custom plug-in from Data Visualization to your local file system, click **Options** on the custom plug-in and select **Download**.

Compose 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 [Create Calculated Data Elements](#) and [Build 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](#).

Use Data Actions to Connect to Canvases and External URLs and Use in External Containers

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

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

Topics:

- [Create Data Actions to Connect Visualization Canvases](#)
- [Create Data Actions to Connect to External URLs from Visualization Canvases](#)
- [Create Data Actions to Connect to REST APIs from Visualization Canvases](#)
- [Invoke Data Actions from Visualization Canvases](#)

Create 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 and confirm that you're working in the Visualize canvas.
2. Click **Menu** on the project toolbar and click **Project Properties**, then select the **Data Actions** tab.
3. Click **Add Action** and enter a name for the new navigation link.
 - You can use only letters and numbers in the navigation link's name.
 - You can add multiple navigation links.
4. Click the **Type** field and select **Canvas Link**.
5. Click the **Anchor To** field and select the 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. Click the **Project** field and select the project you want to use for the anchor:
 - **Use This Project** - Select if you want to link 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 that you want to use.
7. Click the **Canvas Link** field and select the canvas that you want to use.
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 column, then in the **Pass Values** field, select **Anchor Data** to pass the specified column values.

- **All** - Dynamically determines the intersection of the cell that you click 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.
 - **Custom** - Enables you to specify a custom set of columns to pass.
9. Click **OK** to save.

Create 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 select a column such as the supplier ID, it displays a specific external website.

1. Create or open a project and confirm that you're working in the Visualize canvas.
2. Click **Menu** on the project toolbar and click **Project Properties**, then select the **Data Actions** tab.
3. Click **Add Action** and enter a name for the new navigation link.
You can add multiple navigation links.
4. Click the **Type** field and select **URL Navigation**.
5. Click the **Anchor To** field and select the columns that you want the URL to apply to. 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 and optionally include notation and parameters.

For example, where `http://www.example.com?q=${keyValuesForColumn:"COLUMN"}` is displayed like `www.oracle.com?q=${keyValuesForColumn:"Sales"."Products"."Brand"}` The column names that you select here are replaced with values when you invoke the data action.

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 from the menu the navigation name that you created earlier.
Selecting the cells determines the values to pass to the parameters (that is, the URL tokens).

Create Data Actions to Connect to REST APIs from Visualization Canvases

You can use HTTP API data actions in a canvas so that when you select a column, it sends the value to a REST API which returns a response from the external website.

1. Create or open a project and confirm that you're working in the Visualize area.
2. Click **Menu** on the project toolbar and click **Project Properties**, then select the **Data Actions** tab.
3. Click **Add Action** and enter a name for the new HTTP API data action. For example, enter `HTTP API Example`.
You can add multiple HTTP API data actions.
4. Click the **Type** field and select **HTTP API**.
5. Click the **Anchor To** field and select the columns that you want the HTTP API data action 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. Click the **HTTP Method** field and select an appropriate value (that is, GET, POST, PUT, DELETE) to send to the REST API.
7. Enter the URL for the REST API that starts with http or https and optionally includes replacement tokens.

Replacement tokens in the URL pass contextual values to a data action (for example, data values, user name, project path, canvas name).

For example, you can pass a column value (for example, a value for the Category column) to a REST API (for example, the Google books API) using: `http://www.googleapis.com/books/v1/volumes?q=${valuesForColumn:"Category"}` The value that you select from a cell in the Category column (for example, "Books") passes to the REST API.

8. If you selected the POST method, a field is displayed where you enter each parameter on a separate line.

You enter each parameter as a name-value pair with the name and value separated by "=". You can use the same URL token syntax in the name-value pairs as required by the API that you're calling.

For example:

- `paramName1=paramValue1`
- `paramName2=${valuesForColumn:"Product"}`

9. Click **OK** to save.
10. Click a data point in the visualization.

For example, you might select "Books" from the Category column.

11. Right-click and select **HTTP API Example** to display the result.

The selected data-points determine which values to pass to the URL tokens.

A success or failure message is displayed confirming the REST API has been successfully invoked using the selected value.

Invoke Data Actions from Visualization Canvases

You can invoke data actions from a canvas to other canvases and URLs.

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

The name of the data actions that apply in the current view context are displayed in the context menu.

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

The following rules apply to 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. The Pass Values context, set in the **Pass Values** field, 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.

Search 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:

- [Index Data for Search and BI Ask](#)
- [Visualize Data with BI Ask](#)
- [Search for Saved Projects and Visualizations](#)
- [Search Tips](#)

Index 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.

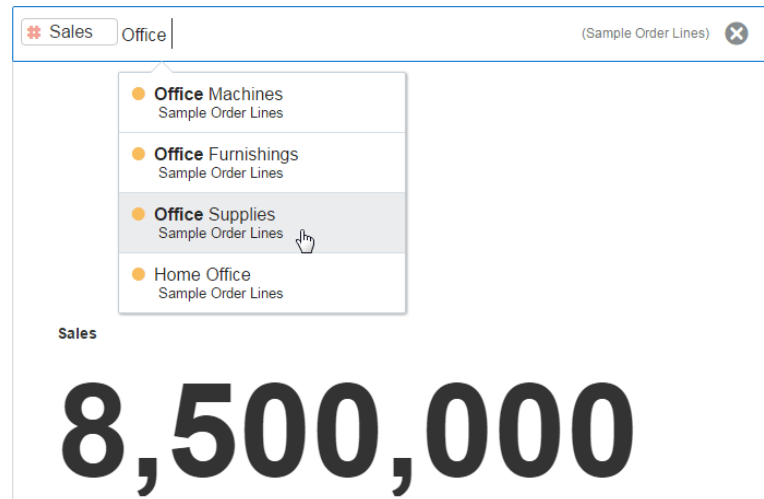
Visualize Data with BI Ask

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.

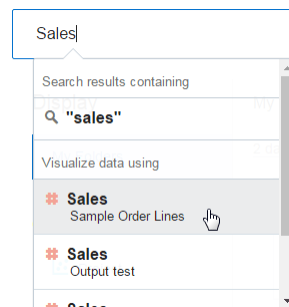
1. On the Home Page, click the **What are you interested in** field.

2. Enter your criteria. 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.



- 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. 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.

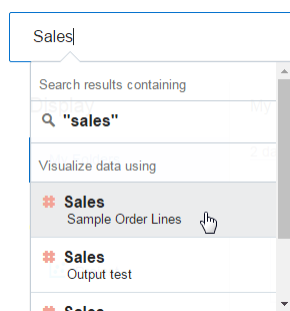
- Click **Change Visualization Type** to apply a different visualization to your data.
- Click **Open in Data Visualization** to further modify and save the visualization.

Search for Saved Projects and Visualizations

On the Home page you can quickly and easily search for saved projects and folders.

Folders and thumbnails for objects that you've recently worked with are displayed on the Home page. Use the search field to locate other content. In the search field you can also use BI Ask to create spontaneous visualizations.

1. On the Home Page, click the **What are you interested in** field.
2. Enter your search criteria such as keywords or the full name of the projects or folders.



3. In the **Search results containing** section, click a search term to display the objects.

Search Tips

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

Table 4-1

Search Criteria Type	Description
Wildcard Searches	You can use the asterisk (*) as a wildcard when searching. For example, you can specify <i>*forecast</i> to find all items that contain the word "forecast". However, using two wildcards to further limit a search returns no results (for example, <i>*forecast*</i>).
Meaningful Keywords	When you search, use meaningful keywords. If you search with keywords such as <i>by</i> , <i>the</i> , and <i>in</i> it returns no results. For example, if you want to enter <i>by</i> 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.

Table 4-1 (Cont.)

Search Criteria Type	Description
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 <i>sales</i> , then the drop-down list of suggestions contains items named <i>sale</i> and <i>sales</i> . However, if you're using a non-English locale such as Korean and type <i>sales</i> , then the drop-down list of suggestions contains only items that are named <i>sales</i> and items such as <i>sale</i> 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 <i>sale</i> rather than <i>sales</i> returns items containing <i>sale</i> and <i>sales</i> . Or search for <i>custom</i> to see a results list that contains <i>custom</i> , <i>customer</i> , and <i>customers</i> .
Frequency of Indexing	If you create or save a project or create a data set and then immediately try to search for the saved project, project content, or column information, then it's likely that your search results won't contain matches for these items. If this happens, then wait a few minutes for the indexing process to run, and retry your search. The system automatically runs the indexing process every two minutes.
Searching for Data Values	All data sets including RPD, Excel, DB, CSV, and TXT data set columns with 1,000 or less distinct rows are indexed and are returned in your search results. Note that database data set data values aren't indexed and won't be included in your search results.

Save Your Changes Automatically

You can use the auto save option to save your updates to a visualization project in real-time automatically.

If you've already saved your project in a specific location, the Save Project dialog isn't displayed after you click **Auto Save**.

1. Create or open a project.
2. From the Save menu, select **Auto Save**.

3. In the Save Project dialog, enter the **Name** and optional **Description** to identify your project.
4. Select the folder where you want to save your project.
5. Click **Save**. Any project updates are saved in real-time.

Suppose that two users are updating the same project and **Auto Save** is enabled. The **Auto Save** option is automatically disabled when different types of updates are made to the project. A message is displayed that states that another user has updated the project.

Sort the Items in a Page

You can quickly reorganize items in the Projects, Data, and Machine Learning pages by sorting the items based on their attributes.

As you add more data or projects, sorting items helps you to control the order in which they're listed. For example, you can reorganize data sets on the Data page based on their modification dates and times.

1. Go to the page (such as Projects, Data, and Machine Learning) in which you want to sort your items.

In the Projects and Data page, select a tab to see the list of items.

2. Click the **Sort By** menu on the page toolbar and select a sort option such as **Modified** or **Reverse Order**.
3. In the table, click a column header to sort the items in that column in ascending or descending order.

You can see the items listed in a table only in the **List View**.

The selected sort and column options are automatically saved as user preferences.

5

Add Data Sources to Analyze and Explore Data

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

Topics:

- [Typical Workflow to Add Data Sources](#)
- [About Data Sources](#)
- [Connect to Database Data Sources](#)
- [Connect to Oracle Applications Data Sources](#)
- [Create Connections to Dropbox](#)
- [Create Connections to Google Drive or Google Analytics](#)
- [Create Generic JDBC Connections](#)
- [Create Generic ODBC Connections](#)
- [Create Connections to Oracle Autonomous Data Warehouse](#)
- [Create Connections to Oracle Autonomous Transaction Processing](#)
- [Create Connections to Oracle Big Data Cloud](#)
- [Connect to Essbase Data Sources](#)
- [Create Connections to Oracle Talent Acquisition Cloud](#)
- [Create Connections to Snowflake Data Warehouse](#)
- [Add a Spreadsheet as a Data Source](#)

Typical Workflow to Add 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.	Create Oracle Applications Connections Create Database Connections
Create a data source	Upload data from spreadsheets. Retrieve data from Oracle Applications and databases. Creating a data source from Oracle Applications or a database requires you to create a new connection or use an existing connection.	Add a Spreadsheet as a Data Source Connect to Oracle Applications Data Sources Create Data Sets from Databases

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).

See [Supported Data Sources](#).

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. 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).

Connect to Database Data Sources

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

Topics:

- [Create Database Connections](#)
- [Create Data Sets from Databases](#)
- [Edit Database Connections](#)
- [Delete Database Connections](#)

Create Database Connections

You can create connections to databases and use the connections to access data.

1. On the Home page, click **Create**, then click **Connection**.
2. In the Create Connection dialog, click the icon for the connection type that you want to create a connection for (for example **Oracle Database**).
3. Enter a name for the connection, and then enter the required connection information, such as host, port, username, password, and service name.

If you're creating an SSL connection to an Oracle Database, in the **Client Wallet** field, click **Select** to browse for the `cwallet.sso` file. Ask your administrator for the location of the `cwallet.sso` file.

4. (Optional) When you connect to some database types (for example, Oracle Talent Acquisition Cloud), you might have to specify the following authentication options on the Create Connection and Inspect dialogs:
 - 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 are required to log in see only the data that they have the permissions, privileges, and role assignments to see.
5. Click **Save**.

You can now begin creating data sets from the connection.

You can't use remote connections to save a data set from a Data Flow.

Create 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.

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.

Edit Database Connections

You can edit the database connection details.

1. In the Data page, click **Connections**.
2. Select the connection you want to edit and click **Action menu** or right-click, then select **Inspect**.
3. In the Inspect dialog, edit the connection details.
4. Click **Save**.

If you're editing an SSL connection to an Oracle Database and you need to use a new `cwallet.sso` file, in the **Client Wallet** field, click **Select** to browse for the `cwallet.sso` file. Ask your administrator for the location of the `cwallet.sso` file.

You must provide a unique **Connection Name**. If a connection with the same name already exists in your system, an error message is displayed. You can't see or edit the current password for your connection. If you need to change it, you must create a connection that uses the same password.

Delete 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.

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**.

Connect to Oracle Applications Data Sources

You can create connections to Oracle Applications to 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:

- [Create Oracle Applications Connections](#)
- [Compose Data Sets from Subject Areas](#)
- [Compose Data Sets from Analyses](#)
- [Edit Oracle Applications Connections](#)
- [Delete Oracle Applications Connections](#)

Create Oracle Applications Connections

You can create connections to Oracle Applications and use the connections to access data.

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 Data page or Home page, click **Create**, then click **Connection**.
2. Click the **Oracle Applications** icon.
3. Enter a name for the connection, the URL for Oracle Fusion Applications with Oracle Transactional Business Intelligence or Oracle BI EE, the user name, and the password.
4. Select the **Authentication** options.
 - Select **Always use these credentials**, so that the login name and password that 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 user name and password to use the data from the Oracle Applications data source. Users must log in to access only the data that they have the permissions, privileges, and role assignments to access.
5. Click **Save**.

You can now create data sets from the connection.

Compose 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.

1. On the Home, Data, or Projects page, click **Create** and click **Data Set**. 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.

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.

Compose Data Sets from Analyses

You can use analyses created in Oracle Fusion Applications with Oracle Transactional Business Intelligence and Oracle BI EE subject areas as data sources.

You must create an Oracle Applications connection before you can create an analysis data set.

1. On the Home page click **Create** and click **Data Set**. 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.
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**.
 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.

Edit 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.
4. Click **Save**.

Delete 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.

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

Create Connections to Dropbox

You can create connections to Dropbox and use the connections to access data.

1. On the Data or 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. 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 Redirect URL field and paste it into the Dropbox application's OAuth 2 Redirect URIs field and then click Add .
Client ID	Go to the Dropbox application, locate the App key field, and copy the key value. Go to Data Visualization and paste this value into the Client ID field.
Client Secret	Go to the Dropbox application, locate the App secret field, click Show to reveal the secret, and copy the secret value. Go to Data Visualization and paste this value into the Client Secret field.

- 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.

- Click **Save**.

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

Create Connections to Google Drive or Google Analytics

You can create connections to Google Drive or Google Analytics and use the connections to access data.

- Set up a Data Visualization application in Google, if you haven't done so already.
 - Sign into your Google account, and go to the Developer's Console.
 - 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.
 - Enable the application and create credentials for the application by accessing the Analytics API.
 - 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.
- On the Data or Home page, click **Create**, then click **Connection** to display the Create Connection dialog.
- Browse or search for the Google Drive or the Google Analytics icon, and then click the icon.
- Enter a connection name and 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 Redirect URL field and paste it into the Google application's Authorized redirect URIs field.
Client ID	Go to the Google application's Credentials area, locate the Client ID field, and copy the key value. Go to Data Visualization and paste this value into the Client ID field.

Field	Description
Client Secret	Go to the Google application's credential information, locate the Client secret field and copy the secret value. Go to Data Visualization and paste this value into the Client Secret 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 [Add a Spreadsheet from Dropbox or Google Drive](#).

Create Generic JDBC Connections

You can create generic JDBC connections to databases and use those connections to access data sources. 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've 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. On the Data or Home page, click **Create**, then click **Connection**.
3. In the Create Connection dialog, locate and click the **JDBC** icon.
4. Enter the connection criteria. Note the following:
 - Avoid using instance-specific connection names such as host names, because the same connection can be configured against different databases in different environments (for example, development and production).
 - Check the driver documentation and the JAR file for specifying the URL of your JDBC data sources.
 - Find the driver class name in the JAR file or from wherever you downloaded the JAR file.
5. Click **Save**.
You can now create data sets from the connection. See [Create Data Sets from Databases](#).

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.

Create Generic ODBC Connections

You can create generic ODBC connections to databases and use the connections to access data sources. 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. On the Data or Home page, click **Create**, then click **Connection**.
- b. In the Create Connection dialog, locate and click the **ODBC** icon.
- c. Enter the connection criteria. Note the following:
 - **Name** - Any name that uniquely identifies the connection.
 - **DSN** - The name of the system DSN that you set up on your computer.
- d. Click **Save**.

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

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.

Create Connections to Oracle Autonomous Data Warehouse

You can create connections to Oracle Autonomous Data Warehouse and use the connections to access data sources.

Tutorial

1. Before you create connections to Oracle Autonomous Data Warehouse, you must obtain the client credentials zip file containing the trusted certificates that enable Data Visualization to connect to Oracle Autonomous Data Warehouse.

See Download Client Credentials (Wallets) in *Using Oracle Autonomous Data Warehouse*.

The credentials wallet file secures communication between Oracle Data Visualization Desktop and Oracle Autonomous Data Warehouse. The wallet file (for example, `wallet_ADWC1.zip`) that you upload must contain SSL certificates, to enable SSL on your Oracle Database Cloud connections.

2. To create a connection to Oracle Autonomous Data Warehouse:
 - a. On the Home page, click **Create** then click **Connection**.
 - b. Click **Oracle Autonomous Data Warehouse** to display the fields for the connection.
 - c. Enter the **Connection Name** and **Description**.
 - d. In the **Client Credentials** field, click **Select** to browse for the Client Credentials wallet file (for example, `wallet_ADWC1.zip`).
The **Client Credentials** field displays the `cwallet.sso` file.
 - e. Enter the **Username** and **Password**, and select a **Service Name** from the list.
 - f. Click **Save** to create the connection.

You can now create data sets from the connection.

Create Connections to Oracle Autonomous Transaction Processing

You can create connections to Oracle Autonomous Transaction Processing and use the connections to access data sources.

1. Before you create connections to Oracle Autonomous Transaction Processing, you must obtain the client credentials zip file containing the trusted certificates that enable Data Visualization to connect to Oracle Autonomous Transaction Processing.

See Download Client Credentials (Wallets) in *Using Oracle Autonomous Transaction Processing*.

The credentials wallet file secures communication between Oracle Data Visualization Desktop and Oracle Autonomous Transaction Processing. The wallet file (for example, `wallet_SALESATP.zip`) that you upload must contain SSL certificates, to enable SSL on your Oracle Database Cloud connections.

2. To create a connection to Oracle Autonomous Transaction Processing:
 - a. On the Home page, click **Create** then click **Connection**.
 - b. Click **Oracle Autonomous Transaction Processing** to display the fields for the connection.
 - c. Enter the **Connection Name** and **Description**.
 - d. In the **Client Credentials** field, click **Select** to browse for the Client Credentials wallet file (for example, `wallet_SALESATP.zip`).
The **Client Credentials** field displays the `cwallet.sso` file.
 - e. Enter the **Username**, and **Password**, and select a **Service Name** from the list.
 - f. Click **Save** to create the connection.

You can now create data sets from the connection.

Create Connections to Oracle Big Data Cloud

You can create connections to Oracle Big Data Cloud Service Compute Edition and use the connections to access data sources.

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:
`%AppData%\Local\DVDDesktop\components\OBIS\bdcscce`
 - c. Restart Data Visualization Desktop.
 2. In Data Visualization, click **Create** and then click **Connection**.
 3. Click **Oracle Big Data Cloud** to display the fields for the connection.
 4. Enter the connection criteria.
 5. Click **Save** to create the connection.
- You can now create data sets from the connection.

Connect to Essbase Data Sources

You can create, edit, and delete Essbase connections and use the connections to create data sets from Essbase cubes.

Topics:

- [Create Connections to Oracle Essbase](#)
- [Create Data Sets from Essbase Cubes](#)

Create Connections to Oracle Essbase

You can create connections to Oracle Essbase 11g and use the connections to access source data.

1. Click **Create**, and then click **Connection**.
2. Click **Oracle Essbase**.
3. For **Connection Name**, enter a name that identifies this connection.
4. For **DSN** (data source name), enter the agent URL for your data source.

If you want to connect to an Oracle Essbase 11g database, enter the hostname and agent port number on which Oracle Essbase is running. Use the format:

hostname:port

For example: `essbase.example.com:1432`

The default port is 1432.

Your Essbase administrator must open ports in the range 32000-34000 to allow the connection.

5. For **Username** and **Password**, enter user credentials with access to the Essbase data source.
6. Select the **Authentication** option:
 - **Always use these credentials:** The username and password you provide for the connection are always used. Users aren't prompted to sign in to access the data available through this connection.
 - **Require users to enter their own credentials:** Users are prompted to enter their own username and password if they want access to this data source. Users 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.

Create Data Sets from Essbase Cubes

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

You must create the Essbase connection before you can create a data set for it.

1. On the Home page click **Create** and click **Data Set**.
2. In the Create Data Set dialog, select an existing Essbase connection.
3. In the Add Data Set page, double-click the Essbase cube that you want to use as a data set.

Essbase cube details are displayed.

4. If required, you can edit the **Description**, and select an **Alias** value.

If you select an alias value other than the default, then values from the selected alias table are displayed in visualizations that use this Essbase data set.

5. Click **Add** to save the Essbase cube.

Create Connections to Oracle Talent Acquisition Cloud

You can create connections to Oracle Talent Acquisition Cloud (OTAC) and use the connections to access data sources.

1. Click **Create** and then click **Connection**.
2. Click **Oracle Talent Acquisition Cloud** to display the fields for the connection.
3. Enter the connection criteria.
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. Select the **Authentication** options.
 - 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 user name and password to use the data from the Oracle Talent Acquisition Cloud data source. Users are required to log in see only the data that they have the permissions, privileges, and role assignments to see.
6. Click **Save** to create the connection.

You can now create data sets from the connection.

Create Connections to Snowflake Data Warehouse

You can create connections to Snowflake Data Warehouse and use the connections to access data sources.

1. Click **Create**, and then click **Connection**.
2. Click **Snowflake Data Warehouse**.
3. For **Connection Name**, enter a name that identifies this connection.
4. For **Description**, enter a description for this connection.
5. For **Hostname** enter the host account name for your data source.

Use the format, for example:

```
<account>.snowflakecomputing.com
```

Where `account` is the Snowflake account name that you want to use to access the data.

For example: `exampleaccountname.snowflakecomputing.com`.

See format guidelines, <https://docs.snowflake.net/manuals/user-guide/connecting.html>.

6. For **Username** and **Password**, enter user credentials with access to the Snowflake data source.
7. For **Database Name**, enter the name of the database containing the schema tables and columns that you want to connect to.
8. For **Warehouse**, enter the name of the warehouse containing the database, schema tables and columns that you want to connect to. For example, `Example-WH`.
9. Click **Save** to create the connection.

You can now create data sets from the connection.

Add a Spreadsheet as a Data Source

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

Topics:

- [About Adding Spreadsheets or Other Data Files](#)
- [Add a Spreadsheet from Your Computer](#)
- [Add a Spreadsheet from Excel with the Smart View Plug-In](#)
- [Add a Spreadsheet from Windows Explorer](#)
- [Add a Spreadsheet from Dropbox or Google Drive](#)

About Adding Spreadsheets or Other Data Files

You can create data sets from data stored in Microsoft Excel spreadsheets (XLSX and XLS), CSV files, and TXT files. The maximum file size you can upload is 250 MB and the data column limit for a single file is 250 columns.

You must structure your Excel spreadsheets in a data-oriented way with no pivoted data. These rules apply 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 is repeated on every page of a printed report.
- Row 1 must contain the names of the columns in the table. 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. If two columns 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.
- Row 2 and greater must contain the data for the table, and those rows can't contain column names.
- Data in a column must be of the same type because it's often processed together. For example, the Amount Purchased column must contain only numbers (and possibly nulls), enabling it to be summed or averaged. The Given Name and Surname columns must contain text values because they might be concatenated, and you might need to split dates into 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, suppose that you have a sales table at the granularity of Customer, Product, and Year that 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 daily summary values in the same table, because the sum of the Amount Purchased values wouldn't be calculated correctly. If you must analyze at the invoice level, the day level, and the 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 the day, month, or quarter.
 - Have multiple tables, one at each granular level (invoice, day, month, quarter, and year).

Add a Spreadsheet from Your Computer

You can create a data set from an Excel spreadsheet (XLSX or XLS), CSV file, or TXT file located on your computer.

- Confirm that the spreadsheet you want to use is either an Excel spreadsheet in .XLSX or .XLS 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.

Add a spreadsheet from your computer and use it as a data source:

1. On the Home page, click **Create**, then click **Data Set**.
2. Click **File** and browse to select a suitable (unpivoted) XLSX or XLS file, CSV file, or TXT file.
3. Click **Open** to upload and open the selected spreadsheet in Data Visualization.
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.

Add a Spreadsheet from Excel with the Smart View Plug-In

The Oracle Smart View Plug-In enables you to publish an XLSX or XLS spreadsheet, a CSV, or TXT file from Excel and use it as a data source.

Upon import into Data Visualization and before you add the spreadsheet as a data source, you can modify column attributes, like data type and whether to treat the data as a measure or attribute.

Before you use the Smart View Plug-In, confirm you've done the following:

- Installed the latest version of Oracle Smart View for Office. To find the download, go to Oracle Smart View for Office. After you install Oracle Smart View for Office, be sure to restart all Microsoft Office applications.
- Confirmed that you've either an Excel spreadsheet in .XLSX or .XLS format, a .CSV file, or a .TXT file to use as the data source.
- Understand how the spreadsheet needs to be structured for successful import.

Follow these steps to publish an Excel spreadsheet, CSV, or TXT file to use it as a data source:

1. Open your Excel (.XLSX or XLS) spreadsheet, CSV, or TXT file in Microsoft Excel.
If you're opening a .TXT file, follow the import steps for example, to specify the delimiter.
2. Click the **DV Desktop** tab.
3. If you're publishing a .XLSX or XLS file with pivot data, follow these steps:
 - a. Select the upper-left numeric data cell, or select an area of data cells that you want to publish.
Don't include grand totals when you select an area of data cells to publish.
 - b. Click **Unpivot**.
 - c. Click **OK**.
4. If required, format the new sheet content in Excel (for example, edit column heading names).
5. In the **DV Desktop** tab, click **Publish** to publish the new sheet.
If Data Visualization isn't running, it starts automatically. The spreadsheet data is displayed in the Data Set editor.
6. In the Data Set editor, 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, select 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.
7. Click **Add**. If a data set exists with the same name, you're prompted to confirm that you want to overwrite it.

Data Visualization creates and displays a new data set that you can update, re-pivot, or apply changes to as needed.
If you later delete the Excel file created when un-pivoting, the data set created in Data Visualization is no longer linked to the Excel file.

Add a Spreadsheet from Windows Explorer

You can add a spreadsheet as a data source from within Windows Explorer.

Before you add a spreadsheet as a data source, do the following:

- Install the latest version of Oracle Smart View for Office. To find the download, go to Oracle Smart View for Office. After you install Oracle Smart View for Office, be sure to restart all Microsoft Office applications.
 - Confirm that you've either an Excel spreadsheet in .XLSX or .XLS format or a .CSV file to use as the data source.
 - For an Excel spreadsheet, ensure that it contains no pivoted data.
 - Understand how the spreadsheet needs to be structured for successful import.
1. Open Windows Explorer and navigate to the spreadsheet file (.XLSX, .XLS, or .CSV) that you want to use as a data source.

2. Right-click the spreadsheet file icon.

3. Click **Open with** from the menu.

4. Select **Oracle DV Desktop**.

If Data Visualization isn't running, it starts automatically.

5. If a data set with the same name already exists, the Create or Reload Data Set window is displayed.
 - Click **Reload** and click **OK** to overwrite the existing data set with the same name.
If you choose to reload, you don't need to follow the final step, and the new data set overwrites the existing data set.
 - Click **Create New**, and complete one of the following options:
 - Enter a new name, and click **OK**.
 - To save using an autogenerated data set name, click **OK**.
6. In the Data Set editor make any required changes to the Name, Description, or to column attributes.

If you're working with a CSV file, then in the **Separated By** field, confirm or change the delimiter. If needed, select Custom and enter the character you want to use as the delimiter.

7. Click **Add**.

Your spreadsheet is added as a data set and is available in Data Visualization.

Add a Spreadsheet from Dropbox or Google Drive

You can upload Excel spreadsheets (XLSX or XLS), CSV files, and TXT files directly from Dropbox or Google Drive.

Before you start, you must set up a connection to Dropbox or Google Drive where your data files are stored. See [Create Connections to Dropbox](#) and [Create Connections to Google Drive or Google Analytics](#).

- Confirm that the spreadsheet you want to use is either an Excel spreadsheet in .XLSX or .XLS 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.
1. In the Data page, click **Create** and click **Data Set**.
 2. In the Create Data Set dialog, click the connection to Dropbox or Google Drive.
 3. 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.

4. Double-click a spreadsheet to select it.
5. Click **Add** to create the data set.

6

Manage Data that You Added

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

Topics:

- [Typical Workflow to Manage Added Data](#)
- [Manage Data Sets](#)
- [Types of Data You Can Refresh](#)
- [Refresh Data in a Data Set](#)
- [Update Details of Data that You Added](#)
- [Delete Data Sets from Data Visualization](#)
- [Rename a Data Set](#)
- [Duplicate Data Sets](#)
- [Blend Data that You Added](#)
- [About Mismatched Values in Blended Data](#)
- [Change Data Blending in a Project](#)
- [View and Edit Object Properties](#)

Typical Workflow to Manage Added Data

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

Task	Description	More Information
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.	Refresh Data in a Data Set
Update details of added data	Inspect and update the properties of the added data.	Update Details of Data that You Added
Manage data sets	See the available data sets and examine or update a data set's properties.	Manage Data Sets
Renaming a data set	Rename a data set listed on the data sets page.	Rename a Data Set
Duplicate data sets	Duplicate a data set listed on the data sets page.	Duplicate Data Sets
Blend data	Blend data from one data source with data from another data source.	Blend Data that You Added About Mismatched Values in Blended Data

Manage Data Sets

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

You can use the Data Sets page to examine data set properties, change column properties such as the aggregation type, 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.

Types of Data You Can Refresh

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

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.

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 Panel for existing projects using the data set.

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 Panel 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.

Refresh Data in a Data Set

You can refresh data in a data set from all source types such as databases, files, and Oracle Applications.

1. If you're in a project:
 - On the Visualize canvas, click **Menu**, then click **Refresh Data** to ensure that you see the most up-to-date data (by re-executing the visualization queries for all views in your project).
2. If you're on the **Data Sets** panel on the Data page, click **Actions menu** next to a data set and select **Reload Data**.

After you reload a data set, in each project that uses that data set, on the Visualize canvas, click **Menu**, and select **Refresh Data**.

Update Details of Data that You Added

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

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 in the following tabs and modify them as appropriate:
 - General
 - Data Elements
4. (Optional) Change the Data Access query mode for a database table. The default is *Live* because database tables are typically large and shouldn't be copied to the cache. If your table is small, then select **Automatic Caching** and the data is copied into the cache if possible. If you select **Automatic Caching**, then you'll have to refresh the data when it's stale.
5. Click **Save**.

Delete Data Sets from Data Visualization

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

Deleting a data set permanently removes it and breaks any projects that use the deleted data set. You can't delete subject areas that you've included in projects. Deleting data differs from removing a data set from a project.

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**.

Rename a Data Set

Renaming a data set helps you to quickly search and identify it in the data set library.

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 and click the **Actions menu** or right-click, then select **Open**.
3. Click **Edit Data Set** on the Results toolbar.
4. Select the last step and go to the **Name** field, then change the value.
5. 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.

Duplicate Data Sets

You can duplicate an uploaded data set that is listed in the Data Sets page to help you further curate (organize and integrate from various sources) data in projects.

For example, suppose an accounts team creates a specific preparation of a data set, and a marketing team wants to prepare the same data set but in a different way. The marketing team duplicates the data set for their own purposes.

1. Go to the Data page and select **Data Sets**.
2. Select a data set that you want to duplicate and click the **Actions menu** or right-click, then select **Duplicate**.
 - The duplication happens immediately.
 - The default name of the duplicated data set is <Data set>Copy.
 - If the data set name already exists, the new name is set to <Data set>Copy# in sequential order based on available names.
 - You can rename the duplicate data set by editing it in the Inspector dialog.
 - The user that duplicates the data set becomes the owner of the new data set.
 - Any user who can view a data set can also duplicate the data set.

- All properties on the new data set, unless specifically stated, are reset (as if it's a new data set). For example, ACL, certified, indexed, custom-attributes.
- Data preparation changes made on the source are retained in the new data set.
- Conformance rules on the source are retained in the new data set.

Blend 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.



Video

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 Panel 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.

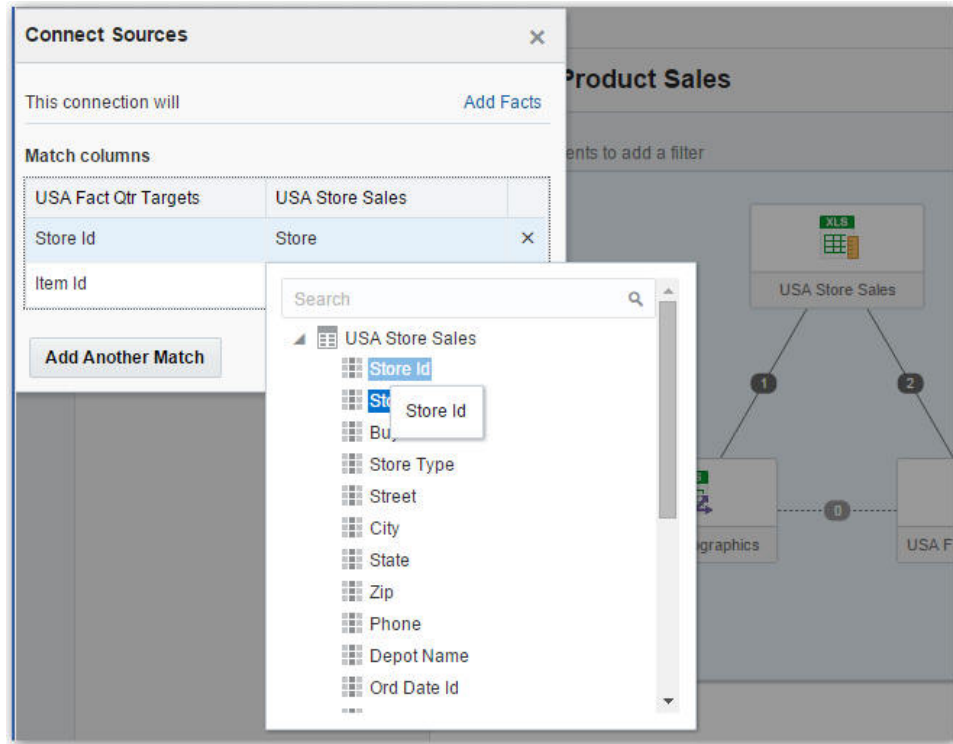
1. Add one or multiple data sets to your project. Confirm that you're working in the Prepare canvas.
2. Go to the tabs at the bottom of the Prepare canvas and click **Data Diagram**. Alternatively, in the Data Panel, right-click and select **Data Diagram**.
3. Click the number along the line that connects the external source to the newly loaded source to display the Connect Sources dialog.

Items that were never explicitly matched together may be matched by the system. For example, Customer.Person_Name is matched to Employee.Name, and Employee.Name is matched to Spouse.Given_Name.

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.

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.

About Mismatched Values in Blended Data

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.

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.

Inv#	Date	Rev
IN-1	1/1/2015	100.00
IN-2	1/1/2015	200.00
IN-3	1/1/2015	300.00
IN-4	1/2/2015	400.00
IN-5	1/2/2015	500.00
IN-6	1/2/2015	600.00
IN-7	1/3/2016	800.00

Inv#	Rep	Bonus
IN-1	Billie	1.00
IN-2	Joe	2.00
IN-3	Kim	3.00
IN-4	Billie	4.00
IN-5	Joe	5.00
IN-6	Kim	6.00
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.

Date	Rep	Rev	Bonus
1/1/2015	Billie	100.00	1.00
	Joe	200.00	2.00
	Kim	300.00	3.00
1/2/2015	Billie	400.00	4.00
	Joe	500.00	5.00
	Kim	600.00	6.00
1/3/2016	(null)	800.00	(null)

Date	Rev	Bonus
1/1/2015	600.00	6.00
1/2/2015	1,500.00	15.00
1/3/2016	800.00	(null)

Rep	Rev	Bonus
Billie	500.00	5.00
Joe	700.00	7.00
Kim	900.00	9.00
(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.

Date	Rep	Rev	Bonus
1/1/2015	Billie	100.00	1.00
	Joe	200.00	2.00
	Kim	300.00	3.00
1/2/2015	Billie	400.00	4.00
	Joe	500.00	5.00
	Kim	600.00	6.00
(null)	Mika	(null)	8.00

Date	Rev	Bonus
1/1/2015	600.00	6.00
1/2/2015	1,500.00	15.00
(null)	(null)	8.00

Rep	Rev	Bonus
Billie	500.00	5.00
Joe	700.00	7.00
Kim	900.00	9.00
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**.

Change Data Blending in a Project

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

1. Select a visualization on the canvas that uses 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**.

View and Edit Object Properties

You can view and edit the properties of standalone objects such as projects, data sets, connections, and data flows.

For example, you can check and modify the access permissions to specify the users who can change or read a data set, or see the source and target data sets for the data flow.

You can use the object inspector in the Home, Data, Projects, and other top-level pages to view and edit the properties of an object. Based on the object's level, the properties also provide references to other objects, such as lower level objects that are part of the object that you're inspecting and other standalone objects that are referenced or used by that object. For example, a project property provides a list of data sets that are included in the project. The properties of lower level objects aren't part of the top-level object's inspector (such as data set properties), so they're not displayed as part of a project's properties. You can inspect the properties of the following objects:

- Projects
- Data Sets
- Connections
- Data Flows

- Sequences
- Schedules
- Folders

For example, perform the following steps to view or edit data flow properties in the inspector.

1. Go to the Data page and select **Data Flows**, then locate a data flow whose properties you want to view or edit.
2. Click the data flow's **Actions menu** or right-click and select **Inspect**.
3. In the Inspector dialog, check and modify the object properties (such as Name and Description).
4. In the Inspector dialog, modify the object properties (such as Name and Description). Common and type-specific properties are organized in tabs in the Inspector dialog, and the following tabs are displayed:
 - **General** - Lists standard life-cycle properties (such as Name, Description, Created By, and Modified By) that are common to all types of object. This tab also lists high-level properties (such as Type, File Name, File Size, and Location), depending on the type of object that you're inspecting.
 - **Sources/Targets** - Lists the source and target data sets for the data flow. The Parameter Name column is displayed if you've applied parameters to the data flow.
 - **Schedules** - Lists schedules for the object (such as Name, Frequency, and Next Start Time of the schedule).
 - **History** - Lists the recent activity for the object.
 - **Permissions** - Lists each user's levels and level of permission.
 - **Related** - Lists objects that are related, referenced, or used by the object that you're inspecting. The objects listed depend on the type of object that you're inspecting.

The Inspector dialog also displays other specific tabs (such as Data Elements, Parameters, and Data Flows), depending on the type of object that you're inspecting.

5. Click **Save**.

7

Prepare Your Data Set for Analysis

Data preparation involves cleansing, standardizing, and enriching your data set before you analyze the data in a visualization canvas.

Topics

- [Typical Workflow to Prepare Your Data Set for Analysis](#)
- [About Data Preparation](#)
- [Data Profiles and Semantic Recommendations](#)
- [Accept Enrichment Recommendations](#)
- [Transform Data Using Column Menu Options](#)
- [Convert Text Columns to Date or Time Columns](#)
- [Adjust the Display Format of Date or Time Columns](#)
- [General Custom Format Strings](#)
- [Create a Bin Column When You Prepare Data](#)
- [Edit the Column Properties](#)
- [Edit the Data Preparation Script](#)

Typical Workflow to Prepare Your Data Set for Analysis

Here are the common tasks for performing data preparation actions in the Prepare canvas.

Task	Description	More Information
Apply enrichment recommendations	Enhance or add information to column data using the enrichment recommendations.	Accept Enrichment Recommendations
Apply transform recommendations	Modify column data using the transformation recommendations or available options.	Transform Data Using Column Menu Options
Change column properties	Change the column properties such as data type, number format.	Edit the Column Properties
Edit the data preparation script	Select and edit the changes applied to a column.	Edit the Data Preparation Script

About Data Preparation

You can transform and enrich the data that you're preparing for analysis.

 [Tutorial](#)

When you create a project and add a data set to it, the data undergoes column level profiling that runs on a representative sample of the data. After profiling the data, you

can implement transformation and enrichment recommendations provided for the recognizable columns in the data set. The following types of recommendations are provided to perform single-click transforms and enrichments on the data:

- Global positioning system enrichments such as latitude and longitude for cities or zip codes.
- Reference-based enrichments, for example, adding gender using on the person's first name as the attribute for make the gender decision.
- Column concatenations, for example, adding a column with the person's first and last name.
- Part extractions, for example, separating out the house number from the street name in an address.
- Semantic extractions, for example, separating out information from a recognized semantic type such as domain from an email address.
- Date part extractions, for example, separating out the day of week from a date that uses a month, day, year format to make the data more useful in the visualizations.
- Full and partial obfuscation or masking of detected sensitive fields.
- Recommendations to delete columns containing detected sensitive fields.

You can use and configure a wide range of data transformations from the column's **Options** menu. See [Transform Data Using Column Menu Options](#).

When you transform data, a step is automatically added to the Preparation Script pane. A blue dot indicates that **Apply Script** hasn't been executed. After applying the script, you can make additional changes to the data set, or you can create a project, or click **Visualize** to begin your analysis.

As each transformation and enrichment change is applied to the data, you can review the changes. You can also compare the data changes with the original source data verify that the changes are correct.

The data transformation and enrichment changes that you apply to a data set affect all projects and data flows that use the same data set. When you open the project that shares the data set, a message appears indicating that the project uses updated data. You can create a data set from the original source that doesn't contain the data preparation changes. When you refresh the data in a data set, the preparation script changes are automatically applied to the refreshed data.

Data Profiles and Semantic Recommendations

After creating a data set, the data set undergoes column-level profiling to produce a set of semantic recommendations to repair or enrich your data. These recommendations are based on the system automatically detecting a specific semantic type during the profile step.

There are various categories of semantic types such as geographic locations identified by city names, a specific pattern such as a credit card number or email address, a specific data type such as a date, or a recurring pattern in the data such as a hyphenated phrase.

Topics

- [Semantic Type Categories](#)

- [Semantic Type Recommendations](#)
- [Recognized Pattern-Based Semantic Types](#)
- [Reference-Based Semantic Types](#)
- [Recommended Enrichments](#)
- [Required Thresholds](#)

Semantic Type Categories

Profiling is applied to various semantic types.

Semantic type categories are profiled to identify:

- Geographic locations such as city names.
- Patterns such as those found with credit cards numbers or email addresses.
- Recurring patterns such as hyphenated phrase data.

Semantic Type Recommendations

Recommendations to repair, enhance, or enrich the data set, are determined by the type of data.

Examples of semantic type recommendations:

- **Enrichments** - Adding a new column to your data that corresponds to a specific detected type, such as a geographic location. For example, adding population data for a city.
- **Column Concatenations** - When two columns are detected in the data set, one containing first names and the other containing last names, the system recommends concatenating the names into a single column. For example, a *first_name_last_name* column.
- **Semantic Extractions** - When a semantic type is composed of subtypes, for example a *us_phone* number that includes an area code, the system recommends extracting the subtype into its own column.
- **Part Extraction** - When a generic pattern separator is detected in the data, the system recommends extracting parts of that pattern. For example if the system detects a repeating hyphenation in the data, it recommends extracting the parts into separate columns to potentially make the data more useful for analysis.
- **Date Extractions** - When dates are detected, the system recommends extracting parts of the date that might augment the analysis of the data. For example, you might extract the day of week from an invoice or purchase date.
- **Full and Partial Obfuscation/Masking/Delete** - When sensitive fields are detected such as a credit card number, the system recommends a full or partial masking of the column, or even removal.

Recognized Pattern-Based Semantic Types

Semantic types are identified based on patterns found in the data.

Recommendations are provided for these semantic types:

- Dates (in more than 30 formats)
- US Social Security Numbers (SSN)
- Credit Card Numbers
- Credit Card Attributes (CVV and Expiration Date)
- Email Addresses
- North American Plan Phone Numbers
- First Names (typical first names in the United States)
- Last Names (typical surnames in the United States)
- US Addresses

Reference-Based Semantic Types

Recognition of semantic types is determined by loaded reference knowledge provided with the service.

Reference-based recommendations are provided for these semantic types:

- Country names
- Country codes
- State names (Provinces)
- State codes
- County names (Jurisdictions)
- City names (Localized Names)
- Zip codes

Recommended Enrichments

Recommended enrichments are based on the semantic types.

Enrichments are determined based on the geographic location hierarchy:

- Country
- Province (State)
- Jurisdiction (County)
- Longitude
- Latitude
- Population
- Elevation (in Meters)
- Time zone
- ISO country codes
- Federal Information Processing Series (FIPS)
- Country name
- Capital

- Continent
- GeoNames ID
- Languages spoken
- Phone country code
- Postal code format
- Postal code pattern
- Phone country code
- Currency name
- Currency abbreviation
- Geographic top-level domain (GeoLTD)
- Square KM

Required Thresholds

The profiling process uses specific thresholds to make decisions about specific semantic types.

As a general rule, 85% of the data values in the column must meet the criteria for a single semantic type in order for the system to make the classification determination. As a result, a column that might contain 70% first names and 30% “other”, doesn't meet the threshold requirements and therefore no recommendations are made.

Accept Enrichment Recommendations

You can use the enrichment recommendations to enhance or add information to data.

You can upload or open an existing data set to modify the data using enrichment recommendations. After making the changes to the data set, you can create a project. You can add one or more data sets to the project and modify the data by using the enrichment recommendations.

If an enrichment recommendation adds information to data such as enhancing a zip code attribute column with the state name, a new column is added to the data set containing the name of the states associated with the zip codes. When you select a recommendation, the change is added to the Preparation Script. If you delete or undo the change, the recommendation is displayed once again as an available option in the Recommendation Panel.

If you don't apply the Preparation Script and you close the project or the data set, you lose all the data changes you've performed.

1. Open a project or data set. If you are working with a project, go to the Prepare canvas. In the Metadata view data panel, select a column to enrich.
2. In the Recommendation Panel, select a recommendation to add the change to the Preparation Script.
3. Continue implementing enrichment recommendations on the data set.
4. In the Preparation Script Panel, click **Apply Script** to apply the data changes to the entire data set.

If you are working with a project, click **Save** and click **Visualize** to review the enriched columns.

If you're using a data set with data access query mode set as Live and if you select an Enrichment or Part Extraction recommendation, you see a message that indicates that this type of data transformation requires the data set to be in Automatic Caching mode if you want to modify it.

These type of recommendations use functions that are not fully supported in Oracle BI Server's query language. For the resulting data to be queried by Oracle BI Server, it must be executed by the data preparation engine and published to the cache for Oracle BI Server to read directly. Also, for this type of recommendations, supplementary data is inserted into the cached data set for external data sets.

To use these semantic type recommendations, you must change the query mode of the data set (which is accessing data from a database) to Automatic Caching.

Transform Data Using Column Menu Options

You can use column menu options to modify the data's format.

You can upload or open an existing data set to transform the data using column menu options. After making the changes to the data set, you can create a project or open an existing project and add the data set to the project.

The data transform changes update the column data using the selected option or add a new column to the data set. See [Transform Recommendation Reference](#).

The list of available menu options for a column depends on the type of data in that column.

If you don't apply the transformation script and close the project or the data set, you lose all the data transform changes you've performed.

1. Open a project, and click **Prepare**. In the Preview data panel, select a column to transform.
2. Click **Options**, and select a transformation option.
3. In the step editor, update the fields to configure the changes. You can review the changes in the data preview table.
4. Click **Add Step** to apply the data changes, close the step editor, and add a step to the Preparation Script Panel.
5. Continue implementing data transform changes in the data set.
6. Click **Apply Script** in the Preparation Script Panel to apply the data transform changes to the entire data set.
7. (Optional) Click **Save**, and then click **Visualize** to see the transformed columns.

GenderGroup

1. Open the project or data set with the Gender column. If you are working on a project, go the Prepare canvas.
2. Select the **Gender** column and click **Options**, then click **Group**.
3. In the group editor, change the new column name to `Gender_Fix`.
4. Change the name of Group 1 to `Female` and select **F** and **f**.

5. Click **(+) Group** to add a new group and change the name to `Male`.
6. Click **Add all** to select the remaining values in the Gender columns that should represent men.
7. Click **Add Step** to include the new column `Gender_Fix` and standardized gender groups in the data set.
8. In the Preparation Script pane, click **Apply Script** to apply the data changes.

Convert 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.

4. To further refine the format, select the column, and use the options on the properties pane.
5. If you want to change the Source Format's default value then click **Source Format** and select a format. For example, `2017.01.23`, `01/23/2017`, `Mon, Jan 23, 2017`, or `Mon, Jan 23, 2017 20:00:00`.

The **Source Format** field automatically displays a suggested format based on the input column text. However, if the **Source Format** field doesn't display a suggested format (for example, for `Sat 03/28 2017 20:10:30:222`), then you can enter a custom format.

6. Click **Custom** if you need to enter your own format into the field at the bottom of the Convert to Date/Time dialog.

The custom format you enter must be in a format recognized by Oracle Business Intelligence before conversion. If you enter a custom format that isn't recognized, an error message is displayed.

7. The **Hide Source Element** is selected by default and hides the original source column after conversion. If you deselect this option, the original column is displayed next to the converted column after conversion.
8. Click **Convert** to convert the text column into a date or time column.

The changes you make apply to all projects using the data source with a modified date or time column.

Adjust 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.

General Format String	Result
[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.
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.

General Format String	Result
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.
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.

Create a Bin Column When You Prepare 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-sized bins or by explicitly specifying the range of values for each bin. You can create a bin column based on a data element.

1. Open a project, and click **Prepare**. In the Preview data panel, select a column that you want to modify using the bin option.
2. Click **Options** for the selected column, and select **Bin**.
3. In the Bin step editor, specify the options for the bin column.
 - Enter a number or use the arrows to increment or decrement the number of bins.
 - Based on your selection in the **Method** field, the range and count of the bins are updated.
 - In the **Manual** method, you select the boundary (that is, minimum and maximum) of each bin. You can also change the default name of each bin.

- In the **Equal Width** method, the boundary of each bin is the same, but the count differs. Based on your selection in the **Bin Labels** field, the bin column labels are updated.
 - In the **Equal Height** method, the height of each bin is the same or very slightly different but the range is equal.
 - If you select the **Equal Width** method, click to select a dimension (that is, an attribute data element) on which to apply the bin.
4. Click **Add Step** to apply the data changes, close the step editor, and add a step to the Preparation Script Panel.

Edit the Column Properties

You can view and edit the properties of each column in the project's Prepare canvas.

Column property changes aren't affected by data transform changes. For example, if you've updated the name of a column after you use a data transform change on the same column, the name of the column is updated automatically.

You must select the **Result** step in the Preparation Script Panel to edit column properties in the properties pane or metadata view.

1. Confirm that you're working in the Prepare canvas of a project.

If you've added more than one data set to the project, go to the tabs at the bottom of the window and select a data set in which you want to edit the column properties.

2. In the Preparation Script Panel, select the **Results** step and do one of the following:
 - a. In the Metadata view data panel or Data Panel, select a column.
 - In the properties pane, use the General tab to change the selected column properties such as Treat As and Data Type.
 - b. Click the view selector list on the Metadata view data panel toolbar and select metadata view, then click a row in the Metadata view data panel.

You see the properties that you can edit (such as Data Element, Data Type, and Aggregation) in the Preview data panel. Each row represents a column in the data set.

- Click a data element and click a property you want to edit, then select an option. For example, you might change the aggregation type from Sum to Average.
- Toggle the checkbox in the Hidden column to hide and unhide a data column in the data set.

For each property change, a step is added to the Preparation Script Panel, alongside any data transformation changes you have applied to the data set using the column's **Options** menu or the Recommendation Panel.

3. Click **Apply Script** in the Preparation Script Panel to apply the property changes to the data set.

The Hidden columns icon at the bottom of the window shows the number of hidden columns in the data set and is available for all views. You can click the Hidden columns icon to unhide one or all hidden columns.

You can also use the column menu options to hide a column. But you can only use the metadata view or Hidden columns icon to unhide a column.

Edit the Data Preparation Script

You can edit the data transformation changes added to the Preparation Script.

Both before and after you've executed **Apply Script**, you can edit the data transformation steps. The edit option isn't available for all types of transform steps. If you're editing the steps after executing **Apply Script**, you must re-apply the script to the entire data set. If you don't save the updates to a step and navigate to another step, a warning message is displayed indicating that you haven't saved the changes.

The updates to the columns are applied only to the data set and not to the visualization. To ensure that you see the most up-to-date data, on the Visualize canvas, click **Menu**, then click **Refresh Data**.

1. Open a project or data set.
If you are working with a project, go to the Prepare canvas and click the data set you want to edit.
2. Select a step in the Preparation Script pane and click **Edit Transform**.
3. Select a transform step in the Preparation Script pane and click the pencil icon or **Edit Transform**.
If a step isn't editable, a message is displayed when you mouse-over the pencil icon that editing for the transform step has been disabled.
4. In the step editor, update the fields to edit the data transform changes that are applied to the columns.
5. Click **OK** to update the column and close the step editor.
6. Click **Apply Script** in the Preparation Script pane to apply the data transform changes to the entire data set.

8

Use Machine Learning to Analyze Data

You can use machine learning to make predictions using your existing data.

Before you start, install the machine learning Framework on the Windows or Mac machine on which you've installed Data Visualization Desktop. See [How Do I Install DVML for Data Visualization Desktop?](#)

Topics:

- [Typical Workflow to Analyze Data with Machine Learning](#)
- [Create a Train Model using a Data Flow](#)
- [Interpret the Effectiveness of the Model](#)
- [Apply a Model Using a Data Flow](#)
- [Add Scenarios to a Project](#)

Typical Workflow to Analyze Data with Machine Learning

Here are the common tasks to use machine learning to analyze data.

Task	Description	More Information
Create your train model using sample data	Use scripts on your sample data to train a data model to predict trends and patterns in your data.	Create a Train Model using a Data Flow
Evaluate your model	Evaluate the effectiveness of your model, and iteratively refine the model until you're satisfied with it.	Interpret the Effectiveness of the Model
Apply your model to your data	Apply a model to your data to generate a data set that includes the predicted trends and patterns.	Apply a Model Using a Data Flow
Add scenarios to a project	Add scenarios to a project to create a blended report.	Add Scenarios to a Project

Create a Train Model using a Data Flow

As an advanced analyst, you use a data flow to create a train model to predict trends and patterns in data.

For example, to perform binary classification on your data, you might use the Naive Bayes script to train your model using a sample data set. When you're satisfied with your model, you can apply it to a full data set.

Scripts define the interface and logic (code) for machine learning tasks. You can use a training task (classification or numeric prediction), for example, to train a model based on known (labelled) data. After you train a model, you can use the model to score unknown data (that is, unlabelled) to generate a data set within a data flow, or to

provide a prediction dynamically within a visualization. Machine learning tasks are available as individual step types (for example, Train Binary, Apply Model).

For example, you could train a model on a set of data that includes employee salary information and then apply this model to a set of employee data that doesn't include salary information. Because the model is based on specific factors and is 67% accurate, it can accurately predict how many and which employees in the data set most likely have an annual salary of over \$50,000.

1. At the Home page, click **Create** and select **Data Flow** to display the Add Data Set pane.
2. Select the data set that you want to use to create your train model, and click **Add**.
You typically use a sample data set containing the data that you're trying to predict.
3. In the data flow, click the **Plus (+)** symbol.
This displays all available data flow step options, including train model types (for example, Train Numeric Predictions, Train Multi-Classifer).
4. Click the train model type that you want to apply to the data set.
For example, Train Binary Classifier is a binary train model (a statistical calculation) that helps predict a binary choice.
5. Select a suitable script from the available scripts for the selected model type (for example, Binary Classification) and click **OK**.
For example, select `CART for model` to build a binary classification train model.
You'll see your new step highlighted in the data flow editor with parameters specific to the script that you selected displayed below.
6. If you're creating a model that predicts a single value (for example, Binary Classification), click **Target** and select a Data Set column that you want to apply the train model to.
For example, you might want to model the Income Level column to predict a person's income. A loan officer can use this information to offer loans only to those whose salary exceeds \$50,000.
7. If you want to change the default settings for your model:
 - a. To change the script, then click the script name next to **Model Training Script**, then click **Target** to select a Data Set column that you want to apply the train model to.
 - b. Click **Target** to reselect the Data Set column that you want to apply the train model to.
 - c. To fine-tune your model, adjust the parameters displayed for the script selected.
8. Click the **Save Model** step and provide a name and description.
9. Click **Save**, enter a name and description, and click **OK** to save the data flow with your choice of parameter values for the current train model script.

Now that you've trained your machine learning model, you can apply this model to your full data set. See [Apply a Model Using a Data Flow](#).

Interpret the Effectiveness of the Model

Once you've created a model, you evaluate it to determine how accurately it makes predictions. For example, you might evaluate how the Naive Bayes script performs binary classification on your sample data so that you can decide whether to use this or a different script.

When you run a train model data flow, it produces outputs that you use to interpret and refine the model.

1. Click the Navigator icon and select **Machine Learning**.

Machine Learning displays the Scripts and Models tabs.

2. To view the train model data flow outputs, display the **Models** tab.

All models are displayed.

3. Click the menu icon for a model and select the **Inspect** option.

This displays three tabs: General, Quality, and Related.

4. (Optional) Click **General**.

This page shows information about the model including:

- **Predicts** - The name of whatever the model is trying to predict (for example, something about IncomeLevel).
- **Trained On** - The name of the data set that you're using to train the model.
- **Script** - The name of the script used in the model.
- **Class** - The class of script (for example, Binary Classification).

5. (Optional) Click **Quality**.

A portion (configurable) of the training data set is kept aside for validation purposes. When the model is built, it's applied to the validation data set with known labels. A different set of metrics such as Accuracy, Precision, and Recall are calculated based on Actual (Label) and Predicted Values. Information is also shown as a matrix, that you can use to provide quick simple summaries of what's found during validation. For example, a certain percentage (X) of people in the validation data who's salaries are greater than \$50,000, whereas the model predicted Y% of the people with salaries greater than \$50,000.

The Quality page displays:

- A list of standard metrics, where the metrics displayed are related to the model selected. Each metric helps you determine how good the model is in terms of its prediction accuracy for the selected Data Set column to which you apply the train model.

For example, you might model the Income Level column to predict (based on a range of other values for each person), when someone's salary is likely to be greater than \$50,000.

- The matrix shows the state of the data used to make the predictions.

The matrix indicates actual values against predicted values to help you understand if the predicted values are close to the actual values.

You can use this information to return to the model and make changes if necessary.

6. (Optional) Click **Related**.

The Related tab displays the data sets created by the machine learning scripts. The data sets contain specific information related to the script logic that an advanced user (data scientist) can use to understand the models.

This page shows the training data including:

- **Training Data** - The data set being used to train the model.
- **Generated Data** - The data sets created by the script that you use for the training model (for example, `obiee.CART.train`). You may see different data sets if you select another script to train a model.

Apply a Model Using a Data Flow

You use a data flow to apply a model (also known as scoring) to generate a data set based on a trained machine learning model.

For example, you might have trained a binary classification model using the Naive Bayes script, and now you're ready to apply this model to your full data set.

You apply a machine learning model using the **Apply Model** step in the Step editor pane.

Before you start, create a separate data flow to create a train model for your sample data. See [Create a Train Model using a Data Flow](#).

1. At the Home page, click **Create** and select **Data Flow** to display the Add Data Set pane.
2. Select the data set that you want to apply the model to, and click **Add**.
Select a data set with the same table structure as the data set you used to train the model.
3. In the data flow, click the **Plus (+)** symbol.
4. Click **Apply Model** from the available options.
5. In the Select Model dialog, select a model that you created earlier and click **OK** to confirm.
6. Select the **Output** columns that you want generated by this data flow, and update the **Column Name** fields if required.

The output columns displayed in the Apply Model pane are created as a data set when the data flow runs. The output columns are relevant to the model.

7. In the data flow, click the **Plus (+)** symbol and select **Save Data**, and change the default **Name** to a meaningful name.

If you don't change the default **Name** value, you'll generate a data set named untitled. Optionally change the other default data set configuration values as required.

8. Click **Save**, enter a name and description and click **OK** to save the data flow with the selected model and output.

You can now execute (or run) the data flow to generate your predictions. To execute the data flow now, click **Run Data Flow**. To execute the data flow later, navigate to the Data Flows tab from the home page, right click a data flow, and click **Run**. After you run this data flow, you'll see the generated data set including

the predictions in the Data Sets page (click **Data** from the navigator on the Home page).

A data set that you create using a scoring data flow can be used within a visualization just like any other data set.

Add Scenarios to a Project

You can apply scenarios within a project by selecting from a list of available machine learning models, joining the model to the existing data sets within a project, then using the resulting model columns within a visualization.

A scenario enables you to add a set of virtual model output columns to create a blended report, which is similar to adding data directly to a project to create blended visualization. You can use the predicted values for the subset of the data of interest within a specific visualization. The virtual data set columns don't physically exist, but instead they represent the model outputs and their values are dynamically generated when used in a visualization.

1. Create or open the Data Visualization project in which you want to apply a scenario.

Confirm that you're working in the Visualize canvas.

2. To add a scenario, do one of the following:

- Click **Add**, and select **Create Scenario**.
- In the Data Panel, right-click the data set and select **Create Scenario**.

3. In the Create Scenario - Select Model dialog, select the name of the model and click **OK**.

4. In the Map Your Data to the Model dialog, specify various options:

- In a project with multiple data set, click **Data Set** to select a data set that you want to map to the model.
- In the table, click **Select Column** to match a column to a model input. Each model has inputs (that is, data elements) that must match corresponding columns from the data set. If the data type (for example, column name) of a model input matches a column, then the input and column are automatically matched. If a model input has a data type that doesn't match any column, you must manually specify the appropriate data element.

Click **Show all inputs** to display the model inputs and the data elements with which they match. Alternatively, click **Show unmatched inputs** to display the model inputs that aren't matched with a column.

5. Click **OK** to add the resulting model columns to the Data Panel. You can now use the model columns with the data set columns.
6. Drag and drop one or more data set and model columns from the Data Panel to drop targets in the Visualize canvas. You can also double-click the columns to add them to the canvas.

You can add one or more scenarios to the same or different data sets. In the Data Panel right-click the model, and select one of the following options:

- **Edit Scenario** - Open the Map Your Data to the Model dialog to edit a scenario.
- **Reload Data** - Update the model columns after you edit the scenario.

- **Remove from Project** - Open the Remove Scenario dialog to remove a scenario.

9

Curate Your Data Using Data Flows

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



Topics:

- [Typical Workflow to Curate Data with Data Flows](#)
- [About Data Flows](#)
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- [Create a Sequence of Data Flows](#)
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Typical Workflow to Curate Data 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.	Create a Data Flow
Run a data flow	Run (that is, execute) data flows to create data sets.	Run a Data Flow
Run a saved data flow	Run a saved data flow to create data sets or to refresh the data in a data set.	Run a Saved Data Flow
Create a sequence of data flows	Create and save a sequential list of data flows.	Create a Sequence of Data Flows
Use Machine Learning to analyze data	Create, interpret, and score models using data flows.	Typical Workflow to Analyze Data with Machine Learning

About Data Flows

Data flows enable you to organize and integrate your data to produce a curated data set that your users can analyze.

To build a data flow, you add steps. Each step performs a specific function, for example, add data, join tables, merge columns, transform data, save your data. Use the data flow diagram pane to add and configure your steps. Oracle Data Visualization validates each step as you make changes. When you've configured your data flow, you execute it to produce a data set.

To add steps, either right-click an existing step and click **Add step** or drag a step from the left-hand **Data Flow Steps** pane and drop it on the data flow diagram.

When you add your own columns or transform data, you can use a wide range of SQL operators (for example, BETWEEN, LIKE, IN), conditional expressions (for example, CASE), and functions (for example, Avg, Median, Percentile).

Create 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 create meaningful visualizations.

1. On the Home or Data page, click **Create** and select **Data Flow**.
2. In the Add Data Set dialog, select a data set or data source and click **Add**.
You can add more data sources at any time by clicking **Add Step (+)**, then clicking **Add Data**.
3. In the Add Data pane, configure your data. For example, you can:
 - Replace the selected data set (click the data source name next to **Add Data** -).
 - Include or exclude columns.
 - Rename columns.
 - Prompt for a data source when the data flow is executed (using the **When Run Prompt to select Data Set** option).
4. Build your data flow:
 - For each function that you want to perform, click **Add a step (+)**, click the step type you want, then specify the properties in the Step editor pane.
Tip: Mouse over the last step to display the **Add a step (+)** option. You can also edit your flow and add steps using **Options** in the Column header. For example, you can rename, reformat, merge, or transform columns.
 - To remove a step, hover over the step and click **X** or right-click the step and click **Delete**. If you've invalidated part of the data flow by deleting a step you'll see a red X icon over the offending step.
 - To undo or redo an edit in a data flow that you haven't saved, go to the workflow diagram panel toolbar and click **Undo Last Edit** or **Redo Last Edit**.
 - At the end of your data flow, add a **Save Data** step and specify a meaningful name.

5. Save your data flow.

You can start the data flow now using the **Run Data Flow** option or later using the **Data Flows** panel on the Data page. If you run it now you can access the generated data set on the **Data Sets** panel on the Data page).

Zoom Controls in Data Flow Editor

The zoom controls help you increase or decrease the data flow diagram view and inspect the flow.

Use the zoom in button **(+)** or the zoom out button **(-)** on the workflow diagram panel toolbar to reset the current zoom level. You can set the zoom level from 30 to 100. In the zoom controls, you can also insert a zoom level number or select a predefined level from the menu.

You can't see the **Remove step** and **Add a step (+)** icons when zoom level is below 100. Go to a step and right-click to select the **Delete** or **Add step** options.

Run a Data Flow

Run (that is, execute) a data flow to produce a data set that you can use to create visualizations.

To successfully run 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 **Run Data Flow** to execute the data flow. If there is no validation error, a completion message is displayed.

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.

3. Click **Save** or **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.

Run a Saved 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.

If it's the first time you're running a 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.

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 [Manage 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.

1. In the Data page, go to the Data Flows section, and locate the data flow that you want to run.
2. Right-click the data flow and select **Run now** (or click **Schedule** to run later).
 - 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**.

Reuse a Data Flow

In a data flow, you can add parameters so you can reuse the data flow with a different source data set or use different criteria to process and select data. Parameters help you identify the type of data appropriate for the data flow and if you want to select an alternative data set when running or scheduling the data flow. You can also apply parameters to modify default values when creating an Essbase cube.

For example, using a parameter you can:

- Process a new data set that has the same format as the default input data set.
- Process and store different aspects of a large data set based on date range, individual departments, or regions into alternative target data sets.

In the Step editor pane, you can apply parameters for the following steps:

Step Name	Parameter Field
Add Data	<ol style="list-style-type: none"> 1. Select the When Run Prompt to select Data Set option. 2. Provide the Name and Prompt values for the parameter.
Save Data	<ol style="list-style-type: none"> 1. Select the When Run Prompt to specify Data Set option. 2. Provide the Name and Prompt values for the parameter.
Create Essbase Cube	<ol style="list-style-type: none"> 1. Select the When Run Prompt to specify Data Set option. 2. Provide the Cube name, Application name, and Prompt value for the parameter.

Apply Incremental Processing to a Data Flow

Use incremental processing to determine the last data processed in the data flow and to process only the newly added data.

1. Select a data element column as an incremental identifier for the data set.

You can select an incremental identifier only for those data sets that are sourced through database connections.

- a. Go to the Data page and select **Data Sets**.
 - b. Select a data set and click the **Actions menu** or right-click, then select **Open**.
 - c. Click **Edit Data Set** on the Results toolbar.
 - d. Select the data set node in the diagram. From the **New Data Indicator** list, select a column, then click **Save**.
2. Apply incremental processing to the data flow using the data sets for which you've selected the incremental identifier.
 - a. Create or open the data flow in which you want to apply incremental processing.
 - b. In the Data Flow editor select the data set.
 - c. In the Step editor pane, select **Add new data only** to mark the data set as incremental.
 - d. Click **Save**.

In a data flow with multiple data sets, you can select only one data set as incremental. If you try to select a second data set as incremental, you see a warning message. Click **Yes** to enable incremental processing for the second data set for which you've selected **Add new data only**. Incremental processing is deselected for the first data set.

Modify Parameter Prompts When You Run a Data Flow

Parameter prompts are displayed before the job runs, when you run a data flow with parameter prompts. Prompts allow you to review the default values or settings and to select or define an alternate value or setting.

1. Go to the Data page and click Data Flows to select the data flow with parameter prompts that you want to run.
2. Click the data flow's **Actions menu** or right-click and select **Run**.
3. In the Data Flow Prompt dialog, either use the default values or define alternate values.
 - In the Sources section, click the default Target - existing data set name, then select a new source data set in the Add Data Set dialog. Click **Add**.
 - In the Targets section, do one of the following:
 - Change the default Target - existing data set name.
 - For a data flow with **Create Essbase Cube** step, change the default Target - Application and Target - Cube names.
4. Click **OK**.

Customize the Names and Descriptions of Data Flow Steps

You can change the names of steps and add your own descriptions.

1. Open a data flow.

2. Click the step you want to customize.
Notice that the step name is displayed in the panel below the step diagram.
3. In the panel below the step diagram, click the step name (for example, **Merge Columns**).
4. Use the **Name** and **Description** fields to change the default values.
The new name that you specify is appended to the default name.
5. To save your changes, click **Enter**.

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

Using Steps

You build data flows using steps to curate your data. Steps are functions that change your data in a specific way. For example, steps can aggregate values, perform time series analysis, or perform machine learning algorithms.

Step	Use this step to:	More Information
Add Columns	Add a new output data column to your data flow using a wide range of functions, conditional expressions, and SQL operators.	Add Columns in a Data Flow
Add Data	Add a data source to your data flow.	Add Data in a Data Flow
Aggregate	Apply aggregate functions to group data in a data flow.	Add Aggregates to a Data Flow
Analyze Sentiment	Detect sentiment for a text column by applying a sentiment analysis to the data flow.	Add a Sentiment Analysis to a Data Flow
Apply Model	Apply a machine learning model to your data (also known as scoring a data model).	Apply a Model Using a Data Flow
Bin	Assign a value to add a binning column to the data set.	Create a Bin Column in a Data Flow
Create Essbase Cube	Create an Essbase cube from a data set.	Create and Customize an Essbase Cube in a Data Flow

Step	Use this step to:	More Information
Cumulative Value	Group data by applying cumulative aggregate functions in a data flow.	Add Cumulative Values to a Data Flow
Filters	Use filters to limit the data in a data flow output.	Filter Your Data in a Data Flow
Group	Create a group column of attribute values in a data set.	Create a Group in a Data Flow
Join	Join multiple tables or data sets.	Add a Join in a Data Flow
Merge Columns	Combine two or more columns in your data flow.	Merge Columns in a Data Flow
Merge Rows	Combine two or more rows in your data flow.	Merge Rows in a Data Flow
Rename Columns	Change the name of data columns to something more meaningful.	Rename Columns in a Data Flow
Save Data	Before running a data flow, modify or select the database name, attribute or measure, and aggregation rules for each columns of the output data set.	Save Output Data from a Data Flow
Save Model	Change the default model name (untitled) and provide a description.	You'll see this step added automatically in the data flow editor when you add a train model step.
Select Columns	Specify which data columns to include in your data flow.	Select Columns to Include in a Data Flow
Time Series Forecast	Apply a time series forecast calculation to a data set to create additional rows.	Add a Time Series Forecast to a Data Flow
Train Binary-Classifer	Apply a machine learning model to classify your data into one of two predefined categories.	Train a Binary Classifier Model in a Data Flow
Train Clustering	Apply a machine learning model to you data to segregate groups with similar traits and assign them into clusters.	Train a Clustering Model in a Data Flow
Train Multi-Classifer	Apply a machine learning model to classify your data into three or more predefined categories.	Train a Multi-Classifer Model in a Data Flow
Train Numeric Prediction	Apply a machine learning model to your data to predict a numeric value based on known data values.	Train a Numeric Prediction Model in a Data Flow
Transform Column	Modify data in a column using a wide range of functions, conditional expressions, and SQL operators.	Transform Data in a Data Flow

Add Columns in a Data Flow

You can add columns to your target database and customize the format and data. For example, you might calculate the value of your stock by multiplying the number of units in a UNITS column by the sale price in a RETAIL_PRICE column.

You add a column using the **Add Columns** step in the Step editor pane.

1. Create or open a data flow.
2. Click **Add a step (+)**, and select **Add Columns**.

3. In the Add Columns pane, use the expression builder to define your column. For example, to calculate the value of stock items you might specify `UNITS * RETAIL_PRICE`.
Select SQL operators, functions, and conditional expressions from the expression pick list.
4. Save your changes.

Add Data in a Data Flow

When you create a new data flow and select a data set, you'll see a step with the name of your data set. You can add additional data from multiple data sources to your data flow. For example, you might add two data sets and merge them.

You add a new data source to your data flow using the **Add Data** step in the Step editor pane.

1. Create or open a data flow.
2. Click **Add a step (+)**, and select **Add Data**.
3. Select a data set and click **Add**.

If matching columns are found in data sets, a Join step is automatically added to enable you to define the relationship between the data sets. For example, you might want to combine rows from two data sets where the CustomerID in the first data set matches the CustomerID in the second data set.

4. If you don't get a Join step automatically, click **Add a step (+)**, and select **Join**.
To complete the join, on the data flow diagram click the circle on the dotted line between the data source step and the **Join** step.
5. Use the Join step to configure the relationship between the data sets.
6. Save your changes.

Add Aggregates to a Data Flow

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

You add aggregates to a data flow using the **Aggregate** step in the Step editor pane.

If your data set already contains aggregates, you'll see them displayed when you click the **Aggregate** step.

1. Create or open the data flow that you want to add an aggregate step to.
2. Click **Add a step (+)** and select **Aggregate**.
In the Aggregate pane you'll see a suggested aggregate column for each numeric column.
3. In the Aggregate pane, for each aggregate configure:
 - **Aggregate** - Select a column you want to add to the aggregate.
 - **Function** - Select an aggregate function (such as Sum, Average, Minimum, and Count) you want to apply to the selected column.
 - **New column name** - Change the name of the aggregate column.

You can also perform multiple aggregates by selecting different functions for the same column.

4. Add or remove aggregates.
 - To remove an aggregate, select the aggregate and click **X**.
 - To see the **Add Aggregate** option, scroll to the bottom of the Aggregate pane.
5. Click **Save**.

Create a Bin Column in a Data Flow

Binning a measure enables you to categorize your data by creating a new column based on the value of the measure. For example, you might categorize numeric values into three bins for low, medium, and high.

You create bin categories using the **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. Select the column that you want to categorize.
4. In the Bin pane, specify the options for the bin column:

Field	Description
Bin	You'll see the column that you selected in Step 3. To change to a different column, click the column name and select a different column.
New element name	Leave the suggested new column name unchanged, or edit this value to change the new column name.
Number of Bins	Specify the number of bins into which you categorize your data.
Method	Specify how the data boundaries are calculated. <ul style="list-style-type: none"> • In the Manual method, the range is divided by the number of bins. • In the Equal Width 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. • In the Equal Height 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). Equal Height method is preferred specifically for the skewed data.
Histogram View	Based on the Method selected, the histogram range (width) and histogram count (height) of the bins are updated.
List View	If you select the Manual method, you can change the name of the bins, and you can define the range for each bin.

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

5. Click **Save**.

Create Multiple Pipelines in a Data Flow Using a Branch

Creates multiple outputs from a data flow using a branch. For example, you might create a data flow from a sales transactions data set, then branch and save the data into multiple data sets based on the sales region.

You add multiple pipelines to a data flow using the **Branch** step in the Step editor pane.

1. Create or open the data flow that you want to branch into multiple subsets. You can add a **Branch** step before or after a **Join** step.

Alternatively, create a data flow from a data set you want to branch into multiple subsets.

2. In the Add step dialog, click **Add a step (+)** and select **Branch**.

A **Branch** step and two **Save Data** steps are added to the data flow.

3. In the **Branch into** field of the Branch pane, specify the number of connections or outputs that you want to branch.

- The **Save Data** steps count is directly related to the number in the **Branch into** field.
- In the **Branch into** field, the minimum number is two, and the maximum is five. You can increase the number of connections or outputs only in the **Branch into** field.
- You can delete a connection or output. In the Add step dialog, click **X** or right-click the **Save Data** step and select **Delete**.
- If you've only two **Save Data** steps and you delete one, you see a warning message indicating that the **Branch** step is also deleted. Click **Yes** to delete the **Branch** step. Only one **Save Data** step is added in the data flow.

4. Click each **Save Data** step and in the Save Data Set pane, specify the properties for saving the output data sets:

- **Save data to** - Specify the location where you want to store the data set, such as Data Set Storage or Database Connection. If you select Database Connection, specify values for the **Connection**, **Table**, and **When Run** options.
- **When Run Prompt to specify Data Set** - Select the option and specify the following parameters: Name and Prompt.
- **Columns** - Specify whether to change a column to a measure or attribute as appropriate. For measures, specify the aggregation type (such as Sum, Average, Minimum, Maximum, or Count).

5. Click **Run Data Flow** to run the data flow. If there's no validation error, you see a completion message. Go to the Data page and select Data Sets to view your resulting data sets in the list.

Alternatively, click **Save** or **Save As**. In the Save Data Flow As dialog, enter a **Name** and **Description** to identify your data flow. On the Data page, select Data Flows to see your resulting data flow in the list.

Create and Customize an Essbase Cube in a Data Flow

You can add single input data from a spreadsheet or database into a data flow to create an Essbase cube.

You can also configure the input columns (for example, column order and designation type) when creating the Essbase cube. You can add data into a data flow to create an Essbase cube only for Oracle Analytics Cloud – Essbase. When selecting an Essbase connection for creating a cube, you might see remote connections to on-premises Oracle Essbase instances. You can't create a cube from data in on-premises Oracle Essbase instances.

You create Essbase cubes using using the **Create Essbase Cube** step in the Step editor pane.

1. Create or open the data flow in which you want to create an Essbase cube.
2. Click **Add a step (+)**, and select **Create Essbase Cube**.
3. In the Create Essbase Cube pane, specify the values for creating the cube such as connection and application name.
4. To configure the input columns, do the following:
 - a. Move the slider to enable the **Customize Cube** option.
 - b. Select the number of rows you want to analyze and click **Configure**.
 - c. Perform the following actions for each column in the Dimensions, Measure, and Skip sections:
 - Cut
 - Paste as Sibling
 - Paste as Child
 - Skip
 - Delete

Section and Designation Type	Cut	Paste as Sibling	Paste as Child	Skip
Dimension Header	No	No	Yes	No
Dimension	Yes	Yes	Yes	Yes
Generation	Yes	Yes	Yes	Yes
Alias, Attribute, UDA	Yes	Yes	No	Yes
Measure Header	No	No	Yes	No
Measure	Yes	Yes	Yes	Yes
Skip Header	No	No	Yes	No
Skip	Yes	Yes	No	No

- d. Change the following column values:
 - Column name in the Data Elements column.
 - Designation type in the Treat As column.
5. Select the **When Run Prompt to specify Data Set** option to apply parameters to change the default values when creating the Essbase cube.

6. Click **Save**.
Go to the Data page and select **Data Flows** to see the resulting data flow in the list.
7. Select the data flow and click the **Action menu** or right-click, then click **Run**.
8. Go to the Data page and select **Data Sets** to see your output data set in the list.

Cut, Paste, and Skip Rules

The cut, paste, and skip actions you perform for each column follow pre-configured rules.

- When you skip a column, it moves to the Skip section of the table. You can only paste a column as a sibling of the Skip header, or as a sibling of any skipped column.
- Any columns that are pasted as a Measure follow the rule of the paste command. Measure hierarchies are allowed, but the designation type doesn't change.
- **Paste as Child** action for Dimension columns:
 - When a column is pasted as a child of the Dimensions header, the cut column is pasted as a Dimension.
 - When a column is pasted as a child of the Dimension column:
 - * The cut column is pasted as a Generation.
 - * If the Dimension column already has a Generation child, the existing Generation (and its children) becomes the children of the new Generation column.
 - When a column is pasted as a child of the Generation column:
 - * The cut column is pasted as a child of the Generation if the cut column is an Alias, Attribute, or UDA.
 - * The cut column is pasted as a Generation if the cut column isn't an Alias, Attribute, or UDA.
 - **Paste as Child** for any Dimension column isn't allowed if the target is an Alias, Attribute, or UDA.
- **Paste as Sibling** action for Dimension columns:
 - When a column is pasted as a sibling of a Dimension column, it's pasted as a Dimension.
 - When a column is pasted as a sibling of an Attribute, Alias, or UDA and it isn't an Alias, Attribute, or UDA, the column is pasted as an Attribute.
 - **Paste as Sibling** for any Dimension column isn't allowed if the target is a Generation.

Designation Change Rules for Generation Columns

The Generation columns follow specific pre-configured rules when you change their designation type.

- **Generation to Attribute/Alias/UDA** - If the Generation column has any children, they move up a level and become children of the Generation column's parent.

- **Attribute/Alias/UDA to Generation** - If the new Generation column has a sibling Generation column, the existing Generation column (and its children) become children of the new Generation column.

Add 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 add cumulative values using the **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 Options 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 Options 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.

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

4. Click **Save**.

Filter Your Data in a Data Flow

You use filters to limit the amount of data included in the data flow output. For example, you could create a filter to limit sales revenue data of a column to the years 2017 through 2019.

You filter data using 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 Data Elements 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 f(x) , select a function type, and then double-click to add a function in the Expression field. Click Apply .
Auto-Apply Filters	Select an auto-apply option for the filters, such as Default (On).

The data preview is updated using the applied filter.

4. Click **Save**.

Create a Group in a Data Flow

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

Use **Group** step in the Step editor pane to group your data.

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. Note the following:
 - **Available values list** - Select the values you want to include in a group. The selected values are displayed in the **Selections** 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.
 - **Include Others** - Group values that haven't been added to any of the other groups.

5. Click **Save**.

Add a Join in a Data Flow

When you add data from multiple data sources to your data flow, you can join them on an common column. For example, you might join a Customers data set to a Customer-orders data set using a unique Customer ID field.

When you use the **Add Data** step to add an extra data source, a **Join** step is automatically added to your data flow. But you can also manually add a **Join** step if you have more than one data source defined in your data flow.

You join columns from different data sets using the **Join** step in the Step editor pane.

1. Create or open a data flow.
2. Click **Add a step (+)**, and select **Add Data**.
3. Select a data set and click **Add**.

A Join step is automatically added where you can define the relationship between the data sets.

Alternatively, if you have more than one data source in your data flow, add a **Join** step. To complete the join, on the data flow diagram click the circle on the dotted line between the data source step and the **Join** step.

4. Use the Join step to specify the relationship between the data sources.
5. Save your changes.

Merge 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 merge columns from the same data set using a **Merge Columns** 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. Note the following:
 - **(+) Column** field - Select more columns you want to merge.
 - **Delimiter** field - Select a delimiter to separate column names (for example, Space, Comma, Dot, or Custom Delimiter).
4. Click **Save**.

Rename Columns in a Data Flow

Rename columns to create more meaningful data column names in your generated data sets.

You rename data columns using a **Rename Columns** step in the Step editor pane.

1. Create or open a data flow.

2. Click **Add a step (+)**, and select **Rename Columns**.
3. Use the **Rename** fields to specify a more meaningful name for each data column.
4. Save your changes.

Save Output Data from a Data Flow

You can save various information about a data flow. Before running or executing a data flow, you can select to save details such as the storage location to save the output data from the data flow; the parameters to reuse in the data flow; the name and description for identifying the data set; the data type of each column; and the default aggregation of each column.

You save output data using a **Save Data** step in the Step editor pane.

1. Create or open the data flow that you want to save with specific values.
2. Click **Add a step (+)** and select **Save Data**. Or, if you've already saved the data flow, then click the **Save Data** step.
 - If you want to rename the data flow step, click the step name.
3. In the Save Data Set pane, enter the **Name** and **Description** to identify the data set.

If you don't change the default **Name** value, you'll generate a data set named untitled. After you run this data flow, you'll see the generated data set in the Data Sets page (click **Data** from the navigator on the Home page).

4. Click **Save data to list** and select a location:
 - **Data Set Storage**: Specify whether you want to save the data set locally.
 - **Database Connection**: Connect to a database and save the output data from a data flow to a table in that database. The data flow is securely stored in the database, and you can take advantage of its managed backup and recovery facility. You can transform the data source by overwriting it with data from the data flow. 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 have no validation errors.
5. If you've selected **Database Connection**, specify the following options:
 - a. Click **Select connection** to display the Save Data to Database Connection dialog.
 - b. Select a connection for saving the data flow.

You must create a database connection before you can select one. For example, you can save to an Oracle database, Apache Hive database, Hortonworks Hive database, or Map R Hive database. See [Create Database Connections](#).
 - c. Enter a name in the **Table** field. The table name must conform to the naming conventions of the selected database. For example, the name of a table in an Oracle database can't begin with numeric characters.
 - d. Click the **When run** list and select to replace existing data or add new data to existing data.
6. Select the **When Run Prompt to specify Data Set** option to apply parameters to the data flow and specify its values.

- In the Columns table, change or select the database name, the attribute or measure, and the aggregation rules for each column in the output data set:

Column name	Description
Treat As	Select how each output column is treated, as an attribute or measure.
Default Aggregation	Select the aggregation rules for each output column (such as Sum, Average, Minimum, Maximum, Count, or Count Distinct). You can select the aggregation rules if a specific column is treated as a measure in the output data set.
Database Name	Change the database name of the output columns. You can change the column name if you're saving the output data from a data flow to a database.

- Click **Save** or **Save As**. In the Save Data Flow As dialog, enter a **Name** and **Description** to identify the data flow.
 - Go to the Data page and select Data Flows to see your resulting data flow in the list.
 - If you don't save the data flow and try to navigate to another page, a Save Changes dialog is displayed that prompts you to save the changes to the data flow.
- Click **Run Data Flow** to execute the data flow. If there's no error, you see a completion message and the output data is saved to the data set storage or to the selected database using the table name that you specified.
 - If you've selected data set storage, go to the Data page and select Data Sets to see your output data set in the list.
 - Click **Actions menu** or right-click and select **Inspect**, to open the data set dialog.
 - In the data set dialog, click **Data Elements** and check the Treat As and Aggregation rules that you've selected for each column in the **Save Data** step.
 - If you select a database to save the output data, go to the table in that database and inspect the output data.
 - If you select a table in the database with the same name, the data in the table is overwritten when you save to the database.

Select Columns to Include in a Data Flow

Select which columns to include in your data flow. By default, all data columns are included in your data flow.

You select data to include in a data flow using the **Select Columns** step in the Step editor pane.

- Create or open a data flow.
- Click **Add a step (+)**, and select **Select Columns**.
- Use the on-screen options to select or remove columns.
- Save your changes.

Add a Sentiment Analysis to a Data Flow

You can detect sentiment for a given text column by applying a sentiment analysis to your data flow.

Sentiment analysis evaluates text based on words and phrases that indicate a positive, neutral, or negative emotion. Based on the outcome of the analysis, a new column contains a “Positive”, “Neutral”, or “Negative” String type result.

You perform sentiment analysis using a **Analyze Sentiment** 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 **Analyze Sentiment**.
3. In the Analyze Sentiment pane and Output section, specify an output column for the emotion result value. The column is named "emotion" by default, and you can rename it.
4. In the Analyze Sentiment pane and Parameters section, specify the value for **Text to Analyze**.

Select a text column with natural language content to analyze.

5. Click **Save**.

Add a Time Series Forecast to a Data Flow

You can calculate additional rows with forecasted values by applying a Time Series Forecast calculation.

A forecast takes a time column and a target column from a given data set and calculates forecasted values for the target column and puts the values in a new column. All additional columns are used to create groups. For example, if an additional column “Department” with values “Sales,” “Finance,” and “IT” is present, the forecasted values of the target column are based on the past values of the given group.

Note that multiple columns with diverse values lead to a large number of groups that affect the precision of the forecast. Select only columns that are relevant to the grouping of the forecast.

You perform time series analysis using a **Time Series Forecast** 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 **Time Series Forecast**.
3. In the Time Series Forecast pane and Output section, specify an output column for the forecasted value. The column is named "forecasted" by default, and you can rename it.
4. In the Time Series Forecast pane and Parameters section, specify the parameters for the forecast calculation:

Field	Description
Target	Select a data column with historical values.

Field	Description
Time	Select a column with date information. Forecasted values use a daily grain.
Periods	Select the value that indicates how many periods (days) are forecasted per group.

5. Click **Save**.

Train a Binary Classifier Model in a Data Flow

Apply a machine learning model to classify your data into one of two predefined categories. For example, you might predict whether a product instance will pass or fail a quality control test.

You train a binary classifier model using the **Train Binary Classifier** step in the Step editor pane.

1. Create or open a data flow.
2. Click **Add a step (+)**, and select **Train Binary Classifier**.
3. At the Select Train Two-Classification Model Script dialog, select a script type, then click **OK**. For example, you might select Naive Bays.
4. Click **Select a column** and select the data column to analyze.
5. Use the on-screen options to configure the script parameters.

[Create a Train Model using a Data Flow](#)

Train a Clustering Model in a Data Flow

Apply a machine learning model to your data to segregate groups with similar traits and assign them into clusters.

You train a clustering model using the **Train Clustering** step in the Step editor pane.

1. Create or open a data flow.
2. Click **Add a step (+)**, and select **Train Clustering**.
3. At the Select Train Clustering Model Script dialog, select a script type, then click **OK**. For example, you might select Hierarchical Clustering for model training.
4. Use the on-screen options to configure the script parameters.

[Create a Train Model using a Data Flow](#)

Train a Multi-Classifer Model in a Data Flow

Apply a machine learning model to classify your data into three or more predefined categories. For example, you might predict whether a piece of fruit is an orange, apple, or pear.

You train a multi-classifier model using the **Train Multi-Classifier** step in the Step editor pane.

1. Create or open a data flow.
2. Click **Add a step (+)**, and select **Train Multi-Classifier**.

3. At the Select Train Two-Classification Model Script dialog, select a script type, then click **OK**. For example, you might select Naive Bays.
4. Click **Select a column** and select the data column to analyze.
5. Use the on-screen options to configure the script parameters.

[Create a Train Model using a Data Flow](#)

Train a Numeric Prediction Model in a Data Flow

Apply a machine learning model to your data to predict a numeric value based on known data values. For example, you might predict the value of a property based on square-footage, number of rooms, zip code, and so on.

You train a numeric prediction model using the **Train Numeric Prediction** step in the Step editor pane.

1. Create or open a data flow.
2. Click **Add a step (+)**, and select **Train Numeric Prediction**.
3. At the Select Train Numeric Prediction Model Script dialog, select a script type, then click **OK**. For example, you might select Random Forest for Numeric model training.
4. Click **Select a column** and select the data column to analyze.
5. Use the on-screen options to configure the train model.
6. Save your changes.

[Create a Train Model using a Data Flow](#)

Transform Data in a Data Flow

You can transform the column data of a data set in a data flow.

Use the Transform Column step to manipulate data in a column. You can also quickly transform the data in a column by using the column menu option in Data Preview. The list of available menu options for a column depends on the type of data in that column. You can perform the following types of data transforms:

- Update or modify the data in a column.
- Group or merge multiple columns in a data set.
- Add a column to or remove a column from a data set.

You transform data using the **Transform Column** step in the Step editor pane.

1. Create or open a data flow, and select a data set.
2. To add a data transform step, do one of the following:
 - Click **Add a step (+)**, select **Transform Column**, then select a column
 - Drag and drop the **Transform Column** step from the Data Flow Steps panel to the workflow diagram panel and select a column.
 - Select a column in the Preview data panel and click **Options**, then select a transform option. See [Column Menu Options for Quick Data Transformations](#).
3. In the Step editor pane, compose an expression or update the fields to configure the changes. You can review the changes in the Preview data panel.

If you're composing an expression, do the following:

- Click **Validate** to check if the syntax is correct.
 - If the expression is valid, click **Apply** to transform the column data.
4. Click **Save**.

Merge Rows in a Data Flow

You can merge the rows of two data sets (known as a UNION command in SQL terminology). 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 merge data using the **Union Rows** step in the Step editor pane.

1. Create a data flow and add the data sets you want to merge.
2. Click **Add a step (+)** and select **Union Rows**.
3. Select the appropriate option for merging the rows.
4. Click **Save**.

10

Import and Share

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:

- [Typical Workflow to Import and Share Artifacts](#)
- [Import and Share Projects or Folders](#)
- [Share Visualizations, Canvases, or Stories](#)

Typical Workflow to Import and Share 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.	Import an Application or Project
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.	Share a Project or Folder as an Application Share a File of a Visualization, Canvas, or Story
Email a folder, project, visualization, canvas, or story	Export data visualization artifacts using email.	Email Projects and Folders Email a File of a Visualization, Canvas, or Story

Import and Share 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:

- [Import an Application or Project](#)
- [Share a Project or Folder as an Application](#)
- [Share a Project or Folder on Oracle Analytics Cloud](#)
- [Email Projects and Folders](#)

Import 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**.
2. On the Projects page click **Page Menu**, then select **Import Project**.
3. In the Import dialog, click **Select File** or drag a project or application file onto the dialog, then click **Import**.
4. If an object with the same name already exists in your system, then choose to replace the existing object or cancel the import.

Share 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, the connection string and credentials, and stored data).

1. On the Home page, click **Projects**.
2. On the Projects page select the project or folder that you want to share and click **Action Menu**, then select **Export** to open the Export dialog.
3. Click **File**, then specify the options for sharing the project or folder:
 - Specify the file name.
 - Move the slider to enable the **Include Data** option to include the data when sharing a project or folder.
 - Move the slider to enable the **Connection Credentials** option, if you want to include the user name and password of the data source connection with the exported project.

Follow these guidelines depending on the data source:

- **For a project or folder 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 or folder with a database data source** - If you enable 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, Oracle Analytics Cloud – Essbase, 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 specify 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.

4. If you selected the **Include Data** option or the **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.
5. Click **Save**.

Share a Project or Folder on Oracle Analytics Cloud

You can choose to use Oracle Analytics Cloud to share one or more of your project or folder.

1. On the Home page, click **Projects**.
2. On the Projects page select the project or folder that you want to share and click **Actions menu**, then select **Export** to open the Export dialog.
3. Click **Cloud**, then specify and select the options for sharing the project or folder:
 - Enter the file name and Oracle Analytics Cloud URL such as `https://cloud.oracle.com/`.
 - Enter your Oracle Analytics Cloud user account credentials.
 - Click the **Include Data** option to include the data with the project or folder.
 - Click the **Connection Credentials** option if you want to include the data source connection's user name and password.

4. Click **Publish**.

The project or folder is shared to the Oracle Analytics Cloud user account you specify and is displayed in Oracle Analytics Cloud with other projects and folders.

Email Projects and Folders

You can email the .DVA file of a project or folder to enable other users to work with it.

When you start to email the project or folder, you initiate an export process that produces a .DVA file that includes everything that you need to use the project or folder (such as associated data sets, the connection string and credentials, and stored data)

1. On the Home page, click **Projects**.
2. On the Projects page select the project or folder that you want to share and click **Action Menu**, then select **Export** to open the Export dialog.
3. Click **Email** to open the Email dialog.
4. Move the slider to enable the **Include Data** option, if you're sharing a project or folder that uses an Excel data source and you want to include the data with the export.
5. Move the slider to enable the **Connection Credentials** option, if retrieving the data requires connection credentials. Then enter and confirm the password.
6. If your project or folder includes data from an Oracle Applications or a database data source and the **Include Data** option is enabled, then you must enter a password that's sent to the database for authentication when the user opens the application and accesses the data. Disable the **Include Data** option if you don't want to include the password with the project or folder. If you clear this option, then users must enter the password when opening the application to access the data.

7. Click **Email**.

Your email client opens a new partially composed email with the .DVA file attached.

When you select the **Email** option, you don't obtain a file that you can save.

Share Visualizations, Canvases, or Stories

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

Topics:

- [Share a File of a Visualization, Canvas, or Story](#)
- [Share a File of a Visualization, Canvas, or Story on Oracle Analytics Cloud](#)
- [Email a File of a Visualization, Canvas, or Story](#)
- [Print a Visualization, Canvas, or Story](#)
- [Write Visualization Data to a CSV or TXT File](#)

Share 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** - Select either to include the active canvas or visualization, or all canvases.
 - **Narrate** - 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. Move the slider to select the **Include Data** and **Connection Credentials** options. If you select the **Include Data** and **Connection Credentials** options, enter a password to retrieve the packaged data.

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**.

Stop Sharing Links

User Profile **Shared Links**

Share a File of a Visualization, Canvas, or Story on Oracle Analytics Cloud

You can share the visualizations, canvases, and stories that you've created in a project in Data Visualization Desktop with a user of Oracle Analytics Cloud.

1. Create or open a data visualization project.
2. Click the **Share** icon on the project toolbar, then click **Cloud** to open the Oracle Analytics Cloud dialog.
3. In the Oracle Analytics Cloud dialog, specify and select the options.
 - Enter the file name and Oracle Analytics Cloud URL such as `https://cloud.oracle.com/`.
 - Enter your Oracle Analytics Cloud user account credentials.
 - Click the **Include Data** option to include the data with the visualizations, canvases, or stories.
 - Click the **Connection Credentials** option if you want to include the data source connection's user name and password.
4. Click **Publish**.

The project is shared to the Oracle Analytics Cloud user account you specify and is displayed in Oracle Analytics Cloud with other projects.

Email a File of a Visualization, Canvas, or Story

You can choose to email one or more of your project's visualizations, canvases, or stories as a file. You can also email a project as a file.

1. Create or open a Data Visualization project.
2. Click the **Share** icon on the project toolbar, then click **Email** to open the Email dialog.
3. In the Email dialog, specify and select the options based on the selected file format that you want to send as an email attachment.
 - **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** - Select either to include the active canvas or visualization, or all canvases.
 - **Narrate** - 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. Move the slider to select the **Include Data** and **Connection Credentials** options. If you select the **Include Data** and **Connection Credentials** option, enter a password to retrieve the packaged data.

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

4. Click **Email**.

Your email client opens a new partially composed email with the export file attached..
When you select the **Email** option, you don't obtain a file that you can save.

Print 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**.
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**.
5. Specify other printing preferences such as which printer to use and how many copies to print and click **Print**.

Write 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**.
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 Data Visualization Desktop.

Topics:

- [FAQs to Install Data Visualization Desktop](#)
- [FAQs for Data Visualization Projects and Data Sources](#)
- [FAQs to Print and Export from Data Visualization](#)

FAQs to Install Data Visualization Desktop

This topic contains common questions about installing Data Visualization Desktop and installing Oracle DVML.

How do I install Machine Learning and Advanced Analytics for Data Visualization Desktop?

Machine learning and advanced analytics are optional components and not automatically installed with Data Visualization. If you want to use the Diagnostics Analytics (Explain), Machine Learning Studio, or advanced analytics functionality, then you must install machine learning.

Follow these steps to install the required version of machine learning on Windows.

1. Click **Install DVML** from the Data Visualization Desktop Windows Start menu. This installation enables machine learning and advanced analytics for the corresponding Data Visualization Desktop installation.
2. Click **Yes** when you see the following message: Do you want to allow the following program to make changes to this computer?
3. The installer starts automatically on completion of the download. Follow the displayed instructions to install machine learning to the selected install path.
4. Click **Finish** to close the installer.
5. Click any key when you see the message: Press any key to continue to closes the terminal window.
6. If Data Visualization Desktop was running during machine learning installation, then you must restart Data Visualization Desktop before you can use the machine learning functionality.

Follow these steps to install the required version of the Machine Learning Framework on Apple Mac.

1. Double-click the application **Oracle Data Visualization Desktop Configure Python** in Finder under Applications or in Launchpad. A terminal window indicates the download progress of the installer.

2. The installer starts automatically on completion of the download. Follow the displayed instructions to install machine learning to the selected install path.
 - To run the installation, you must enter the user name and password for an administrator.
 - Review the license terms and agree.
3. Click **Close**, when the installation is completed.
The Machine Learning Framework is installed in `/Library/Frameworks/DVMLruntime.framework`
4. If Data Visualization Desktop was running during machine learning installation, then you must restart Data Visualization Desktop before you can use the machine learning and advanced analytics functionality.

IMPORTANT: If you have issues with upgrading Data Visualization Desktop from previous versions, then you should delete the previous version prior to installing the new version. See Important Steps Before Upgrading Oracle Data Visualization Desktop on Apple Mac.

Why can't I install Data Visualization Desktop on my computer?

To successfully install Data Visualization Desktop on your computer, you must have administrator privileges. If you try to install Data Visualization Desktop without administrator privileges, the following error message is displayed: `Error in creating registry key. Permission denied.`

To check to see if you've the required administrator privileges, go to Windows Control Panel and check your user accounts. If you don't have administrator privileges, then see your company's technical support person to help you set up the needed privileges.

How can I get the most current version of Data Visualization Desktop?

If you open Data Visualization Desktop when a newer version is available, a message is displayed, telling you to go to Oracle Technology Network to download the latest version of the Data Visualization Desktop installer.

You can find the current version of the installer on Oracle Technology Network. See Oracle Data Visualization Desktop Installation Download.

FAQs for Data Visualization Projects and Data Sources

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

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've 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\extdriver.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`.

FAQs to Print and Export from Data Visualization

This topic contains common questions about printing and exporting from Data Visualization.

Why don't I see images in projects or from background maps when I print pages or when I export images in formats such as PDF, PPT, and PNG?

You or a visualization builder might have added an image to a project or background map by referencing that image with a URL. For the image to print or be exported in various formats, the external website hosting that image must have the `Access-Control-Allow-Origin` header from the host server, to ensure proper security. If a map background includes an image reference that's taken from an external website that doesn't have this header, you won't see the image.

For more information about this header, see https://www.w3.org/wiki/CORS_Enabled.

B

Troubleshoot 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\extdrvier.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 Panel 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 Spreadsheets or Other Data Files](#).

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`

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 Data Visualization Desktop

This topic describes accessibility features and information for Data Visualization Desktop.

Topics:

- [Start Data Visualization Desktop with Accessibility Features Enabled](#)
- [Keyboard Shortcuts for Data Visualization](#)
- [Keyboard Shortcuts for Data Flow](#)

Start Data Visualization Desktop with Accessibility Features Enabled

You can enable features that make the interface for Data Visualization Desktop more accessible by improving navigation. To enable these features, you must start Data Visualization Desktop from the command line. Open a command window and enter the following:

On Windows:

```
dvdesktop.exe - sdk
```

On Mac:

```
open /Applications/dvdesktop.app --args -sdk
```

When you run the command, you see Data Visualization Desktop open in a web browser.

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
Add insights to a project.	Ctrl + I
Add data columns to a project.	Shift + F10
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 canvas.	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

Use these keyboard shortcuts when you want to open, create, or edit artifacts such as data sets, projects, data flows, and sequences in a new tab or window.

Task	Keyboard Shortcut
Open an artifact in a new browser tab.	Ctrl+Click the artifact
Open an artifact in a new browser window.	Shift+Click the artifact

Keyboard Shortcuts for Data Flow

Use these keyboard shortcuts to perform actions in the data flow editor.

Task	Keyboard Shortcut
Undo the last change.	Ctrl + Z / Command + Z
Reverse the last undo.	Ctrl + Y / Command + Y

D

Data Sources and Data Types Reference

Find out about supported data sources, databases, and data types.

Topics

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

Supported Data Sources

You can connect to many different data sources.

Data Sources Supported for Use with Data Visualization Desktop on Mac

You can use these as data sources on Mac.

- Oracle Applications
- Oracle Database
- Oracle Essbase
- Oracle Autonomous Data Warehouse
- Oracle Talent Acquisition Cloud (Beta)
- Microsoft Excel XLSX File
- CSV File

Data Sources Supported for Use with Oracle Data Visualization Desktop

Data Source	Version	DV Desktop for Windows	DV Desktop for Mac	More Information
Oracle Applications	11.1.1.9+ or Fusion Applications Release 8 and later	Yes	Yes	Connector supports several Oracle SaaS Applications. See Oracle Applications Connector Support . See also Create Oracle Applications Connections .

Data Source	Version	DV Desktop for Windows	DV Desktop for Mac	More Information
Oracle Autonomous Data Warehouse	-	Yes	Yes	<p>Connection to public IP address only.</p> <p>You can connect to multiple Oracle Autonomous Data Warehouse data sources. Upload a wallet for each connection.</p> <p>See Create Connections to Oracle Autonomous Data Warehouse.</p>
Oracle Big Data Cloud	-	Yes	-	<p>Oracle Big Data Cloud must be integrated with Oracle Identity Cloud Service.</p> <p>See Create Connections to Oracle Big Data Cloud.</p>
Oracle Database	11.2.0.4+ 12.1+ 12.2+	Yes	Yes	<p>Use the Oracle Database connection type to connect to Oracle Database Cloud Service.</p> <p>You can connect to multiple database services. Upload a wallet for each connection.</p> <p>Ensure that the appropriate security access rules are in place to allow a network connection to the database service on the database listening port.</p> <p>See Create Database Connections.</p>
Oracle Content and Experience Cloud	-	Yes	-	-
	Oracle Essbase 11.1.2.4.0 + Oracle Analytics Cloud – Essbase	Yes	Yes	See Create Connections to Oracle Essbase .
Oracle Service Cloud	1.2	Yes	-	-
Oracle Talent Acquisition Cloud	-	Yes	Yes	-
Action Ingres	5.0+	Yes	-	-
Action Matrix	5.0+	Yes	-	-
Action Vector	5.0+	Yes	-	-
Amazon Aurora	-	Yes	-	-

Data Source	Version	DV Desktop for Windows	DV Desktop for Mac	More Information
Amazon EMR	Amazon EMR 4.7.2 running Amazon Hadoop 2.7.2 and Hive 1.0.0 Amazon EMR (MapR) - Amazon Machine Image (AMI) 3.3.2 running MapR Hadoop M3 and Hive 0.13.1	Yes	-	Complex data types not supported.
Amazon Redshift	1.0.1036 +	Yes	-	-
Apache Drill	1.7+	Yes	-	-
Apache Hive	2.3.0+ 3.0+	Yes	-	-
Cassandra	3.10	Yes	-	-
DB2	10.1+ 10.5+	Yes	-	-
DropBox	-	Yes	-	-
Google Analytics	-	Yes	-	-
Google Cloud	-	Yes	-	-
Google Drive	-	Yes	-	-
GreenPlum	4.3.8+	Yes	-	-
HortonWorks Hive	1.2+	Yes	-	-
HP Vertica	7+	Yes	-	-
IBM BigInsights Hive	1.2+	Yes	-	-
Impala	2.7+	Yes	-	-
Informix	12.1+	Yes	-	-
MapR Hive	1.2+	-	-	-
Microsoft Access	2013 2016	Yes	-	-
MonetDB	5+	Yes	-	-
MongoDB	3.2.5	Yes	-	-
MySQL	5.6+ 5.7+	Yes	-	Connections to MySQL Community Edition isn't supported.
Netezza	7	Yes	-	-

Data Source	Version	DV Desktop for Windows	DV Desktop for Mac	More Information
Pivotal HD Hive	-	Yes	-	-
PostgreSQL	9.0+	Yes	-	-
Presto	-	Yes	-	-
Salesforce	-	Yes	-	-
Spark	1.6+	Yes	-	-
SQL Server	2014 2016	Yes	-	-
Sybase ASE	15.7+	Yes	-	-
Sybase IQ	16+	Yes	-	-
Teradata	14 15 16 16.10	Yes	-	-
Teradata Aster	6.10+	Yes	-	-
Elastic Search	5.6.4+	Yes	-	-
JDBC	Generic JDBC driver support	-	-	-
OData	4.0+	Yes	-	-
ODBC	Generic ODBC driver support	-	-	-
CSV File	-	Yes	Yes	-
Microsoft Excel	-	Yes	Yes	Only XLSX files.

Oracle Applications Connector Support

Oracle Applications Connector supports several Oracle SaaS Applications. You can also use Oracle Applications Connector to connect to your on-premises Oracle BI Enterprise Edition deployments (if patched to an appropriate level) and another Oracle Analytics Cloud service.

Oracle SaaS applications you can connect to:

- Oracle Sales Cloud
- Oracle Financials Cloud
- Oracle Human Capital Management Cloud
- Oracle Supply Chain Cloud
- Oracle Procurement Cloud
- Oracle Project Cloud
- Oracle Loyalty Cloud

Data Visualization Supported and Unsupported Data Types

Read 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
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

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

E

Data Preparation Reference

This topic describes the set and types of recommendation and options you can use to perform data transform changes to a data set.

Topics:

- [Transform Recommendation Reference](#)
- [Column Menu Options for Quick Data Transformations](#)

Transform Recommendation Reference

Find out about the data transform options in the project's Prepare canvas.

Option	Description
Edit	Edits the column. For example, you can change the name, select another column, or update functions.
Hide	Hides the column in the Data Panel and in the visualizations. If you want to see the hidden columns, click Hidden columns (ghost icon) on the page footer. You can then unhide individual columns or unhide all the hidden columns at the same time.
Group, Conditional Group	Select Group to create your own custom groups. For example, you can group States together with custom regions, and 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 uppercase 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 identical content 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 any value that you specify. For example, you can change all instances of <i>Mister</i> to <i>Mr.</i> 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 and 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, or Senior based on custom requirements.
Log	Calculates the natural logarithm of an expression.

Option	Description
Power	Raises the values of a column to the power that you specify. The default power is 2.
Square Root	Creates a column populated with the square root of the value in the column selected.

Column Menu Options for Quick Data Transformations

You can use the following column menu options to transform data in a data flow.

Options	Description
Rename	Change the column name.
Duplicate	Create a column with data that's identical to the selected column.
Delete	Select and remove a column from the data set.
Convert to Number	Change the data type of the column to number and delete any values that aren't numbers.
Convert to Text	Change the data type of a column to text.
Uppercase	Convert all the text in the column to uppercase.
Lowercase	Convert all the text in the column to lowercase.
Sentence Case	Convert the first letter of the first word to uppercase on each row in a column.
Group	Create a custom group to combine related values. For example, you can group states with custom regions and categorize dollar amounts into groups showing small, medium, and large.
Merge Columns	Combine two or more columns to display as one.
Transform	Modify the column data by using an expression.
Bin	Create your custom groups for number ranges.

F

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"."P ROD_NAME" IS NULL	Determines if a value is null.	IS NULL
LIKE	"PRODUCTS"."P ROD_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
+	(FEDERAL_REVE NUE + LOCAL_REVENUE) - TOTAL_EXPENDI TURE	Plus sign for addition.	+

Operator	Example	Description	Syntax
-	(FEDERAL_REVE NUE + LOCAL_REVENUE) - TOTAL_EXPENDI TURE	Minus sign for subtraction.	-
* or X	SUPPORT_SERVI CES_EXPENDITU RE * 1.5	Multiply sign for multiplication.	* X
/	CAPITAL_OUTLA Y_EXPENDITURE /1.05	Divide by sign for division.	/
%		Percentage	%
	STATE CAST(YEAR AS CHAR(4))	Character string concatenation.	
((FEDERAL_REVE NUE + LOCAL_REVENUE) - TOTAL_EXPENDI TURE	Open parenthesis.	(
)	(FEDERAL_REVE NUE + LOCAL_REVENUE) - TOTAL_EXPENDI TURE	Closed parenthesis.)
>	YEAR > 2000 and year < 2016 and year <> 2013	Greater than sign, indicating values higher than the comparison.	>
<	YEAR > 2000 and year < 2016 and year <> 2013	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.	<=

Operator	Example	Description	Syntax
<>	YEAR > 2000 and year < 2016 and year <> 2013	Not equal to, indicating values higher or lower, but different.	<>
,	STATE in ('ALABAMA', 'C ALIFORNIA')	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)	CASE WHEN score-par < 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	Evaluates each WHEN condition and if satisfied, assigns the value in the corresponding THEN expression. If none of the WHEN conditions are satisfied, it assigns the default value specified in the ELSE expression. If no ELSE expression is specified, the system automatically adds an ELSE NULL.	CASE WHEN request_condition1 THEN expr1 ELSE expr2 END

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](#)
- [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. <code>measure</code> is the name of a measure column. <code>level</code> 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	<code>BIN(revenue BY productid, year WHERE productid > 2 INTO 4 BINS RETURNING RANGE_LOW)</code>	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. <code>numeric_expr</code> is the measure or numeric attribute to bin BY <code>grain_expr1, ..., grain_exprN</code> is a list of expressions that define the grain at which the <code>numeric_expr</code> will be calculated. BY is required for measure expressions and is optional for attribute expressions. WHERE a filter to apply to the <code>numeric_expr</code> before the numeric values are assigned to bins INTO <code>number_of_bins BINS</code> is the number of bins to return BETWEEN <code>min_value</code> AND <code>max_value</code> 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	<code>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}])</code>
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.	<code>BottomN(expr, integer)</code>
Count	<code>Count(Products)</code>	Determines the number of items with a non-null value.	<code>COUNT(expr)</code>
CountDistinct		Adds distinct processing to the Count function. expr is any expression.	<code>COUNT(DISTINCT expr)</code>
Count*	<code>SELECT COUNT(*) FROM Facts</code>	Counts the number of rows.	<code>COUNT(*)</code>
First	<code>First(Sales)</code>	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.	<code>First([NumericExpression])</code>
Last	<code>Last(Sales)</code>	Selects the last non-null returned value of the expression.	<code>Last([NumericExpression])</code>
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.	<code>MAVG(expr, integer)</code>

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	<code>REGR(revenue, (discount_amount), (product_type, brand), 'fitted', '')</code>	Fits a linear model and returns the fitted values or model. This function can be used to fit a linear curve on two measures.	<code>REGR(y_axis_measure_expr, (x_axis_expr), (category_expr1, ..., category_exprN), output_column_name, options, [runtime_binded_options])</code>
Evaluate_Script	<code>EVALUATE_SCRIPT('filerepo ://obiee.Outliers.xml', 'isOutlier', 'algorithm=kmeans;id= %1;arg1=%2;arg2= %3;useRandomSeed=False;', customer_number, expected_revenue, customer_age)</code>	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.	<code>EVALUATE_SCRIPT(script_file_path, output_column_name, options, [runtime_binded_options])</code>

Calendar Functions

Calendar functions manipulate data of the data types DATE and DATETIME based on a calendar year.

Function	Example	Description	Syntax
CURRENT_Date	<code>CURRENT_DATE</code>	Returns the current date. The date is determined by the system in which the Oracle BI is running.	<code>CURRENT_DATE</code>
CURRENT_TIME	<code>CURRENT_TIME(3)</code>	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.	<code>CURRENT_TIME(expr)</code>
CURRENT_TIMESTAMP	<code>CURRENT_TIMESTAMP(3)</code>	Returns the current date/timestamp to the specified number of digits of precision.	<code>CURRENT_TIMESTAMP(expr)</code>
DAYNAME	<code>DAYNAME(Order_Date)</code>	Returns the name of the day of the week for a specified date expression.	<code>DAYNAME(expr)</code>
DAYOFMONTH	<code>DAYOFMONTH(Order_Date)</code>	Returns the number corresponding to the day of the month for a specified date expression.	<code>DAYOFMONTH(expr)</code>
DAYOFWEEK	<code>DAYOFWEEK(Order_Date)</code>	Returns a number between 1 and 7 corresponding to the day of the week for a specified date expression. For example, 1 always corresponds to Sunday, 2 corresponds to Monday, and so on through to Saturday which returns 7.	<code>DAYOFWEEK(expr)</code>
DAYOFYEAR	<code>DAYOFYEAR(Order_Date)</code>	Returns the number (between 1 and 366) corresponding to the day of the year for a specified date expression.	<code>DAYOFYEAR(expr)</code>

Function	Example	Description	Syntax
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	CAST(hiredate AS CHAR(40)) FROM employee	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).	CAST(expr AS type)
IfNull	IfNull(Sales, 0)	Tests if an expression evaluates to a null value, and if it does, assigns the specified value to the expression.	IFNULL(expr, value)
INDEXCOL	SELECT IndexCol(VALUEOF (NQ_SESSION.GEOGRAPHY_LEVEL), Country, State, City), Revenue FROM Sales	Uses external information to return the appropriate column for the signed-in user to see.	IndexCol([integer literal], [expr1] [, [expr2], ?-])
NullIf	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";	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.	NullIf([expression], [expression])
To_DateTime	SELECT To_DateTime ('2009-03-03 01:01:00', 'yyyy-mm-dd hh:mi:ss') FROM sales	Converts string literals of DateTime format to a DateTime data type.	To_DateTime([expression], [literal])
VALUEOF	SalesSubjectArea.Customer.Region = VALUEOF("Region Security"."REGION")	References the value of an Oracle BI repository variable in a filter. Use expr variables as arguments of the VALUEOF function. Refer to static repository variables by name.	ValueOf(expr)

Display Functions

Display functions operate on the result set of a query.

Function	Example	Description	Syntax
BottomN	BottomN(Sales, 10)	Returns the <i>n</i> lowest values of expression, ranked from lowest to highest.	BottomN([NumericExpression], [integer])

Function	Example	Description	Syntax
Filter	<code>Filter(Sales USING Product = 'widget')</code>	Computes the expression using the given preaggregate filter.	<code>FILTER(measure USING filter_expr)</code>
Mavg	<code>Mavg(Sales, 10)</code>	Calculates a moving average (mean) for the last <i>n</i> rows of data in the result set, inclusive of the current row.	<code>Mavg([NumericExpressi on], [integer])</code>
Msum	<code>SELECT Month, Revenue, Msum(Revenue, 3) as 3_MO_SUM FROM Sales</code>	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.	<code>Msum([NumericExpressi on], [integer])</code>
Ntile	<code>Ntile(Sales, 100)</code>	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.	<code>Ntile([NumericExpress sion], [integer])</code>
Percentile	<code>Percentile(Sales)</code>	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.	<code>Percentile([NumericEx pression])</code>
Rank	<code>Rank(Sales)</code>	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...).	<code>Rank([NumericExpressi on])</code>
Rcount	<code>SELECT month, profit, Rcount(profit) FROM sales WHERE profit > 200</code>	Takes a set of records as input and counts the number of records encountered so far.	<code>Rcount([NumericExpres sion])</code>
Rmax	<code>SELECT month, profit, Rmax(profit) FROM sales</code>	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.	<code>Rmax([NumericExpressi on])</code>
Rmin	<code>SELECT month, profit, Rmin(profit) FROM sales</code>	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.	<code>Rmin([NumericExpressi on])</code>

Function	Example	Description	Syntax
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([NumericExpression])
TopN	TopN(Sales, 10)	Returns the <i>n</i> highest values of expression, ranked from highest to lowest.	TopN([NumericExpression], [integer])

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)	Calculates the arc tangent of a numeric expression. expr is any expression that evaluates to a numerical value.	ATAN(expr)
Atan2	Atan2(1, 2)	Calculates the arc tangent of y/x , where <i>y</i> is the first numeric expression and <i>x</i> is the second numeric expression.	ATAN2(expr1, expr2)
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)

Function	Example	Description	Syntax
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()
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(expr)
Round	Round(2.166000, 2)	Rounds a numeric expression to n digits of precision. expr is any expression that evaluates to a numerical value. integer is any positive integer that represents the number of digits of precision.	ROUND(expr, integer)

Function	Example	Description	Syntax
Sign	<code>Sign(Profit)</code>	This function returns the following: <ul style="list-style-type: none"> • 1 if the numeric expression evaluates to a positive number • -1 if the numeric expression evaluates to a negative number • 0 if the numeric expression evaluates to zero 	<code>SIGN(expr)</code>
Sin	<code>Sin(1)</code>	Calculates the sine of a numeric expression.	<code>SIN(expr)</code>
Sqrt	<code>Sqrt(7)</code>	Calculates the square root of the numeric expression argument. The numeric expression must evaluate to a nonnegative number.	<code>SQRT(expr)</code>
Tan	<code>Tan(1)</code>	Calculates the tangent of a numeric expression. <code>expr</code> is any expression that evaluates to a numerical value.	<code>TAN(expr)</code>
Truncate	<code>Truncate(45.1234 5, 2)</code>	Truncates a decimal number to return a specified number of places from the decimal point. <code>expr</code> is any expression that evaluates to a numerical value. <code>integer</code> is any positive integer that represents the number of characters to the right of the decimal place to return.	<code>TRUNCATE(expr, integer)</code>

Running Aggregate Functions

Running aggregate functions perform operations on multiple values to create summary results.

Function	Example	Description	Syntax
Mavg		Calculates a moving average (mean) for the last <code>n</code> rows of data in the result set, inclusive of the current row. <code>expr</code> is any expression that evaluates to a numerical value. <code>integer</code> is any positive integer. Represents the average of the last <code>n</code> rows of data.	<code>MAVG(expr, integer)</code>
Msum	<code>select month, revenue, MSUM(revenue, 3) as 3_MO_SUM from sales_subject_ar ea</code>	This function calculates a moving sum for the last <code>n</code> rows of data, inclusive of the current row. <code>expr</code> is any expression that evaluates to a numerical value. <code>integer</code> is any positive integer. Represents the sum of the last <code>n</code> rows of data.	<code>MSUM(expr, integer)</code>

Function	Example	Description	Syntax
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)
Bit_Length	Bit_Length('abcd ef')	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)

Function	Example	Description	Syntax
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)
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)

Function	Example	Description	Syntax
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. integer is 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)
Replace	Replace('abcd1234', '123', 'zz')	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.	REPLACE(expr1, expr2, expr3)

Function	Example	Description	Syntax
Right	SELECT Right('123456', 3) FROM table	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	RIGHT(expr, integer)
Space	Space(2)	Inserts blank spaces. integer is any positive integer that indicates the number of spaces to insert.	SPACE(expr)
Substring	Substring('abcde f' FROM 2)	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.	Substring([SourceString] FROM [StartPosition])
SubstringN	Substring('abcde f' FROM 2 FOR 3)	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.	SUBSTRING(expr FROM startPos FOR length)
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)

Function	Example	Description	Syntax
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
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, <code>PERIODROLLING</code> 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])

Function	Example	Description	Syntax
Forecast	FORECAST(numeric _expr, ([series]), output_column_na me, options, [runtime_binded_ options])	Creates a time-series model of the specified measure over the series using Exponential Smoothing (ETS) or Seasonal ARIMA or ARIMA, 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(revenue, (time_year, time_quarter), 'forecast', 'modelType=arima;numP eriods= %1;predictionInterval =70;', 3)

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.

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Data Visualization SDK Reference

This topic describes the software development kit (SDK) that you can use to develop and deploy visualization plug-ins to your Data Visualization installation.

Topics:

- [Oracle Data Visualization SDK](#)
- [Create the Visualization Plug-in Development Environment](#)
- [Create a Skeleton Visualization Plug-in](#)
- [Create a Skeleton Skin or Unclassified Plug-in](#)
- [Develop a Visualization Plug-in](#)
- [Run in SDK Mode and Test the Plug-in](#)
- [Validate the Visualization Plug-in](#)
- [Build, Package, and Deploy the Visualization Plug-in](#)
- [Delete Plug-ins from the Development Environment](#)

Oracle Data Visualization SDK

The Oracle Data Visualization SDK provides a development environment where you can create and develop custom visualization plug-ins and deploy them to your Data Visualization installation.

Topics:

- [Scripts](#)
- [Other Resources](#)

Scripts

Your installation of Oracle Data Visualization includes the scripts that you use to create a development environment and create skeleton visualization plug-ins.

The scripts are located in this directory: `<your_installation_directory>\Oracle Data Visualization Desktop\tools\bin`.

For example, `C:\Program Files\Oracle Data Visualization Desktop\tools\bin`

Note the following script names and descriptions:

- **bicreateenv** - Run this script to create the development environment where you develop your plug-ins.
- **bicreateplugin** - Run this script to create a skeleton visualization to quickly get started on developing your custom plug-in.

- **bideleteplugin** - Run this script to delete a plug-in from your development environment.
- **bivalidate** - Run this script with the `gradlew validate` command to call the `bivalidate` script. The `bivalidate` script validates whether the JSON configuration files are properly formatted and contain appropriate visualization configuration.

Other Resources


You can use resources other than scripts to develop your custom visualization plug-ins.

Note the following available resources:

- **circlePack sample** - The `circlePack` sample is included in your development environment. You can deploy and use this sample immediately. However, the sample is designed for you to use with the provided tutorial to learn how to develop a visualization plug-in. You can also copy the sample and use it as a template for the visualization plug-ins that you want to create.

The `circlePack` sample is located in `<your_development_directory>\src\sampleviz\sample-circlepack`

For example, `C:\OracleDVDev\src\sampleviz\sample-circlepack`
- **Other visualization plug-in samples** - You can download plug-in examples from the [Oracle Analytics Library](#).
- **Tutorial** - The tutorial contains information and instructions to help you understand how to create a robust visualization plug-in. This tutorial provides step-by-step instructions for modifying the `circlePack` sample included in your plug-in development environment.

 [Tutorial](#)
- **JS API documentation** - This documentation contains JavaScript reference information that you need to develop a visualization plug-in. See [Data Visualization SDK JavaScript Reference](#).

Create the Visualization Plug-in Development Environment

You need to set the `PATH` environment variable and create the development environment before you can create visualization plug-ins.

1. Using the command prompt, create an empty development directory. For example, `C:\OracleDVDev`.
2. Set the `PATH` environment variable. For example,

```
set DVDESKTOP_SDK_HOME="C:\Program Files\Oracle Data Visualization
Desktop"
set PLUGIN_DEV_DIR=C:\OracleDVDev
REM add tools\bin to path:
set PATH=%DVDESKTOP_SDK_HOME%\tools\bin;%PATH%
```

3. Run the **bicreateenv** script included in your installation to create the development environment in the empty directory. For example,

```
cd C:\OracleDVDev
bicreateenv
```

For information about the options available for running this script, see the script's command-line help. For example,

```
C:\OracleDVDev>bicreateenv -help
```

The complete development environment, including build.gradle and gradlew, is created in the directory that you specified.

4. (Optional) If you're working behind a web proxy, then you need to set gradle.properties to point to your proxy. The gradle.properties are located in your development environment, for example C:\OracleDVDev\gradle.properties.

Use the following example to set your gradle.properties:

```
systemProp.https.proxyHost=www-proxy.somecompany.com
systemProp.https.proxyPort=80
systemProp.https.nonProxyHosts=*.somecompany.com|*.companyaltname.com
```

Create a Skeleton Visualization Plug-in

After you create a skeleton visualization plug-in in your development environment, you then develop it into a robust visualization plug-in and deploy it to your Data Visualization environment.

1. Run the **bicreateplugin** script included in your installation to create a skeleton visualization. Use the following syntax:

```
bicreateplugin viz -<subType> -<id> -<name>
```

- <subType> is the type of visualization that you want to create. Your choices are:
 - **basic** - Use this option to create a visualization that doesn't use any data from Data Visualization or use any data model mapping. This is like the Image and Text visualization types delivered with Data Visualization. For example, you can use this visualization type to show an image or some text that's coded into the plug-in or from a configuration. You can use this type of visualization to improve formatting.
 - **dataviz** - This type renders data from data sources registered with Oracle Data Visualization into a chart or table or some other representation on the screen. It also respond to marking events from other visualizations on the same canvas and publish interaction events to affect other visualizations on the same canvas.
 - **embeddableDataviz** - This type renders data from data sources registered with Oracle Data Visualization into the cells of a trellis visualization. It also responds to marking events from other visualizations on the same canvas and publish interaction events to affect other visualizations on the same canvas.

- `<id>` is your domain and the name that you want to give the visualization directory and components in your development environment. For example, `com-company.basicviz`.
- `<name>` is the name of the visualization plug-in that you test, deploy, and use in Data Visualization projects.

For example to create a basic visualization, name its development directory `com-company-basicviz`, and name the visualization plug-in `helloViz`, enter and run the following command:

```
C:\OracleDevDir>bicreateplugin viz -subType basic -id
com.company.basicviz -name helloViz
```

2. (Optional) Open the script's command-line help for information about the options available for running this script. For example, `C:\OracleDVDev> bicreateplugin -help`

When you run the `bicreateplugin -viz` command for the first time, the system creates the `customviz` directory in the following location.

```
<your_development_environment>\src\customviz
```

All custom visualization development directories that you create are added to this directory.

For example, `C:\OracleDVDev\src\customviz\com-company-basicviz`

Create a Skeleton Skin or Unclassified Plug-in

The `bicreateplugin -unclassified` command creates an empty plug-in with `plugin.xml`, localization bundles, and is a starting point for other Oracle Data Visualization plug-ins. The `bicreateplugin -skin` command creates a skeleton skin plug-in.

1. Run the **createplugin** script included in your installation to create a skeleton plug-in. Use one of the following syntaxes:

```
bicreateplugin -skin -<id>
```

```
bicreateplugin -unclassified -<id>
```

- `<id>` is your domain and the name that you want to give the visualization. For example, `com-company.newskin`

For example, to create a skin plug-in, enter and run the following command:

```
C:\OracleDevDir>bicreateplugin skin -id com.company.newskin
```

Develop a Visualization Plug-in

After you create the skeleton visualization plug-in, you can use resources provided by Oracle to help you develop your plug-in.

The directories for `dataviz` and `embeddableDataviz` types include the `datamodelhandler.js` file, which contains the physical-to-logical data mapping format. This file also tells Data Visualization how to render itself on the screen and pass user interactions to the server.

- Use the tutorial to learn how to perform development tasks such as implement data mapping.

 [Tutorial](#)

- Use the .JS API documentation to learn how to add dependencies. See [Data Visualization SDK JavaScript Reference](#).

Run in SDK Mode and Test the Plug-in

You can run Oracle Data Visualization in SDK mode from your browser when you're developing your visualization plug-in or when you want to test your visualization plug-in.

1. Execute the `gradlew run` command. For example, `C:\OracleDevDir>gradlew run`

After you run the command, note the following results:

- Data Visualization opens in SDK mode in your default browser. Use the browser's JavaScript debugger to test and debug the application.
 - The visualization that you created is available in the Visualizations pane of Data Visualization.
 - A system tray is displayed in the operating system's toolbar and includes three links: Launch Browser, which you use to launch or relaunch your default browser to display Data Visualization; Copy URL to Clipboard, which you can use to copy the URL and paste it into a different browser; and Shutdown, which you use to shut down the development browser.
2. Test your visualization by dragging and dropping it to a project's canvas and adding data elements.
 3. If necessary, continue developing the visualization plug-in. When working in SDK mode in the browser, you can update the .JS definition and refresh the browser to see your changes.

Validate the Visualization Plug-in

After you've tested your visualization plug-in and before you can package and deploy it, you must validate it.

1. Run the `gradlew validate` command. For example,

```
cd C:\OracleDVDev
.\gradlew validate
```

This step validates whether the JSON configuration files are properly formatted and contain appropriate visualization configuration. If the validation discovers any errors, then the system displays error messages.

2. To check for errors in the JavaScript source files, use your browser's development tools.

Build, Package, and Deploy the Visualization Plug-in

After you validate the visualization plug-in, you've to build and package it, and then copy the resulting distributions into your Data Visualization installation directory.

The build and package process runs for all of the visualizations in your development directory, and each plug-in is contained in its own zip file. There's no way to build and

package specific visualizations. If you want to exclude visualizations from the build and package process, then you've to move the visualizations that you want to exclude out of your development directory, or delete them from the directory before you perform the build. See [Delete Plug-ins from the Development Environment](#).

1. Run the `gradlew build` command. For example,

```
cd C:\OracleDVDev
.\gradlew clean build
```

A build directory is added to your development environment. For example, `C:\OracleDVDev\build\distributions`. This directory contains a zip file for each visualization. The zip file's name is the one that you gave the visualization when you created its skeleton. For example, `basicviz.zip`.

2. Copy the zip files to your Data Visualization installation directory. For example, `%localappdata%\DVDesktop\plugins`.

Delete Plug-ins from the Development Environment

You can use the `bideleteplugin` script provided with Data Visualization to delete the unneeded plug-ins from your development environment.

The build and package process includes all of the visualizations contained in your development directory. There is no way to build and package specific visualizations. To exclude any unwanted visualizations from the build, you can delete them before you perform the build and package process.

1. If you want to delete a visualization plug-in, then run the `bideleteplugin` command, using the following syntax:

```
cd C:\<your_development_directory>
bideleteplugin viz -id <name_of_your_domain>.<name_of_viz_plugin>
```

2. If you want to delete an unclassified plug-in, then run the `bideleteplugin` command, using the following syntax:

```
cd C:\<your_development_directory>
bideleteplugin unclassified -id
<name_of_your_domain>.<name_of_unclassified_plugin>
```

3. If you want to delete a skin plug-in, then run the `bideleteplugin` command, using the following syntax:

```
cd C:\<your_development_directory>
bideleteplugin skin -id <name_of_your_domain>.<name_of_skin_plugin>
```