Oracle® Fusion Middleware

User's Guide for Oracle Data Visualization

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Oracle Fusion Middleware User's Guide for Oracle Data Visualization, 12*c* (12.2.1.3.0)

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Preface

Topics:

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

- Audience
- Related Resources
- Conventions

Audience

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

Documentation Accessibility

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

Access to Oracle Support

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

Related Resources

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

In addition:

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

Conventions

The following text conventions are used in this document:

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

New Features for Oracle Data Visualization Users

Learn about the latest additions to the application.
This preface contains the following topics:

New Features for Oracle BI EE 12c (12.2.1)

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

- Visualize data in Oracle Applications

- Modify uploaded data sources

- Use new and enhanced visualization types

- Customize your color schemes

- Move filter panels in projects

- Data wrangling — update data sources after upload

- Share reports with others on a read-only basis

- New ways to present data visualizations

Visualize data in Oracle Applications

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

Modify uploaded data sources

You can modify uploaded data sources including editing columns, and creating new ones for use in projects. See Modifying Uploaded Data Sources.

Use new and enhanced visualization types

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

Customize your color schemes

Create custom color palettes and apply color to data elements in specific ways. See Working With Color.

Move filter panels in projects

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

Data wrangling — update data sources after upload

Make updates to existing data sources including editing columns, and creating new ones for use in projects. See Modifying Uploaded Data Sources.

Share reports with others on a read-only basis

Give people limited access to your reports. Let them view and interact with visualizations without worrying about compromising the data. See Investigating Data Using Interactions.

New ways to present data visualizations

The following visualizations were added:

Donut charts – Similar to pie charts

Tile views – Performance tiles present a distilled analysis of data

Text boxes – Annotate your data with text

See Changing Visualization Types.

New Features for Oracle BI EE 12c (12.2.1.1)

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

- Visualize data in databases
- Size of data files to upload
- Change data blending

Visualize data in databases

You can use data from databases as data sources for projects. See Connecting to Database Data Sources.

Size of data files to upload

You can now upload data files up to 50 MB in size. See About Adding a Spreadsheet as a Data Source.

Change data blending

You can change the way that the system automatically blends the data from two data sources. See Changing Data Blending.

New Features for Oracle BI EE 12c (12.2.1.2)

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

New Features for Oracle BI EE 12c (12.2.1.3)

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

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Getting Started with Visual Analyzer

This topic helps you understand Visual Analyzer and how to navigate the home page.

Topics

- About Oracle Data Visualization
- What is the Visual Analyzer Home Page?
- Searching for Projects and Visualizations
- Visualizing Data with BI Ask
- Search Tips

About Oracle Data Visualization

Oracle Data Visualization makes it easy for you to quickly explore your data and discover meaningful insights. It includes tools to help you analyze data in your Oracle Business Intelligence repository as well as data outside the repository, with easy to use visualization and data management tools.

What is the Visual Analyzer Home Page?

You can use the Visual Analyzer home page to create, edit, or view visual analyzer projects, dashboard, or analyses.
In Oracle BI EE the Visual Analyzer Home Page is also called the **New Home Page**. You can toggle from the Visual Analyzer home page to the Oracle BI EE home page, which is also called the OBI Classic page, by clicking **Open OBI Classic**. Use the OBI Classic page to create other business intelligence objects such as alerts, prompts, and Oracle Business Intelligence Publisher reports. See What is the Oracle BI EE Home Page?

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

Creating and Using Data Sources

The **Data Sources** area contain the data that you use to create visualizations and analyses. A data source can be either a subject area or a data set. You can create data sets by either uploading an Excel file or by building a connection to Oracle BI Applications or to a database. See Adding Your Own Data.

Using the Catalog

The Display area provides several categories to help you quickly locate analyses, dashboards, and visualization projects stored in the catalog. Use **My Folder** or **Shared Folders** to browse the catalog. Or click the **Favorites**, **Recents**, **VA Projects**, **Dashboards**, or **Analyses** category to quickly locate an object that you recently viewed or a specific object by type.

Searching for Objects in the Catalog

You can use keywords to search for the objects in the catalog. Type a search term in the **Find content or visualize** field to see a list of objects that match your search criteria, and click on a row with the magnifying glass icon (located at the top of the dropdown window in the **Search results containing** section). See Searching for Projects and Visualizations.

Visualizing Data with BI Ask

You can use BI Ask to quickly combine existing data objects into a visualization. Type a search term in the **Find content or visualize** field to see a list of objects that match your search criteria, and click on a row with an data attribute icon (located in the **Visualize data using** section of the dropdown window) to start building your visualization. See Visualizing Data with BI Ask.

Creating Objects

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

- **VA Project** as described in Typical Workflow for Exploring Content
- **Dashboard** as described in Creating Dashboards in *User's Guide for Oracle Business Intelligence Enterprise Edition*
- **Analysis** as described in Specifying the Criteria for Analyses in *User's Guide for Oracle Business Intelligence Enterprise Edition*

Getting More Information

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

Searching for Projects and Visualizations

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

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

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

1. In the Home Page, click the **Find content or visualize** field.

2. Enter your search criteria by typing either keywords or the full name of an object such as a folder or project. As you enter your criteria, the system builds the search string in the drop-down list. See Search Tips.

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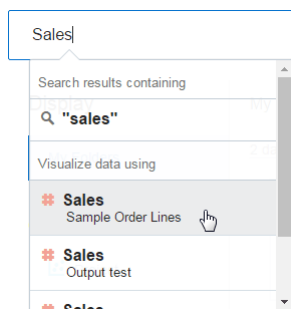
3. In the **Search results containing** section of the drop-down list, click the search term that you want to use.

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

4. To clear the search criteria, in the **Find content or visualize** field, click the **X** icon.

Visualizing Data with BI Ask

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

1. In the Home Page, click the **Find content or visualize** field.

2. Enter your criteria. As you enter the information, the application returns search results in a drop-down list. If you select an item from this drop-down list, then your visualized data is displayed.

   • What you select determines the data source for the visualization, and all other criteria that you enter is limited to columns or values in that data source. The name of the data source you're choosing from is displayed in the right side of the **Find content or visualize** field. Note the following BI Ask search and visualization example:
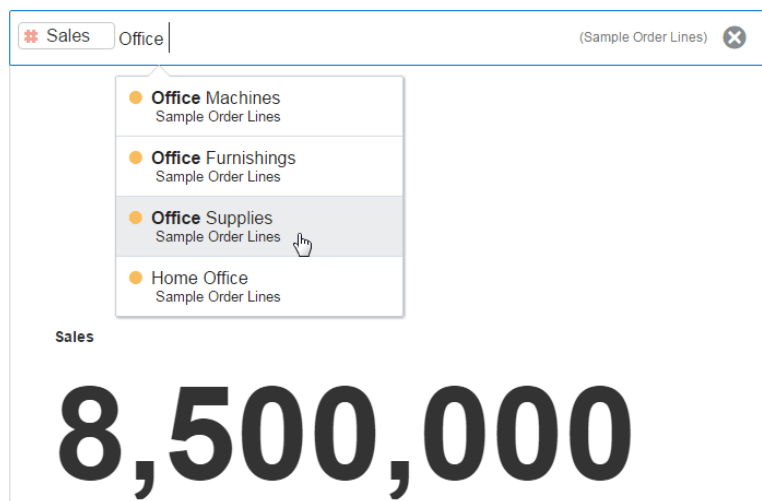
   • You can use the **Find content or visualize** field to search for projects and visualizations or to use BI Ask. When you enter your initial search criteria, the drop-down list contains BI Ask results, which are displayed in the **Visualize data using** section of the drop-down list. Your initial search criteria also build a search string to find projects and visualizations. That search string is displayed

in the **Search results containing** section of the drop-down list and is flagged with the magnifying glass icon. See Search Tips.
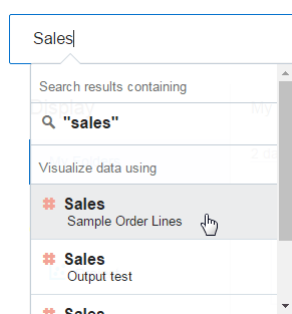
3. Enter additional criteria in the search field, select the item that you want to include, and the application builds your visualization.

4. Optional. 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.

5. Optional. Click **Change Visualization Type** to apply a different visualization to your data.

6. Optional. Click **Open in Data Visualization** to further modify and save the visualization.

7. To clear the search criteria, in the **Find content or visualize** field, click the **X** icon.

Search Tips

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

Wildcard Searches

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

Meaningful Keywords

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

Items Containing Commas

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

Date Search

If you want to search for a date attribute, you search using the year-month-date format. Searching with the month/date/year format (for example, 8/6/2016) doesn't

produce any direct matches. Instead, your search results contain entries containing 8 and entries containing 2016.

Searching in Non-English Locales

When you enter criteria in the search field, what displays in the drop-down list of suggestions can differ depending upon your locale setting. For example, if you're using an English locale and enter *sales*, then the drop-down list of suggestions contains items named *sale* and *sales*. However, if you're using a non-English locale such as Korean and type *sales*, then the drop-down list of suggestions contains only items that are named *sales* and items such as *sale* aren't included in the drop-down list of suggestions.

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

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Exploring Your Content

This topic describes the many ways that you can explore and work with content.

Topics

- Typical Workflow for Exploring Content
- Choosing Data Sources
- Adding Data Elements to Visualizations
- Sorting Data in Visualizations
- Adjusting the Canvas Layout
- Changing Visualization Types
- Adjusting Visualization Properties
- Working With Color
- Undoing and Redoing Edits
- Reversing Visualization Edits
- Refreshing Visualization Content
- Exploring Data Using Filters
- Exploring Data in Other Ways
- Composing Expressions
- Creating Calculated Data Elements
- Building Stories
- Exploring Data Without Authoring
- Exploring Data on Mobile Devices

Typical Workflow for Exploring Content

Here are the common tasks for exploring content.

Task	Description	More Information
Select data sources	Select data sources for a project.	Choosing Data Sources
Add data elements	Add data elements from a selected data source to visualizations.	Adding Data Elements to Visualizations
Adjust the canvas layout	Add, remove, and rearrange visualizations.	Adjusting the Canvas Layout

Task	Description	More Information
Filter content	Streamline the content shown in visualizations.	Exploring Data Using Filters
Set visualization interaction properties	Specify how visualizations synchronize.	Specifying How Visualizations Interact with One Another

Choosing Data Sources

Before you can begin to explore data in a project, you must select a data source for that information. You can select subject areas, Oracle Applications, databases, or uploaded data files as your data sources.

If you installed the sample data, then you can immediately use the sample data as a data source. For example, if you want to explore product sales by region, you can select Sample Sales as the data source.

1. In the Add Data Source dialog, select the appropriate subject area or data source containing the data that you want to visualize. This dialog opens automatically when you create a new project.
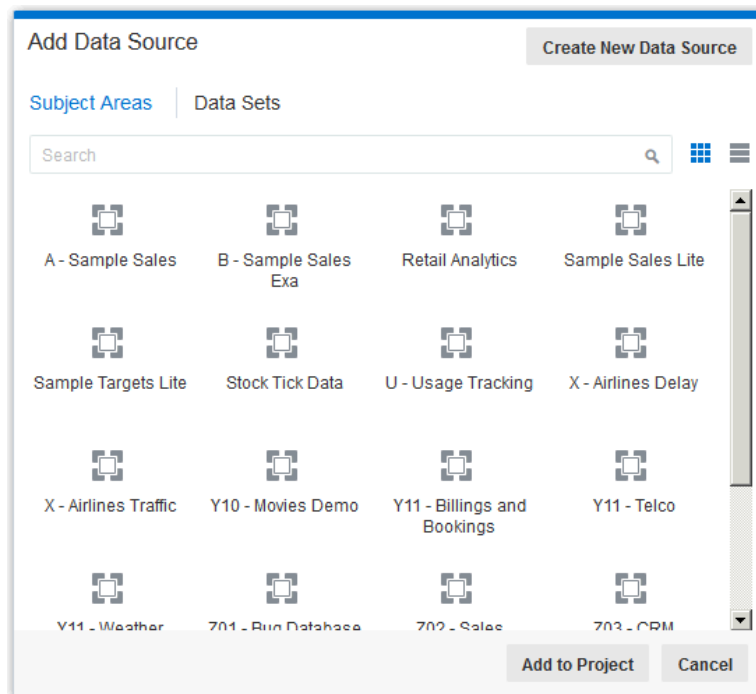
2. Click **Add to Project**.

> **✎ Note:**
>
> To add data sources to an existing project, right-click the Data Elements pane, and then click **Add Data Source**. When you add two or more data sources to a project, they must match. Sometimes the system matches them automatically, but sometimes you need to match them manually using the **Source Diagram** option. If the data sources don't match, then the additional data sources you added aren't displayed in the Data Elements pane, but are displayed in the Data Sources pane. See Blending Data That You Added.

Adding Data Elements to Visualizations

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

Topics:

- Adding Data Elements to Drop Targets
- Adding Data Elements to Visualization Drop Targets
- Adding Data Elements to a Blank Canvas

Adding Data Elements to Drop Targets

After you select the data sources for your project, you can begin to add data elements such as measures and attributes to visualizations. A drop target is the visualization element (for example, Columns) onto which you can drop a compatible data element (for example, Category) from the data source.
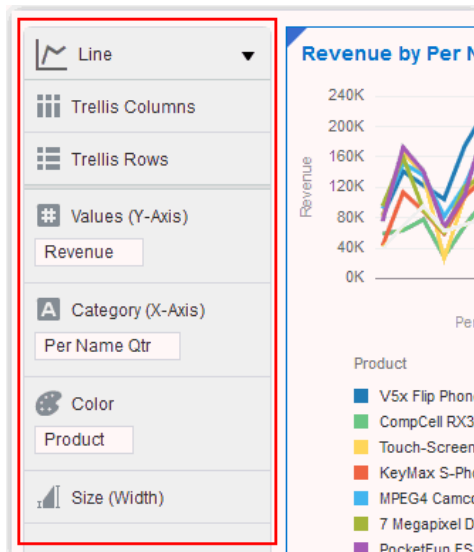
Here are some of the ways that you can add data elements to drop targets:

- Drag and drop one or more data elements from the Data Elements pane to drop targets in the Explore pane.

The data elements are automatically positioned in the best drop target in the Explore pane, and if necessary the visualization changes to optimize its layout.
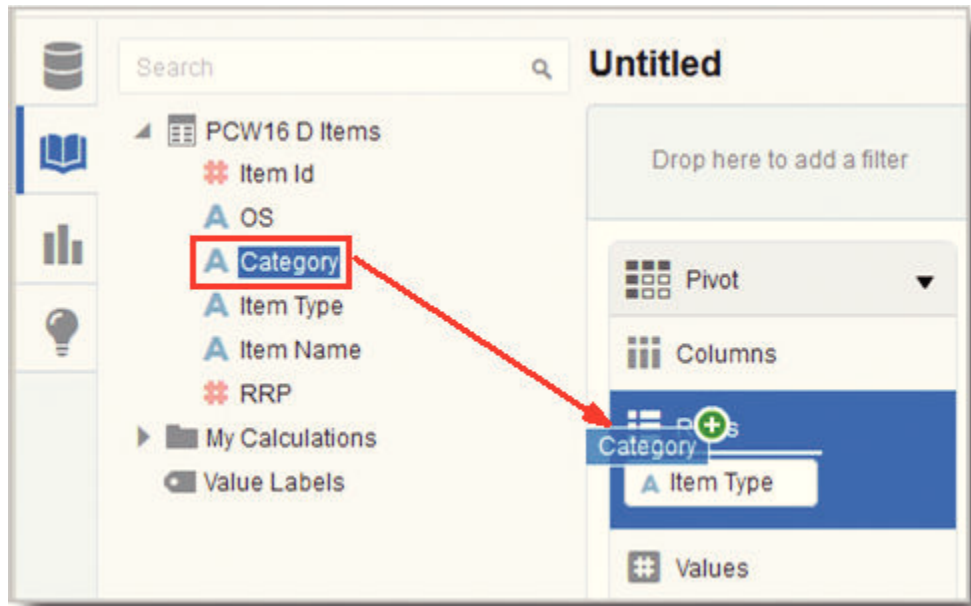
- Double-click data elements in the Data Elements pane to add them to the Explore pane.

- Replace a data element in the Explore pane by dragging it from the Data Elements pane and dropping it over an existing data element already in the Explore pane.

- Swap data elements in the Explore pane by dragging a data element already inside the pane and dropping it over another data element in the pane.

- Remove a data element from the Explore pane by clicking the **X** in the data element token.

Adding Data Elements to Visualization Drop Targets

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

- When you drag and drop a data element over to a visualization (but not to a specific drop target), you'll see a blue outline around the recommended drop targets in the visualization. In addition, you can identify any valid drop target because you'll see a green plus sign icon appear next to your data element.
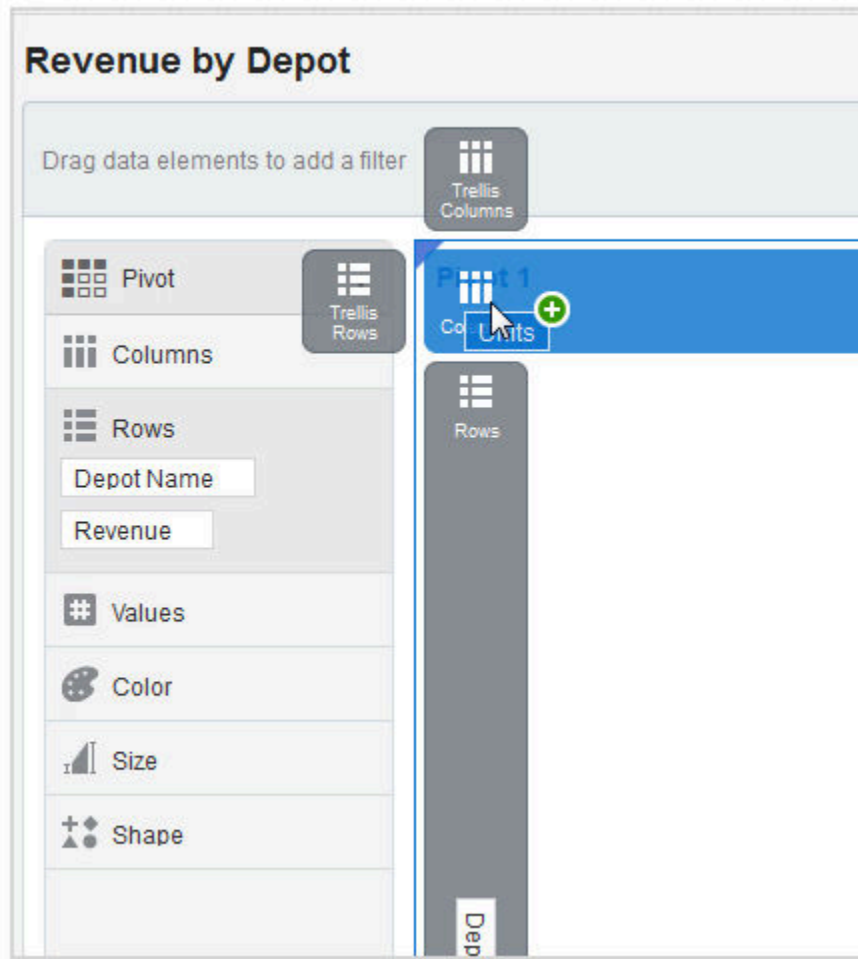
> **Note:**
>
> If you aren't sure where to drag and drop any data element, then drag and drop the data element anywhere over the visualization instead of to a specific drop target.

After you drop data elements into visualization drop targets or when you move your cursor outside of the visualization, the drop targets disappear.

- To display the drop targets again in the visualization, on the visualization toolbar, click **Show Assignments**. You can also do this to keep the visualization drop targets in place while you work.
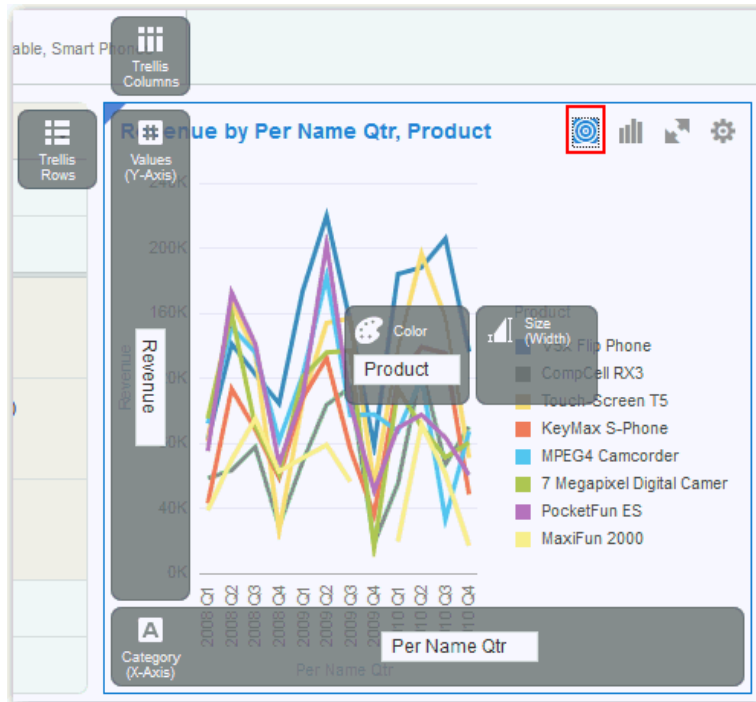
Adding Data Elements to a Blank Canvas

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

Drag one or more data elements to the blank canvas or between visualizations on the canvas. A visualization is automatically created and the best visualization type and layout are selected. For example, if you add time and product attributes and a revenue measure to a blank canvas, the data elements are placed in the best locations and the Line visualization type is selected.

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

Sorting Data in Visualizations

Sometimes you're working with a lot of data in visualizations. To optimize your view of that data, you need to sort it.

1. In the Explore pane, click the data element you want to sort.
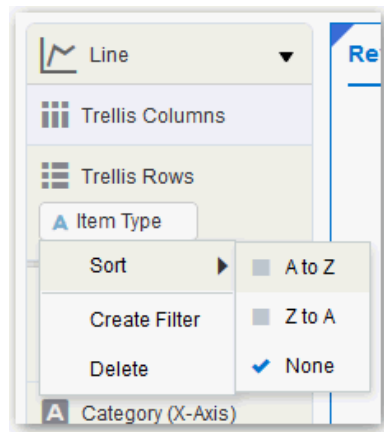
2. Select **Sort**.

3. Select a sort option such as **A to Z** or **Low to High**. The available sort options are based on the data element you're sorting.

Adjusting the Canvas Layout

You can adjust the look and feel of visualizations on the canvas to make them more visually attractive. For example, you can create a visualization and then copy it to the canvas. You can then modify the data elements in the duplicated visualization, change the visualization type, and then resize it.

- To delete a visualization from the canvas, right-click it and select **Delete Visualization**.

- To rearrange a visualization on the canvas, drag and drop the visualization to the location (the space between visualizations) where you want it to go. The target drop area is displayed with a blue outline.

- To resize a visualization, use your cursor to drag the edges to size it.

- To copy a visualization on the canvas, right-click it and select **Copy Visualization**.

- To paste a copied visualization on the canvas, right-click the canvas and select **Paste Visualization**.

Changing Visualization Types

You can change visualization types to maximize the graphical representation of the data you're exploring.

The visualization type is automatically chosen based on the selected data elements. However, this is true when you create a new visualization by dragging data elements to a blank area on the canvas. After a visualization is created, dragging additional data elements to it won't change the visualization type automatically.

1. Select a visualization on the canvas, and on the visualization toolbar, click **Change Visualization Type**.
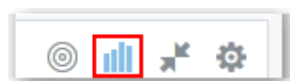
> **✎ Note:**
>
> You can also add a new visualization to the canvas by dragging it from the Visualizations pane to the canvas.
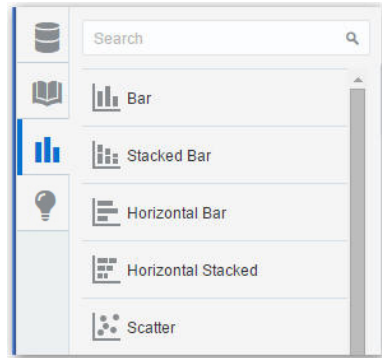
2. In the View Select dialog, select a visualization type. For example, change the visualization type from Bar to Stacked Bar.

> **✎ Note:**
>
> You can choose any visualization type, but the visualization types that are highlighted in blue are the recommended ones based on the data elements you select and where they're positioned on the canvas.
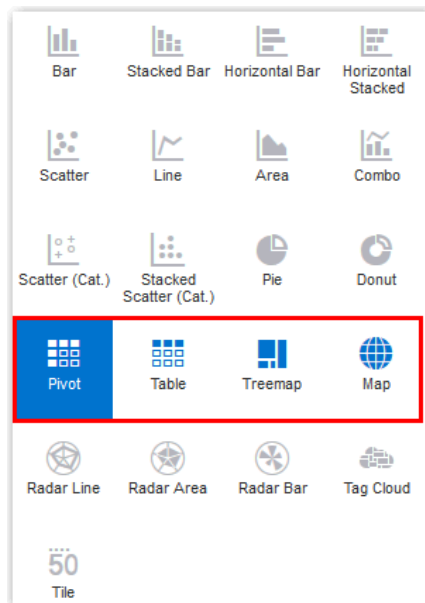
When you change the visualization type, the data elements are moved to matching drop target names. If an equivalent drop target doesn't exist for the new visualization type, then the data elements are moved to a drop target labeled **Unused**. You can then move them to the drop target you prefer.

Adjusting Visualization Properties

You generally don't need to change visualization properties because the default selections cover most cases. You might want to make adjustments such as hiding the legend, changing axis labels, or adding a URL link.

- On the active visualization toolbar, click **Menu** , and then select **Properties** to display the Properties dialog.
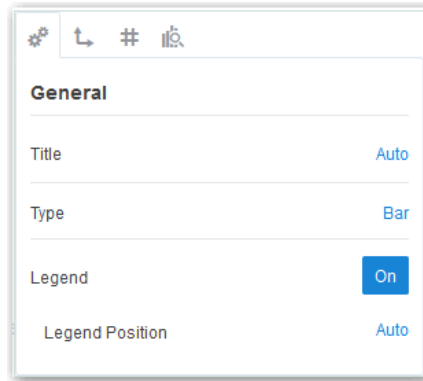
The properties you can edit depend on the type of visualization you're handling.

- Adjust visualization properties:

Properties Tab	Description
Analytics	Add reference lines, trend lines, and bands to display at the minimum or maximum values of a measure included in the visualization.
Axis	Set horizontal and vertical value axis labels and start and end axis values.
Edge Labels	Show or hide row or column totals and wrap label text.
General	Format titles, position the legend, and customize descriptions.
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 the description via audio.
Style	Set the background and border color for Text visualizations.
Values	Specify data value display options including the aggregation method such as sum or average, and number formatting such as percent or currency.

Working With Color

This topic covers working with color in projects and visualizations.

Topics:

- Applying Color to Projects

Applying Color to Projects

You can work with color to make visualizations appear more dynamic on the canvas. For example, you can color a series of measures (Sales and Costs) or a series of attribute values (2015 and 2016).
Visualizations also have a Color drop target that can contain a measure or set of attributes. When a measure is in color, continuous coloring is used, and the brightness of the measure color is based on the measure value. When attributes are in color, series coloring is used, and each attribute value in the series is assigned a color. By default, colors are auto-assigned based on the current palette, but series colors can also be customized.

To apply color to a project:

• To apply color to the entire project, click the **Canvas Settings** button on the toolbar and then select **Project Properties**. Select the color series you want to use or create a new custom color palette.
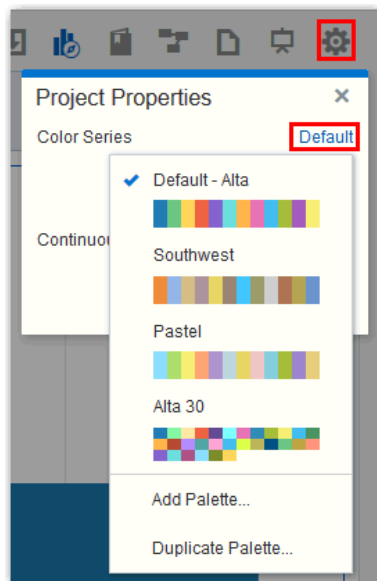
The colors are applied in a progression, with each measure colored uniquely. Each measure is allocated a color, and that color assignment stays in place while you work in the project.

• To apply high contrast continuous coloring, click **Canvas Settings** on the project toolbar, then select **Project Properties**, then click the **Auto** link, and then select **High Contrast**.
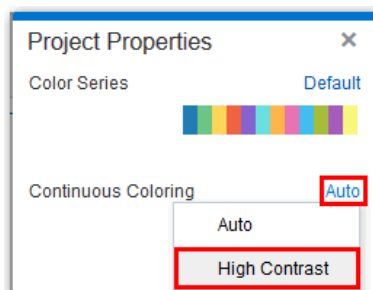
High contrast enables the optimal delineation of colors based on human eyesight. For example, you can use a measure to color data points with lighter or darker shades of a base color.

- To create a custom palette, click **Canvas Settings** on the project toolbar, then select **Project Properties**, then click the **Default** link, and then select **Add Palette**. In the Add Palette dialog, set up the palette and activate it.

- To reset all the colors to the project default, click **Canvas Settings** on the project toolbar, and then select **Reset Colors**. This overrides all the color management changes you've made so far.

> **Note:**
>
> You can also use the **Undo** and **Redo** buttons on the project toolbar to go back or forward a step and play with colors. For more information, see Undoing and Redoing Edits.

Setting Visualization Colors

You can work with color for specific visualizations on the canvas. Series and data point coloring are shared across all visualizations within a project, so if you change the series or data point color in one visualization, this can affect the colors in other visualizations.

To set color in visualizations:

- To manage color assignments for attributes and measures in a visualization, right-click in the visualization, select **Color**, and then select **Manage Color Assignments**.
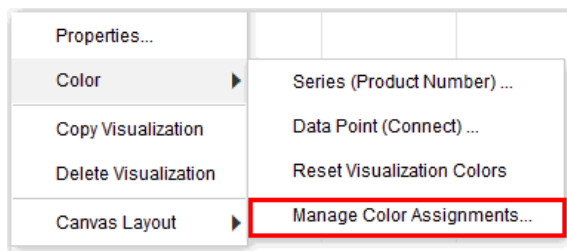
You can then reset the series colors, or select a different color palette by series. If you click **Reset Series Colors**, it re-renders the visualization and only the current data element colors in the visualization are reset.
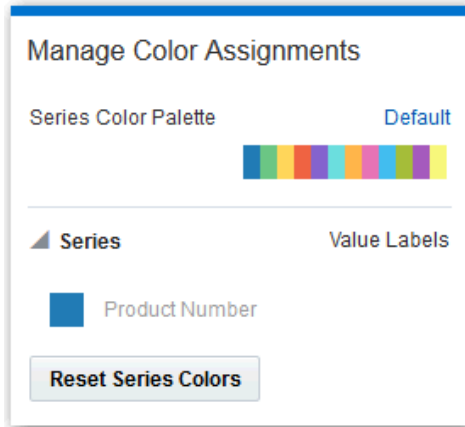
- To reset the series and data point color overrides for attributes and measures in a specific visualization, right-click in the visualization, select **Color**, and then select **Reset Visualization Colors**.

- To set color by data point in a visualization, right-click the visualization, select **Color**, and then select **Data Point (HomeView)**. This is the home view value and the color is applied across a series in the visualization.
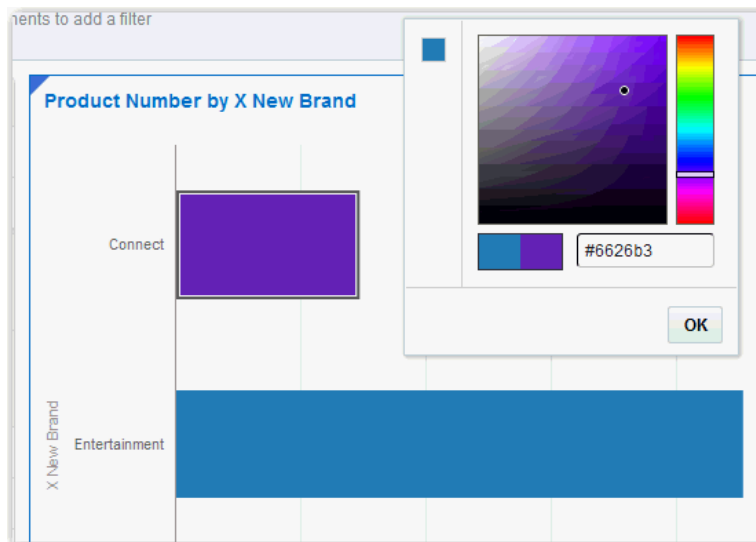
> ✏ **Note:**
>
> Color management tools apply to all visualization types with the exception of Tile.

Undoing and Redoing Edits

You can quickly undo your last action and then redo it if you change your mind. For example, you can try a different visualization type when you don't like the one you've just selected, or you can go back to where you were before you drilled into the data. These options are especially useful as you experiment with different visualizations. On the project toolbar, click the **Undo Last Edit** or the **Redo Last Edit** button.

Reversing Visualization Edits

You can easily reverse changes you make in a project, as long as the project has not been saved since making the changes. For example, if you accidentally place data elements in the wrong drop targets in a visualization, and can easily undo your changes.

You can reverse edits in two ways:

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

- To undo the last edit you made to a project, on the project toolbar click **Undo Last Edit**. You can click **Redo Last Edit** to reapply the edit that you undid. You can only use these options if you have not saved the project since making the changes.

Refreshing Visualization Content

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

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

- Click **Canvas Settings** on the project toolbar and select **Refresh Metadata and Report**.

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

Exploring Data Using Filters

This topic describes how you use filters to explore your content.

Topics

- About Filters and Filter Types
- How Visualizations and Filters Interact
- About Automatically Applied Filters
- Creating Filters on a Project
- Moving Filter Panels
- Applying Range Filters
- Applying List Filters
- Applying Date Filters
- Building Expression Filters

About Filters and Filter Types

Filters reduce the amount of data shown in visualizations, canvases, and projects. The types of filters you can use are Range, List, Date, and Expression.
Filter types are automatically determined based on the data elements you choose as filters.

- Range filters are generated for data elements that are number data types and that have an aggregation rule set to something other than none. Range filters are applied to data elements that are measures, and that limit data to a range of contiguous values, such as revenue of $100,000 to $500,000. Or you can create a range filter that excludes (as opposed to includes) a contiguous range of values. Such exclusive filters limit data to noncontiguous ranges (for example, revenue less than $100,000 or greater than $500,000). See Applying Range Filters.

- List filters are applied to data elements that are text data types and number data types that aren't aggregatable. See Applying List Filters.

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

- Expression filters let you define more complex filters using SQL expressions. See Building Expression Filters.

How Visualizations and Filters Interact

There are several ways to specify how visualizations and filters interact.

How Filters Interact

Note how filters are applied and interact:

- **Filter Bar:** Any filters that are added to the filter bar are applied to all visualizations on all canvases in the project. These project-level filters are always applied first, before any filters you include on the visualizations.

- **Filter Bar with Limit Values Applied:** If you add more than one filter to the filter bar, then by default the filters restrict each other based on the values that you select. For example, if you have filters for Product Category and Product Name, and if you set the Product Category filter to Furniture and Office Supplies, then the options in the Product Name filter value pick list is limited to the product names of furniture and office supplies. However, you can use the **Limit Values** option to remove or limit how the filters in the filter bar restrict each other.

- **Filters on Visualizations:** Filters that you specify on an individual visualization are applied 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 being used as a filter in the visualization, then filters are generated in the other visualizations.

How Visualizations Interact

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.
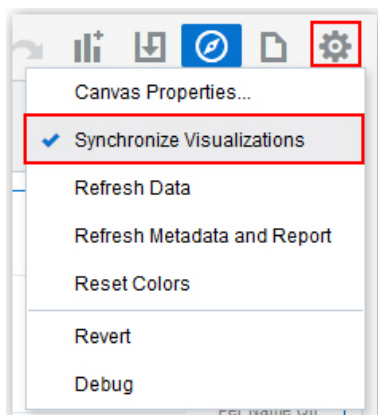
When **Synchronize Visualizations** is on (selected), then all filters on the filter bar and actions that produce filters (such as Drill, Keep Selected, Remove Selected) are applied to all visualizations on the canvas. For example, if you have a canvas with multiple visualizations and you drill into one of the visualizations, a corresponding filter is added to the filter bar and it affects all visualizations on the canvas. Note that any visualization-level filters are applied to only the visualization.

When **Synchronize Visualizations** is off (deselected), then analytic actions such as Drill or Keep Selected affect the visualization to which you applied the action. In this mode, the filters are displayed in a small gray filter bar within each visualization.

The analytic actions such as Drill, or Keep Selected affect only the visualization to which you applied the action.

There is an additional option, **Use as Master**, that is available from all visualizations' context menu. If **Use as Master** is turned on for a given visualization, then that one becomes the master visualization for the canvas. This means that selecting data in the master applies a filter to all other visualizations on the canvas.
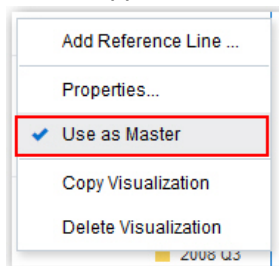
About Automatically Applied Filters

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

To turn off **Auto-Apply**, go to the filters bar, click **Actions**, and then select **Auto-Apply Filters**.
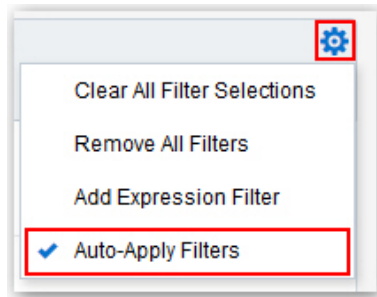
Creating Filters on a Project

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

For example, you can add a filter so that all of the visualizations in the project show only data for the years 2012, 2013, and 2014.

There are several options that you can use to define how filters interact with each other. See How Visualizations and Filters Interact.

Any filters included on the canvas are applied before the filters chosen from an individual visualization.

1. Go to the Data Elements pane and drag a data element to the filter bar.

2. Set the filter values. How you set the values depends upon the data type that you're filtering.

    • Apply a range filter to filter on columns such as Cost or Quantity Ordered. See Applying Range Filters.

    • Apply a list filter to filter on columns such as Product Category or Product Name. See Applying List Filters.

    • Apply a date filter to filters on columns such as Ship Date and Order Date. See Applying Date Filters.

3. (Optional) Click the Filters Bar **Menu** and select **Auto Apply Filters** 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.

Moving Filter Panels

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

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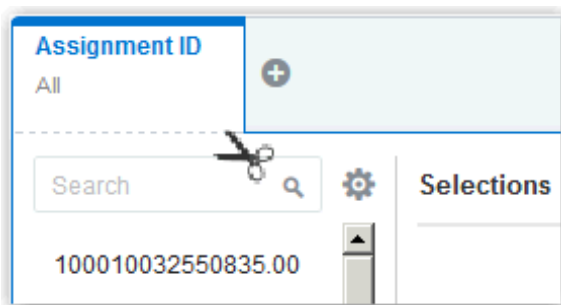
- To reattach the panel to the filter bar, click the reattach panel icon.
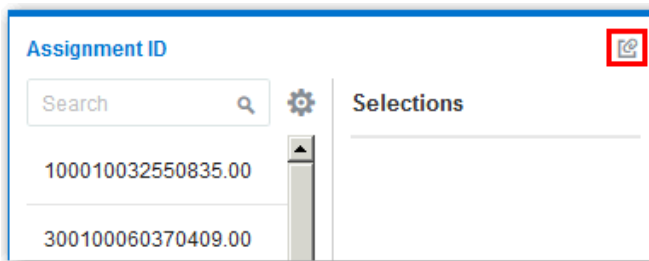
Applying Range Filters

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

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

1. Click the filter to view the Range list.

2. In the Range list, click **By** to view the Selections list.

   All members that are being filtered have check marks next to their names.

3. Optionally, in the Selections list, for any selected member that you want to remove from the list of selections, click the member.

   The check mark disappears next to the previously selected member.

4. Optionally, in the **Selections** list, for any non selected member that you want to add to the list of selections, click the member.

   A check mark appears next to the selected member.

5. Optionally, set the range that you want to filter on by moving the sliders in the histogram. The default range is from minimum to maximum, but as you move the sliders, the Start field and End field adjust to the range you set.

6. Click outside of the filter to close the filter panel.

Applying List Filters

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

1. Click the filter to view the Selections list.

2. Optionally, to the left of the Selections list, use the **Search** field to find the members you want to add to the filter.

3. Locate the member you want to include and click it to add it to the Selections list. You can locate members to include in two ways:

   - Scroll through the list of members.

   - Search for members. You can use the wildcards * and ? for searching.

4. Optionally, in the Selections list, you can click a member to remove it from the list.

5. Optionally, 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.

6. Optionally, 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.

7. Optionally, 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.

8. Click outside of the filter panel to close it.

9. Optionally, to clear the filter selections or remove all filters at one time, right-click in the filter bar, and then select **Clear Filter Selections** or **Remove All Filters**.

10. Optionally, to remove a single filter, right-click the filter in the filter bar, and then select **Remove Filter**.

Applying Date Filters

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

1. 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 new dates, in the filter, click **Action** and then select **Clear Filter Selections**.

5. Click outside of the filter to close the filter panel.

Building Expression Filters

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

For example, you can create the expression filter "Sample Sales"."Base Facts"."Revenue" < "Sample Sales"."Base Facts"."Target Revenue". After applying the filter, you see only 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. On the filter bar, click **Action** and 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.

Exploring Data in Other Ways

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.

Here are some of the analytic actions that you can take when you right-click content in visualizations:

*   Use **Sort** to sort attributes in a visualization, such as product names from A to Z. If you're working with a table view, then the system always sorts the left column first. In some cases where specific values display in the left column, you can't sort the center column. For example, if the left column is Product and the center column is Product Type, then you can't sort the Product Type column. To work around this issue, swap the positions of the columns and try to sort again.

*   Use **Drill** to drill to a data element, and drill through hierarchies in data elements, such as drilling to weeks within a quarter. You can also drill asymmetrically using multiple data elements. For example, you can select two separate year members that are columns in a pivot table, and drill into those members to see the details.

*   Use **Drill to [*Attribute Name*]** to directly drill to a specific attribute within a visualization.

*   Use **Keep Selected** to keep only the selected members and remove all others from the visualization and its linked visualizations. For example, you can keep the sales that are generated by a specific sales associate.

*   Use **Remove Selected** to remove selected members from the visualization and its linked visualizations. For example, you can remove the Eastern and Western regions from the selection.

*   Use **Add Reference Line or Band** to add a reference line to highlight an important fact depicted in the visualization, such as a minimum or maximum value.

For example, you might add a reference line across the visualization at the height of the maximum Revenue amount. You also might add a reference band to more clearly depict where the minimum and maximum Revenue amounts fall on the Revenue axis.

> **Note:**
>
> To add a reference band to a visualization, right-click it and select **Add Reference Line** to display the Properties dialog. On the Analytics tab, in the **Method** field, toggle **Line** to **Band**. See Adjusting Visualization Properties.

Composing Expressions

You can compose an expression to use in an expression filter or in a calculation. For both expression filters and calculations, you use the Expression Builder. Expressions that you create for expression filters must be Boolean (that is, they must evaluate to true or false). Expressions that you create for calculations aren't limited in this way.

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

You can compose an expression in various ways:

- Directly enter text and functions in the Expression Builder.
- 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.

Creating Calculated Data Elements

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

1. To open the Add Calculation dialog, go to the bottom of the Data Elements pane and click **Add Calculation**.

2. In the Expression Builder, compose an expression. See About Composing Expressions and Expression Editor Reference.

3. Click **Validate**.

4. In the **Name** field, enter a name for the calculated data element.

5. Click **Save**.

The new data element is created and added to the My Calculations folder in the Data Elements pane. You can add this data element to your visualizations as you would any other data element. For example, in visualization drop targets or in filters.

Building Stories

You can capture insights, group them into stories, and share them with others.

Topics:

- Capturing Insights
- Shaping Stories
- Sharing Stories

Capturing Insights

As you delve into data in visualizations, you can capture key information within an insight. Insights are live in that they can be changed and polished as many times as you need before you are ready to share them with others.

Insights enable you to take a snapshot of the information you see in a visualization, and help you remember "ah ha" moments while you work with the data. You can share insights in the form of a story, but you don't have to. They can simply remain as a list of personal "ah ha" moments that you can use to go back to, and perhaps explore further. You can combine multiple insights in a story and you can link them to visualizations. See Adjusting Visualization Properties.

> **Note:**
>
> Insights don't take a snapshot of data. They only take a snapshot of the project definition at a certain point in time. If someone else views the same insight, but that person has different permissions to the data, they might see different results than you do.

1. Perform one of the following actions:

a. Click the **Insights** tab in a project to display the Insights pane, and click **Add Insight**.
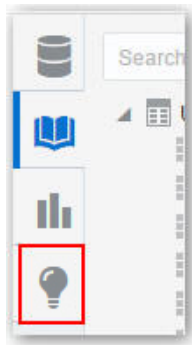
b. On the canvas toolbar, click **Story Navigator**, and in the Story Navigator pane, click **Add Insight**.

> **Note:**
>
> You can also press the control key and "I" on your keyboard to quickly create an insight.

2. In the Insight text box, click the down arrow, and select **Edit**.
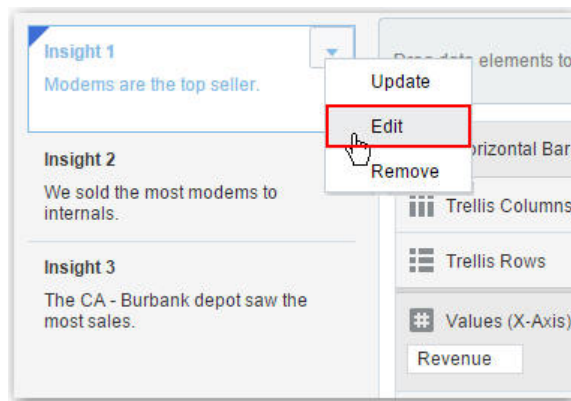
3. In the Description field, enter text to describe the realization you have for the data shown in the visualization at that moment.
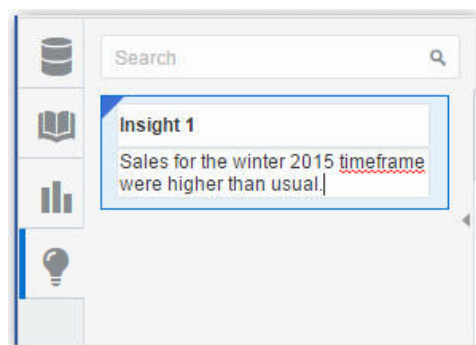
4. Continue adding insights to build a story about your data exploration.

The story builds in the Story Navigator pane, with each insight displayed as a blue circle.
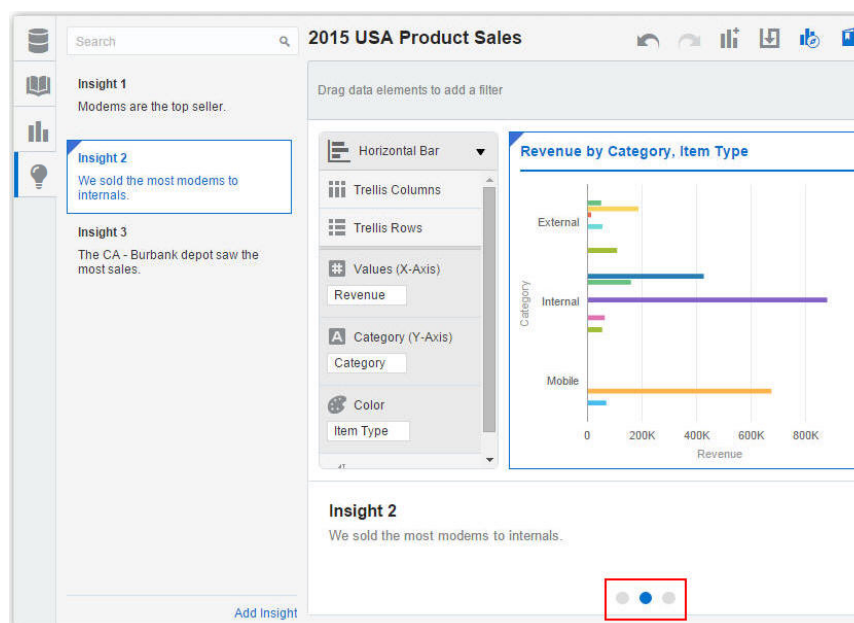
> **Note:**
>
> If an insight has a solid triangle, this tells you that it matches the project's current state. If you navigate away from the insight, the triangle becomes hollow. This is useful when you are creating and navigating a story. The same solid or hollow treatment is also applied to the circle representing the current step in the Story Navigator.

See Shaping Stories and Sharing Stories.

Shaping Stories

After you begin creating insights within a story, you can cultivate the look and feel of that story. For example, you can include another insight or hide an insight title.

> **Note:**
>
> You can have only one story in a project.

1. On the canvas toolbar, click **Story Navigator**.
2. In the Story Navigator pane, click **Menu**.

3. Shape the story in the following ways:

- Edit insights.

- Include or exclude insights.

- Show or hide insight titles or descriptions.

- Rearrange an insight within a story by dragging and dropping the insight in the Insights pane to the desired position. A dark blue line tells you where the insight is positioned.
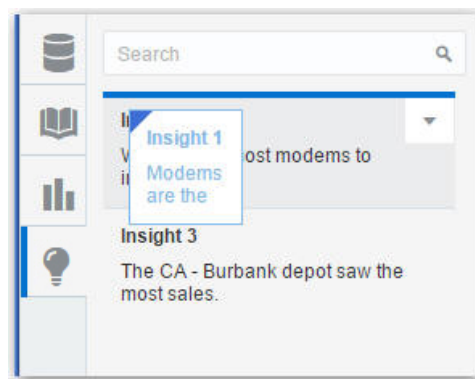
- Drag and drop insights between visualizations on the canvas.

> ✎ **Note:**
>
> You can modify canvas content for an insight, for example, add a trend line, change the chart type, or add a text visualization. After you make a change to an insight you are viewing, the wedge (in the Insight pane) or dot (in the Story Navigator) becomes hollow. If you select **Update**, it updates the insight with the changes, and the wedge or dot becomes solid blue again.

Sharing Stories

After you save a story, you can share it with others using the project URL.

The best way for users to see a story is in presentation mode. You can set a project to be view-only for all users by adding the parameter **reportMode = presentation** to the project URL, and then sharing that URL directly with others, for example, by e-mail or instant message. See Viewing Streamlined Content.

> **Note:**
>
> Project authors see the Story Navigator if they launched it before they shifted into presentation mode.

Exploring Data Without Authoring

This topic covers how authors can interact with others in projects without worrying about non-authors compromising the data.

Topics:

- Investigating Data Only Using Interactions
- Viewing Streamlined Content

Investigating Data Using Interactions

Project content authors can interact with view-only users in projects while still maintaining project integrity. View-only users have an optimized view of the project data without seeing the clutter of unnecessary authoring content controls.
View-only users can't perform authoring tasks such as creating projects, modifying data, editing visualizations, or modifying canvas layouts, so those controls aren't displayed to them while they are investigating project content.

However, view-only users can still:

- Exploring Data Using Filters
- Perform analytic functions to delve into data provided by project authors such as sorting and drilling in data elements. See Exploring Data in Other Ways.
- Perform the undo and redo actions in projects. See Undoing and Redoing Edits.

> **Note:**
>
> View-only users can also use presentation mode to look at projects in an even more simplified mode, without the header, and with the filter bar controls limited to opening and editing the existing filter selections only. See Viewing Streamlined Content.

Viewing Streamlined Content

You can use the presentation mode to view a project and its visualizations without the visual clutter of the canvas toolbar and authoring options.
Presentation mode allows you to easily share a streamlined view of the project with other users who need the information, but don't author the content. In presentation mode, view-only users can hide, open, and edit current filter selections, and explore stories, insights, and discussions, but they can't change anything. A view-only user can toggle the presentation mode on and off.

> **Tip:**
>
> In the project editor, click the **Filter Panel** toggle icon to collapse the filter bar before starting the presentation mode. You can hide the filters bar to maximize the canvas space and provide a cleaner view of the project's visualizations.

1. On the canvas toolbar, click **Presentation Mode**.

   The project is displayed in presentation mode.
2. To return to the interaction mode, click **Presentation Mode**.

   See Investigating Data Only Using Interactions.

Exploring Data on Mobile Devices

Explore your data at your desk and on the move. You can use mobile devices using Android, Windows, or Apple operating systems.

Topics:

• What You See on a Tablet
• What You See on a Mobile Phone

What You See on a Tablet

This topic covers the differences you see in projects when you explore data on a tablet.

• You can search for and use existing data sources in projects. See Choosing Data Sources.
• To create a project, on the Home page, tap **Add Data** on the canvas to display the Explore pane.
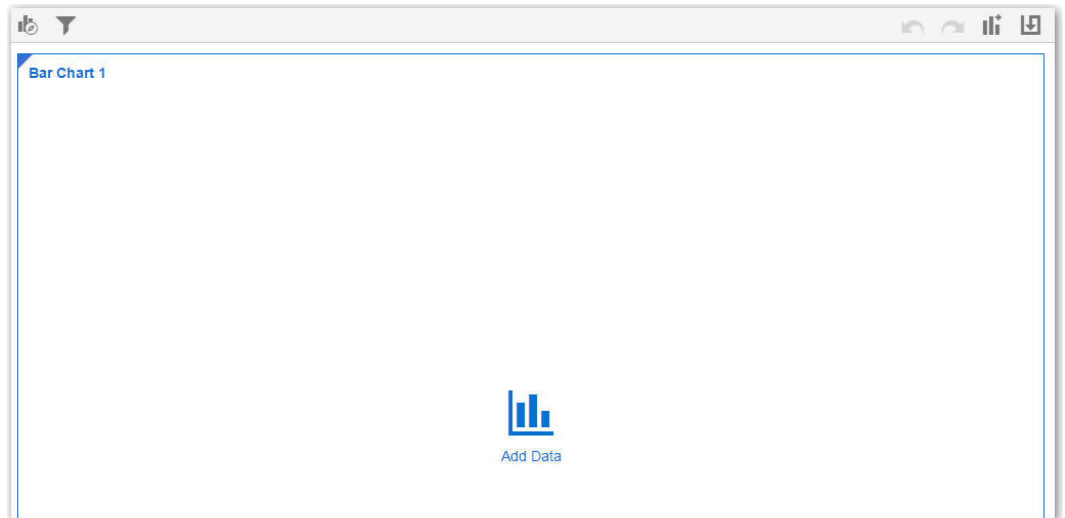
In the Explore pane, tap **Auto-Add** to select data elements. This action automatically positions the selected data elements and picks the best visualization type on the canvas.
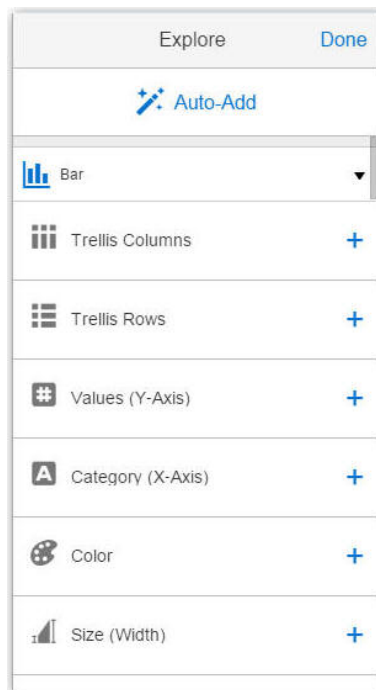
See Adding Data Elements to Visualizations and Changing Visualization Types.

- To create a filter, tap **Filter** to display the Filter pane, and add data elements to the filter.
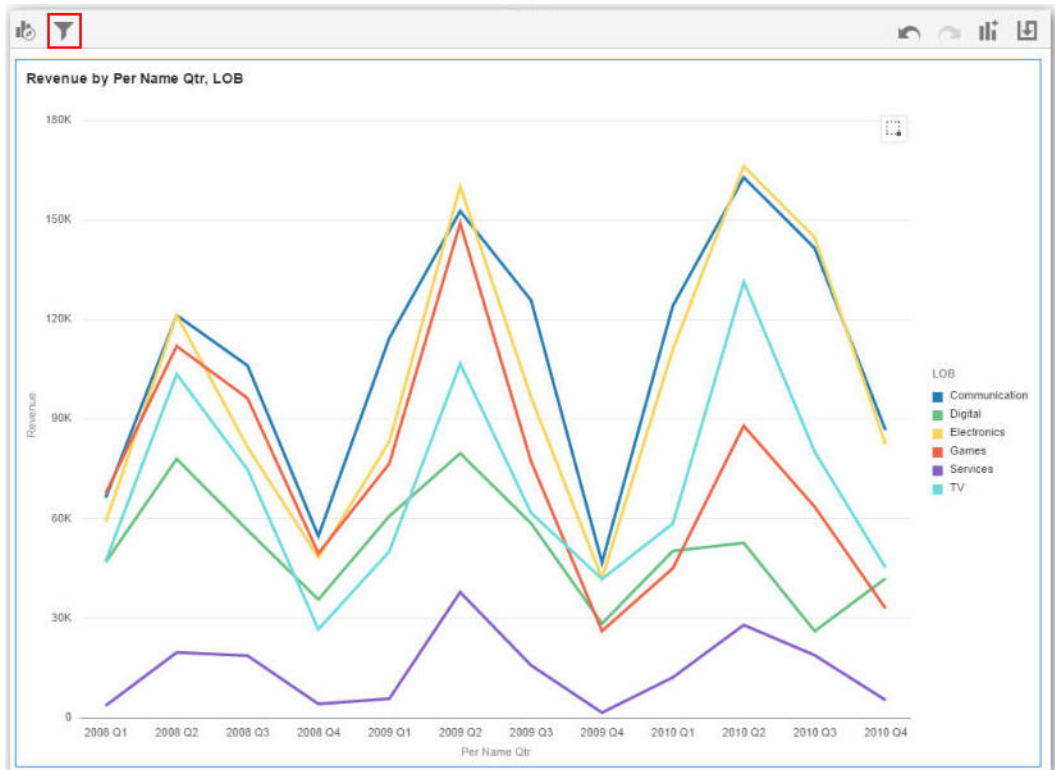
What You See on a Mobile Phone

This topic covers the differences you'll see in projects when you explore data on a mobile phone.

- You can only search for and use existing data sources in projects. See Choosing Data Sources.

- To create a project, on the Home page, tap the mobile slider, and then select **VA Project**.

In the Explore pane, tap **Auto-Add** to select data elements. This action automatically positions the selected data elements and picks the best visualization type on the canvas.
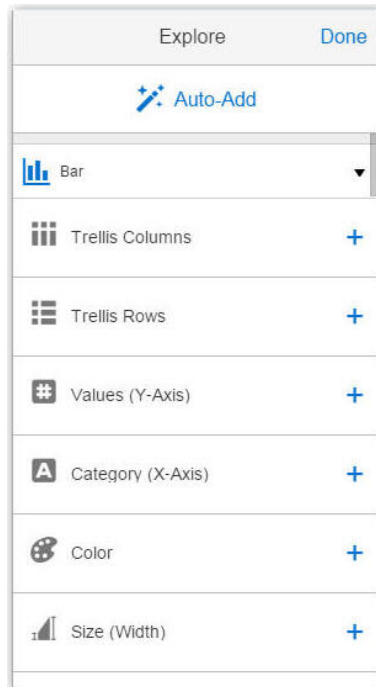
- When a project contains multiple visualizations on the canvas, they are each displayed as the same size in a summary view.
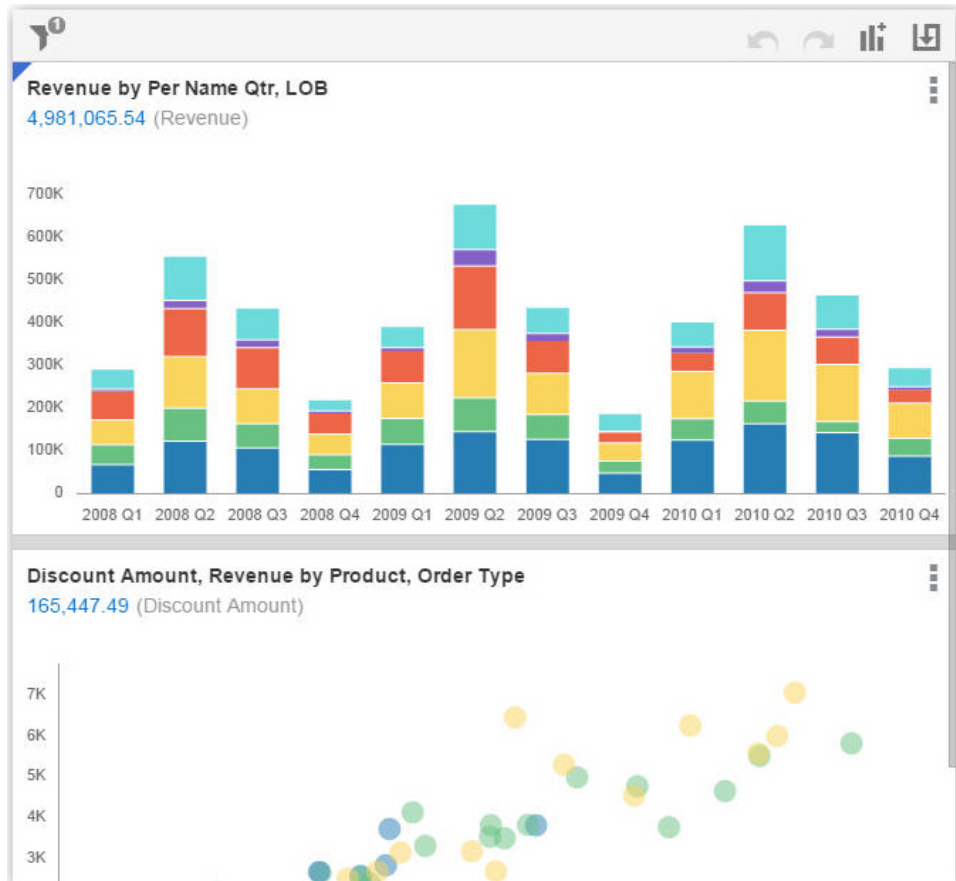
- A visualization can display an aggregated value of all measures within it. To set this display value, tap **Visualization Properties** to select the measure that you want to aggregate or to show or hide the value.

3
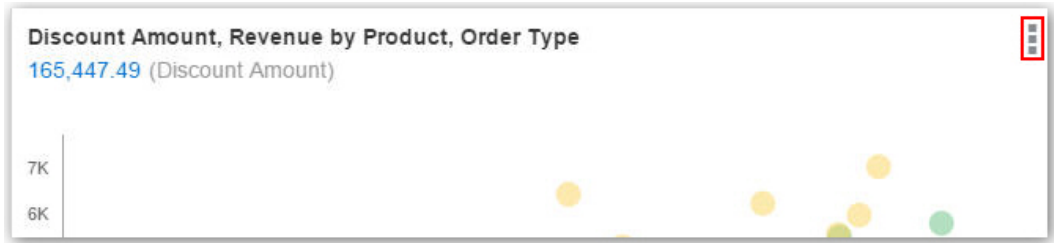
Adding Your Own Data

You can add your own data for analysis and exploration.

Topics

Typical Workflow for Adding Data from 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.	Connecting to Oracle Applications Data Sources Connecting to Database Data Sources

Task	Description	More Information
Create a data source	Upload data from a file such as a spreadsheet. Retrieve data from Oracle Applications and from databases if the data isn't already cached. Creating a data source from Oracle Applications or a database requires you to create a new connection or use an existing connection.	Creating Data Sources from Databases
Blend data	Blend data from one data source with data from another data source.	Blending Data That You Added Changing Data Blending
Refresh data	Refresh data for the files when newer data is available. Or refresh the cache for Oracle Applications and databases if the data is stale.	Refreshing Data that You Added
Extend uploaded data	Add new columns to the data source.	Modifying Uploaded Data Sources
Control sharing of data sources	Specify which users can access the data that you added.	Controlling Sharing of Data You Added
Remove data	Remove data that you added.	Removing Data From a Project

About Adding Your Own Data

It's easy to add data from data sources. Adding your own data is sometimes referred to as "mash-up."
You can add data in these ways:

- Add data from a single source, such as a spreadsheet, to analyze on its own. Or combine a source with other sources to broaden the scope of your analysis.

- Add your own data as an extension to an existing subject area.

  You can load data to Data Visualization from a data source that is related to an existing Subject Area. You may need to identify the columns that have common values so that Data Visualization can match external and Subject Area rows appropriately. You can "Add Facts" where a table includes measures - columns that are typically summed or averaged, or you can "Extend Dimensions" where a table includes no measures.

- Add data from Oracle Applications data sources. See Connecting to Oracle Applications Data Sources.

- Add data from a database. See Connecting to Database Data Sources.

> ✏ **Note:**
>
> You can match multiple data sources to a subject area, but you can't match a data source to another data source.

Suppose that you have a subject area that contains data about sales, such as Products, Brands, and Salespeople. You have a spreadsheet file that contains Target Revenue sales figures, which do not exist in the subject area. You'd like to create a visualization that combines Product and Brand values from the subject area with the Target Revenue figures from your spreadsheet. When you add the data, you match the Product and Brand columns from the spreadsheet with those in the subject area and add Target Revenue as a measure. The matching connects the spreadsheet with the subject area. When you drag the three columns to the canvas, Data Visualization treats the data as if it is part of one integrated system.
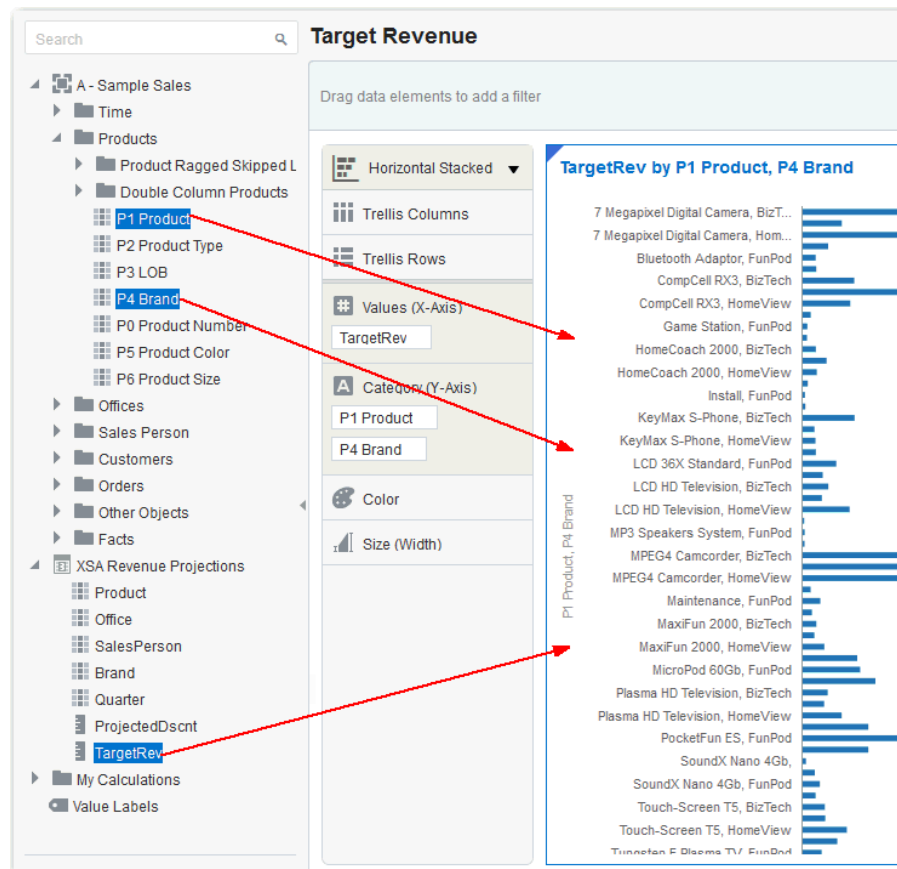
When you add data to projects, it uses the names and data types of the columns being added to guess the best way to blend the data for you. You can make manual adjustments if that guess is not appropriate. A data model is created as part of your workflow, and you do not need to create one explicitly. The system does the work for you, but you can make manual adjustments if you want to. See Blending Data That You Added and Changing Data Blending.

You can add the data to projects and share it with other users. You can delete the data when you need to preserve space. See Deleting Data Sources.

About Data Sources

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

- Match columns: These contain values that are found in the match column of another source, which relates this source to the other (for example, Customer ID or Product ID).

- Attribute columns: These contain text, dates, or numbers that are required individually and aren't aggregated (for example, Year, Category Country, Type, or Name).

- Measure columns: These contain values that should be aggregated (for example, Revenue or Miles driven).

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

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

Combining Subject Areas and Data Sources

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

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

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

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

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

- Matches can be made to a single dimension only.

- The set of values in matched columns must be unique in the external data source. For example, if the data source matches on ZIP code, then ZIP codes in the external source must be unique.

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

- All other columns must be attributes.

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

- Matches can be made to one or more dimensions.

- The set of values in matched columns doesn't need to be unique in the external data source. For example, if the data source is a set of sales matched to date,

customer, and product, then you can have multiple sales of a product to a customer on the same day.

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

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

Working with Sources with no Measures

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

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

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

- All other columns must be attributes.

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

Working with Sources with Measures

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

- You can match tables with measures to other tables with a measure, a dimension, or both.

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

Working with Matching

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

- The sources contain common values (for example, Customer ID or Product ID).

- The match must be of the same data type (for example, number with number, date with date, or text with text).

About Adding a Spreadsheet as a Data Source

Data source files from a Microsoft Excel spreadsheet file must have the XLSX extension (signifying a Microsoft Office Open XML Workbook file).
Before you can upload a Microsoft Excel file as a data source, you must structure the file in a data-oriented way and it mustn't contain pivoted data. Note the following rules for Excel tables:

- Tables must start in Row 1 and Column 1 of the Excel file.

- Tables must have a regular layout with no gaps or inline headings. An example of an inline heading is one that repeats itself on every page of a printed report.

- Row 1 must contain the table's column names. For example, Customer Given Name, Customer Surname, Year, Product Name, Amount Purchased, and so on. In this example:

  – Column 1 has customer given names.

  – Column 2 has customer surnames.

  – Column 3 has year values.

  – Column 4 has product names.

  – Column 5 has the amount each customer purchased for the named product.

- The names in Row 1 must be unique. Note that if there are two columns that hold year values, then you must add a second word to one or both of the column names to make them unique. For example, if you have two columns named Year Lease, then you can rename the columns to Year Lease Starts and Year Lease Expires.

- Rows 2 onward are the data for the table, and they can't contain column names.

- Data in a column must be of the same kind because it's often processed together. For example, Amount Purchased must have only numbers (and possibly nulls), enabling it to be summed or averaged. Given Name and Surname must be text as they might be concatenated, and you may need to split dates into their months, quarters, or years.

- Data must be at the same granularity. A table can't contain both aggregations and details for those aggregations. For example, if you have a sales table at the granularity of Customer, Product, and Year, and contains the sum of Amount Purchased for each Product by each Customer by Year. In this case, you wouldn't include Invoice level details or a Daily Summary in the same table, as the sum of Amount Purchased wouldn't be calculated correctly. If you have to analyze at invoice level, day level, and month level, then you can do either of the following:

  – Have a table of invoice details: Invoice Number, Invoice Date, Customer, Product, and Amount Purchased. You can roll these up to day or month or quarter.

  – Have multiple tables, one at each granular level (invoice, day, month, quarter, and year).

Connecting to Oracle Applications Data Sources

You can connect to Oracle Applications and create data sources that help you visualize, explore, and understand your Oracle Applications data.

Topics:

- [Creating Oracle Applications Connections](#)
- [Composing Data Sources from Oracle Applications Connections](#)
- [Editing Oracle Applications Connections](#)
- [Deleting Oracle Applications Connections](#)

Creating Oracle Applications Connections

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

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

1. Start the Add a New Connection dialog using one of these actions:

   - On the Data Sources page, click **Connections**, and then **Add Connection**.
   - In the project Data Sources pane, click the **Add Data Source** link, then **Create a New Source**, and then **From Oracle Applications**.
   - In the project Data Elements pane, right-click anywhere in the pane and select **Add Data Source**.

2. In the Add a New Connection dialog, enter the connection name, Oracle Fusion Applications with Oracle Transactional Business Intelligence or Oracle BI EE URL, user name, and password.

   Note the following information:

   - HTTP and HTTPs URLs are supported.
   - Connection names must be unique and can't contain any special characters.
   - You can get the connection URL by opening the Oracle application you want to connect to, displaying the catalog folders that contain the analysis you want to use as the data source for projects, and copying the browser URL into the New Connection dialog, making sure to strip off anything after /analytics. For example, http://www.example.com:9704/analytics.

3. Click **Save**.

   Now you can create data sources from this connection. See Composing Data Sources From Oracle Application Connections.

> ✏️ **Note:**
>
> The connection is visible only to you (the creator), but you can create and
> share data sources for it.

Composing Data Sources from Oracle Applications Connections

After you create Oracle Applications connections, you can use those connections to
create data sources to use in projects.

You must create the Oracle Applications connection before you can create a data
source for it. See Creating Connections.

1. Display the Select an Analysis dialog using one of these actions:

    *   On the Data Sources page, click **Add Data Source**, and then **From Oracle
        Applications**.

    *   In the project Data Sources pane, click the **Add Data Source** link, then **Create
        a New Source**, and then **From Oracle Applications**.

    *   In the project Data Elements pane, right-click the pane, select **Add Data
        Source**, then **Create a New Source**, and then **From Oracle Applications**.
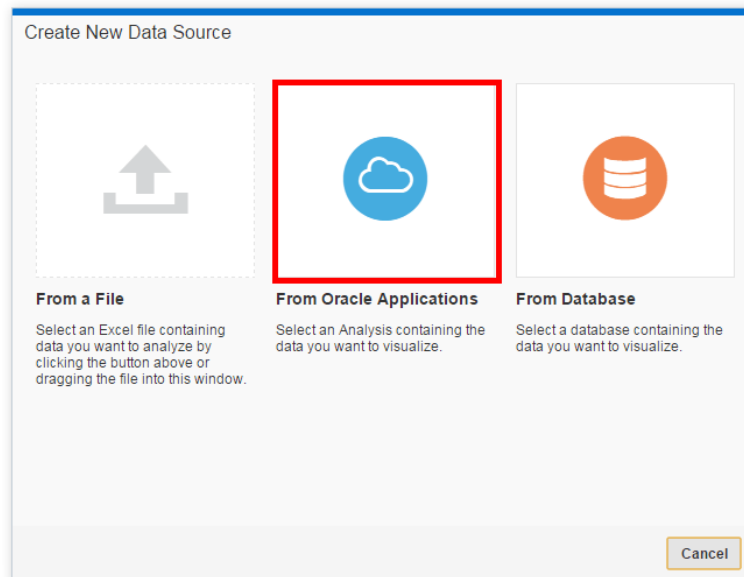
2. From the connection drop-down list, select the Oracle Applications connection that
    you want to use.
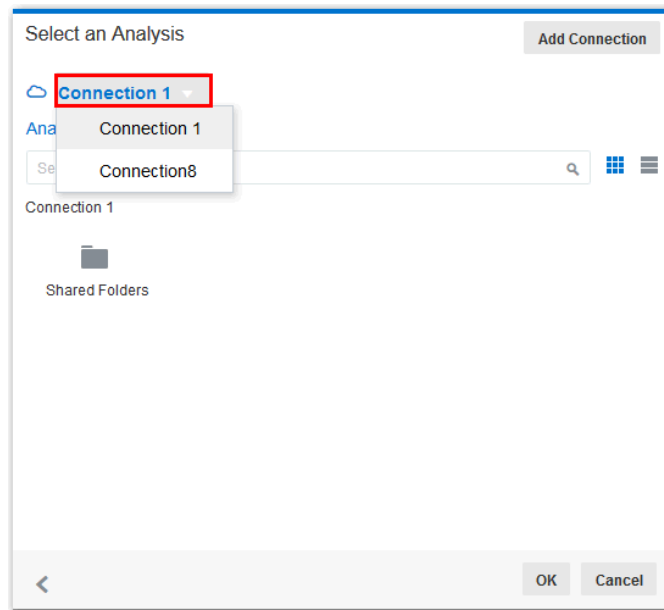
3. Perform one of these actions:

- On the Analysis tab, browse catalog folders to search for and select the analysis that you want to use. You only see catalog folders that contain analyses from the connection you picked. The data in the data source reflects any filters or selection steps included on the analysis you choose.

- Click **Logical SQL** to display the Logical SQL Statement dialog. Typically, users compose the SQL statement in the Oracle Applications catalog, and then copy and paste it here.

> **Note:**
>
> If you need take a step back to pick a different analysis or look at the logical SQL again, click the *back* button at the bottom of the dialog. For example, you can go back to remove an extra 0 column from the logical SQL statement.

4. Click **OK**.

5. Preview the data, update column characteristics, or exclude columns from the data source, and then click **Add Data Source**.
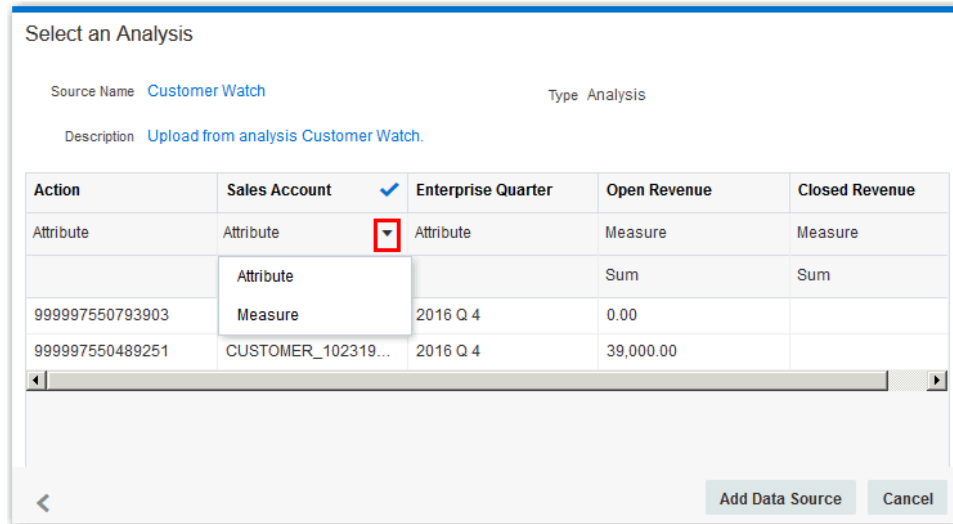
A cached copy of the data source is created, and you can refresh the data and metadata from that data source, as needed.

Editing Oracle Applications Connections

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

1. In the Data Sources page, click **Connections**.

2. To the right of the connection that you want to edit, click **Options**, and then select **Edit**.
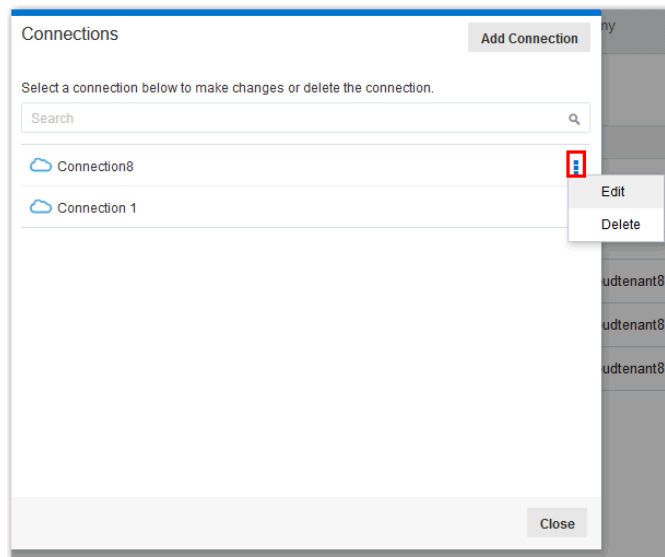
3. In the Edit Connection dialog, edit the connection details, and then click **Save**.

> **✎ Note:**
>
> You can't see current passwords for these connections. If you need to change the password, you must enter a new one.

Deleting Oracle Applications Connections

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

1. In the Data Sources page, click **Connections**.

2. To the right of the connection that you want to delete, click **Options**, and then select **Delete**.

3. Click **OK**.

> **✎ Note:**
>
> If the connection contains any data sources, you must delete the data sources before you can delete the connection. Oracle Applications connections are only visible to the user that creates them (connections aren't shared), but a user can create data sources using those connections, and share the data sources with others.

Connecting to Database Data Sources

You can create, edit and delete database connections, and create data sources from databases which lets you use these data sources to better understand the data using Oracle Data Visualization.

Topics:

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

Creating Database Connections

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

1. Display the Add a New Connection dialog using one of these actions:

   - On the Data Sources page, click **Connections**, then **Add Connection**, and then **From Database**.

   - In the project Data Sources pane, click the **Add Data Source** link, then **Create a New Source**, and then **From Database**.

- In the project Data Elements pane, right-click anywhere in the pane and select **Add Data Source**, then **Create a New Source**, and then **From Database**.

2. In the Add a New Connection dialog, enter the connection name and click **Database Type** to view a list of supported databases. Enter the required connection information, such as Host, Port, and so on.

3. Click **Save**.

   You can now begin creating data sources from the connection. See Creating Data Sources from Databases.

Creating Data Sources from Databases

After you create database connections, you can begin creating data sources for those connections for use in projects.

You must create the database connection before you can create a data source for it. See Creating Database Connections.

1. Launch the Select a Table dialog using one of these actions:

   - On the Data Sources page, click **Add Data Source**, and then **From Database**.

   - In the project Data Sources pane, click the **Add Data Source** link, then **Create New Data Source**, and then **From Database**.

   - In the project Data Elements pane, right-click the pane, select **Add Data Source**, then **Create New Data Source**, and then **From Database**.
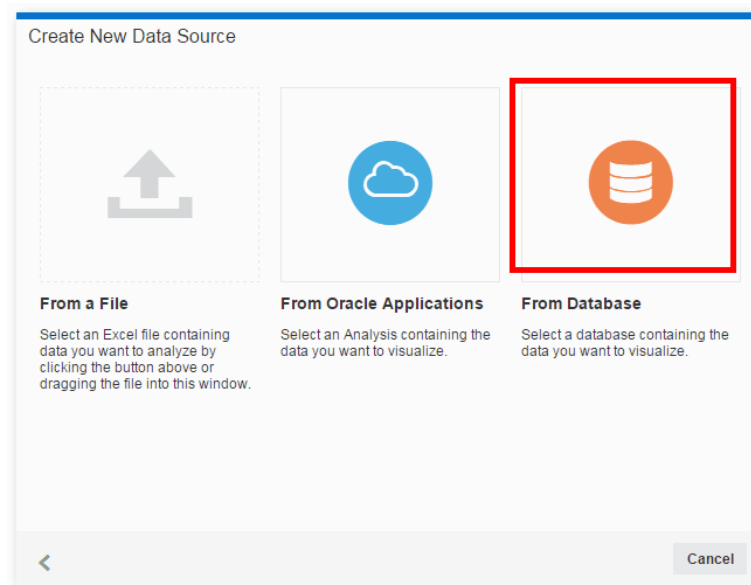
2. From the connection drop-down list, select the database connection that you want to use.
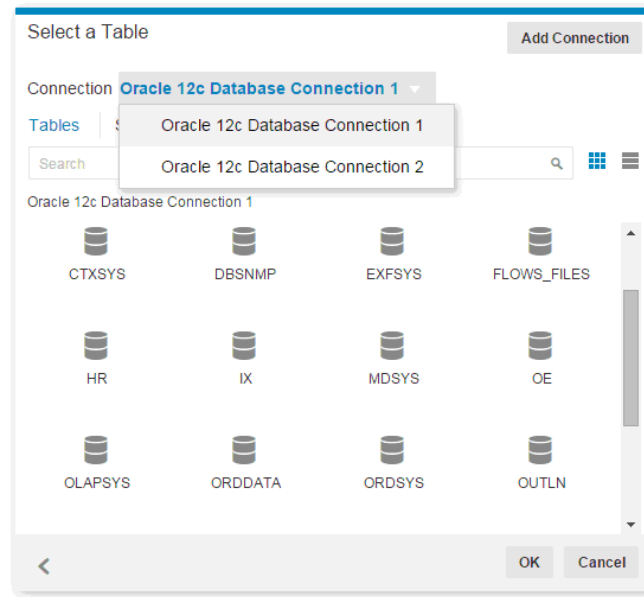
3. Perform one of these actions:

   • On the Tables tab, browse to search for and select the database that you want to use. Click **OK** and then choose a table. The table you choose is treated as a live connection but the system doesn't load the table. When you use columns from this table in a project, the system issues a database query to fetch the needed data.

   • Click **Logical SQL** to display the Logical SQL Statement window. Enter a SQL statement to select a specific set of columns. If you enter and run a SQL statement to create a virtual table, the results are loaded into the cache. Make sure that your SQL statement produces the most compact result set possible, otherwise the virtual table may be too large to cache. For example if you want to fetch City, State, Month, Year, and Revenue, then your SQL statement should select City, State, Month, Year, Sum(Revenue).

Note:

If you need take a step back to pick a different database or look at the logical SQL again, click the *back* button at the bottom of the dialog.

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4. Click **OK**.

5. Preview the data or exclude columns from the data source, and then click **Add to Project**.
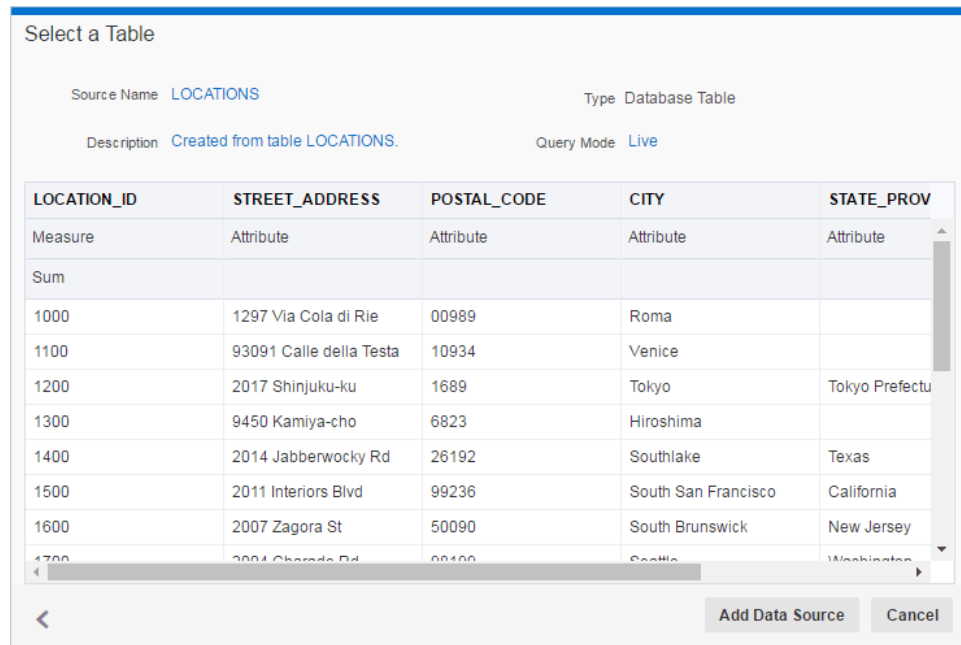
A cached copy of the data source is created, and you can refresh the data and metadata from that data source, as needed.

Editing Database Connections

You can edit a database connection for example, to change the name.

1. On the Data Sources page, click **Connections**.

2. Mouse over the connection that you want to edit. To the right of the highlighted connection, click **Options**, and select **Edit**.
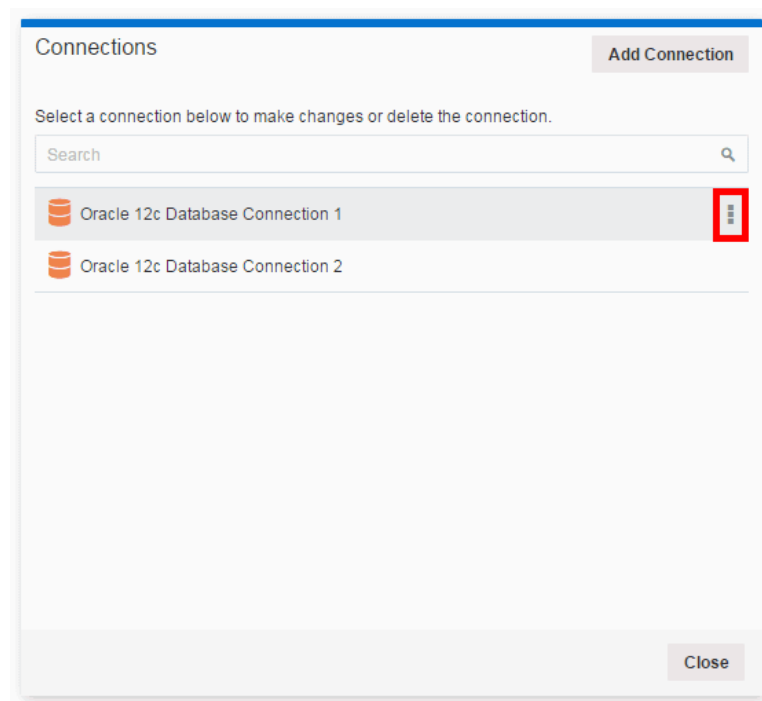
3. In the Edit Connection dialog, edit the connection details, and then click **Save**.

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

Deleting Database Connections

You can delete a database connection for example if the database password has changed.

1. On the Data Sources page, click **Connections**.

2. Mouse over the connection that you want to delete. To the right of the highlighted connection, click Options and select **Delete**.

3. Click **OK**.

> ✎ **Note:**
>
> If the connection contains any data sources, you must delete the data sources before you can delete the connection.

Adding Data from Data Sources

This topic covers adding data to projects.

Topics:

- Adding File Based Data
- Adding Oracle Application Data
- Adding Database Data

Adding File Based Data

You use uploaded data source files such as .xlsx to create visualizations in projects.

1. From the Home page, in the Create section, click **Project**.

> ✎ **Note:**
>
> You can also use the Data Sources page to upload data files. See Managing Data Sources.

2. In the Add Data Source dialog, select an existing data set, or click **Create a New Source** to upload a new file.

3. If you are uploading a new data file, select **A File** to search for and select a locally stored data file. Or you can drag the data file from your local drive and drop it on the dialog.

4. If the file contains multiple sheets, select the sheet with the data you want to load.
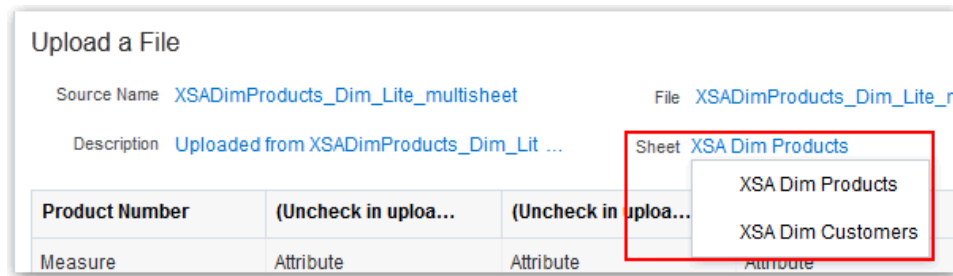
5. When uploading a data source for the first time, edit the source names and descriptions to be more meaningful to you.

6. Adjust the column types as needed. The application automatically assign column types as follows:

   • Columns that contain decimals are imported as the Measure type.

   • Primary keys, which are typically integers, are imported as the Attribute type.

   • Integers such as Age, Region Code, and Product Code are imported as the Attribute type. However, in some cases integer columns might be measures and not attributes (for example, Quantity and Number of Employees). In these cases you will need to change the column type to Attribute.

7. To exclude a column, hover over the column name, and click the check mark.

> **Note:**
>
> A column that is unavailable and marked with a red information symbol is invalid and will be excluded. Typically, this happens because the column name is a duplicate or it contains illegal characters (leading or trailing spaces, or special characters). You can hover over the symbol to see the reason why the column is invalid.

8. Click **Add to Project** to accept the data associations. See Blending Data that You Added.

Adding Oracle Applications Data

You can add Oracle Applications data to your projects.

1. From the Home page, in the Create section, click **VA Project**.

2. In the Add Data Source dialog, click **Create a New Source**.

3. Select the data source that you want to use.

4. Select the analysis you want to use or enter a logical SQL statement. See Composing Data Sources From Connections.

5. Preview the data, and make adjustments as needed.

6. Click **Add to Project** to accept the data associations. See Blending Data that You Added for details on manually editing data associations.

> ✎ **Note:**
>
> The Oracle Applications connection must be created before you add that data to projects. See Connecting to Oracle Application Data Sources.

Adding Database Data

You can add database data to your projects.

1. From the Home page, in the Create section, click **VA Project**.

2. In the Add Data Source dialog, select an existing database data source, or click **Create a New Source**.

3. Select the connection that you want to use.

4. Select the database and table you want to use or enter a logical SQL statement. See Creating Data Sources from Databases.

5. Preview the data, and make column exclusions as needed.

6. Optionally, change the Query Mode for a database table. The default is **Live** because database tables are typically large and shouldn't be copied to cache. If your table is small, then choose **Auto** and the data is copied into the cache if possible. If you select **Auto**, you will have to refresh the data when it is stale.

7. Click **Add to Project** to accept the data associations. See Blending Data that You Added.

> ✎ **Note:**
>
> The database connection must be created before you add that data to projects. See Creating Database Connections.

Modifying Uploaded Data Sources

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

You can create new columns, edit columns, and hide and show columns for a data set. The column editing options depend on the column data type (date, strings, or numeric). Selecting an option invokes a logical SQL function that edits the current column or creates a new one in the selected data set.

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

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

Here are some examples of column modifications that you can perform:

- For a date or time column, create a year, quarter, month, or day column.

- For an attribute column, convert a column to a number or convert it to a date. You can concatenate or replace the column. You can group or split the column. You can apply upper case, lower case, or sentence case to the data items in the column.

- For a measure column, apply operators such as power, square root, or exponential.

1. On the project toolbar, click **Stage**.

2. If there are more than one uploaded data sets in the project, select the one you want to work with. Only the first 100 records in the selected data set are displayed.
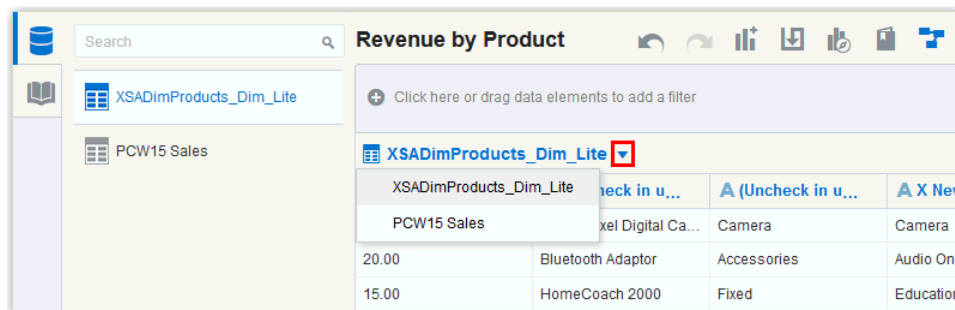
3. Click **Options** for the column that you want to work with, and then select an option to modify or convert the column. The options list and column modifications you can perform depends on the type of column you're working with.
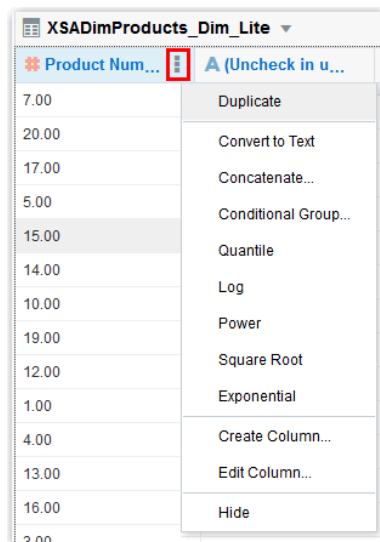
Data wrangling doesn't modify the original columns in the data set. Instead, it creates duplicate columns.

4. Click **Save**.

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

Blending Data That You Added

You might have a project where you added two data sources. You can blend data from one data source with data from another data source.

For example, Data Source A might contain new dimensions that extend the attributes of Data Source B. Or Data Source B might contain new facts that you can use alongside the measures that already exist in Data Source A.
When you add more than one data source 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 source.

You can specify how you want the system to blend your data. See Changing Data Blending.

1. Add data to your project. See Adding Data from External Sources .

2. In the Data Sources pane, click **Source Diagram**.

3. Click the number along the line that connects the external source to the newly loaded source to display the Connect Sources dialog.

4. In the Connect Sources dialog, make changes as necessary.

   a. To change the match for a column, click the name of each column to select a different column from the external data source or between sources.

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

   b. Click **Add Another Match**, and then select a column from the external sources to match.
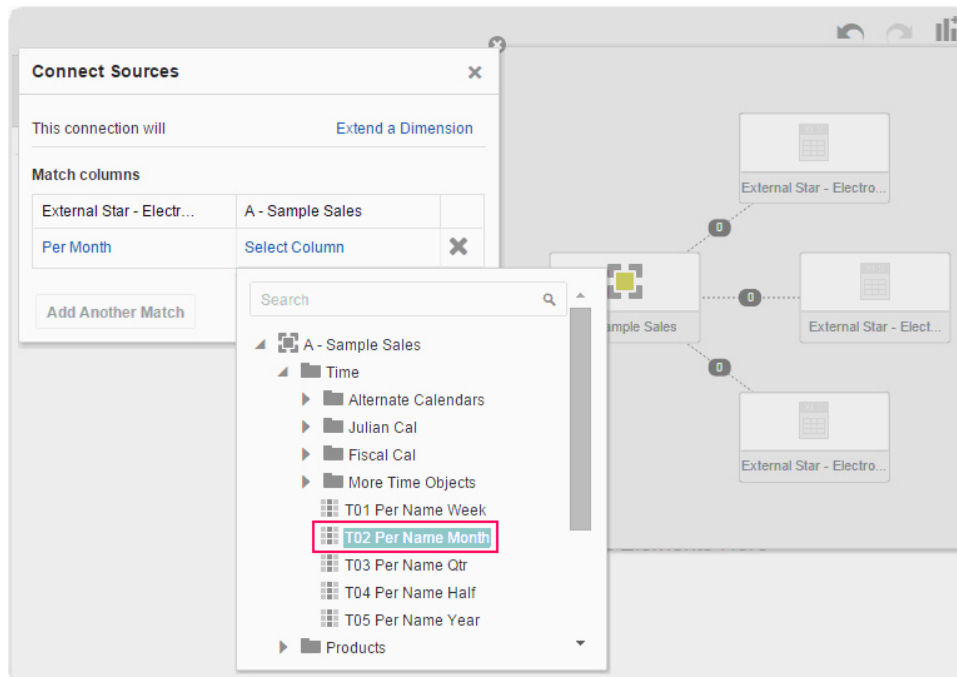
c. For a measure that you're uploading for the first time, specify the aggregation type such as *Sum* or *Average*.

d. Click the **X** to delete a match.

5. Click **OK** to save the matches from the external source to the data model on the server.

Changing Data Blending

If your project includes data from two data sources that contain a mixture of attributes and values, and there are match values in one source that don't exist in the other, then sometimes the system might omit rows of data that you may want to see.

In such cases, you need to specify which source takes precedence over the other for data blending.
For example, we have two data sources (Source A and Source B), which include the following rows. Note that Source A doesn't include IN-8 and Source B doesn't include IN-7.

The following results are displayed if the **All Rows** data blending option is selected for Source A and the **Matching Rows** data blending option is selected for Source B. Because IN-7 doesn't exist in Source B, the results contain null Rep and null Bonus.
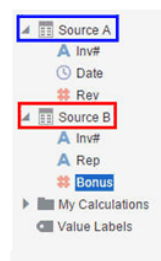
The following results are displayed if the **Matching Rows** data blending option is selected for Source A and the **All Rows** data blending option is selected for Source B. Because IN-8 doesn't exist in Source A, the results contain null Date and null Revenue.

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, these attributes can't be used with a measure from the opposite table unless the match column is also used.

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 these describe what rows from a source the system uses when returning data to be visualized.

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

- If a match column is in the visualization, then the sources with the match column are set to **All Rows**.

- If an attribute is in the visualization, then its source is set to **All Rows** and the other sources are set to **Matching Rows**.

- If multiple attributes are in the visualization and all come from the same source, then that source is set to **All Rows** and the other sources are set to **Matching Rows**.

- If attributes come from multiple sources, then the source listed first in the project's elements panel is set to **All Rows** and the other sources are set to **Matching Rows**.

To change data blending:

1. Select a visualization on the canvas, and in the visualization toolbar click **Menu**, then click **Properties**.

2. In the Properties dialog, click **Data Sets**.

3. In the Data Sets tab, click **Auto** and then select **Custom** to view how the system determined blending.

4. Adjust the blending settings as necessary.

   - At least one source needs to be assigned 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.

Refreshing Data that You Added

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

> **Note:**
>
> Rather than refresh a data source, you can replace it by loading a new data source with the same name as the existing one. However, replacing a data source can be destructive and is discouraged. Only replace a data source if you understand the consequences:
>
> - Replacing a data source breaks projects that use the existing data source if the old column names and data types aren't all present in the new data source.
>
> - Any data wrangling (modified and new columns added in the data stage), is lost and projects using the data source are likely to break.

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

Databases

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

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 subject area.

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 source aren't affected. To be able to use the new columns in projects, you must unhide them in data sources after you refresh. This behavior is the same for file-based data sources.

1. In the Data Sources pane or the Subject Areas pane, locate the data source you want to refresh.

2. Right-click the data source and select **Reload Data**. The Reload Data dialog is displayed.

3. If you're reloading a spreadsheet and the file is no longer in the same location or has been deleted, then the Reload Data dialog prompts you to locate and select a new file to reload into the data source.

4. The Reload Data dialog indicates that your data was reloaded successfully. Click **OK**.

The original data is overwritten with new data, which is displayed in visualizations in the project or analysis, after the visualization is refreshed.

Updating Details of Data that You Added

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

1. In the Data Sources page, go to the Display pane, and locate the data source that you want to update.

2. Click the Options menu and select **Inspect**. The Data Source dialog is displayed.

3. Inspect the properties and update the description of the data as appropriate.

   Note that if you're working with a file-based data source, and spreadsheet you used to create the data source has been 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 to the data source.

4. Optionally, change the Query Mode for a database table. The default is *Live* because database tables are typically large and shouldn't be copied to cache. If your table is small, then select **Auto** and the data is copied into the cache if possible. If you select **Auto**, then you'll have to refresh the data when it's stale.

5. In the Columns area, specify whether to change a column to a measure or attribute as appropriate. For measures, specify the aggregation type, such as *Sum* or *Average*.

   See also Specifying Aggregation for Measures in Fact Tables.

6. Optionally, share the data with others.

   See Controlling Sharing of Data You Added.

7. Click **OK** to save your changes.

> ✎ **Note:**
>
> You can also inspect data sources on the Data Sources page. See Managing Data Sources.

Controlling Sharing of Data You Added

After you add data, the data is visible only to you as the user who uploaded and owns it. You as the owner or other users with appropriate permissions can specify the data as a shared resource that other users who have access to the server environment can include immediately in projects. You control which users can share the external data.

1. In the Data Sources pane, right-click the data source, and select **Inspect**.
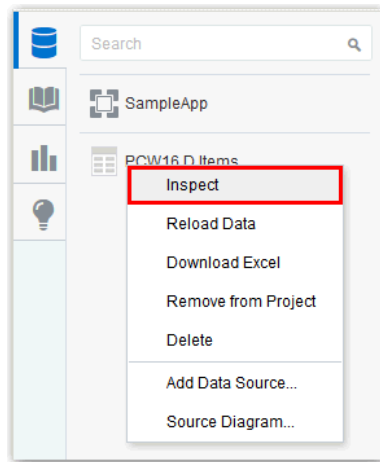
2. On the Permissions tab, double-click a user or role to grant access. Select the appropriate level of access:

   • **Full Control** — User can modify and set permissions on the dataset.

   • **Modify** — User can read, refresh data, and edit dataset properties

   • **Read** — User can view and create projects using this dataset.

   • **No access** — User can't view or access the dataset.

3. On the Permissions tab, click the **X** beside a user or role to remove it from the selection of permissions that you're managing.
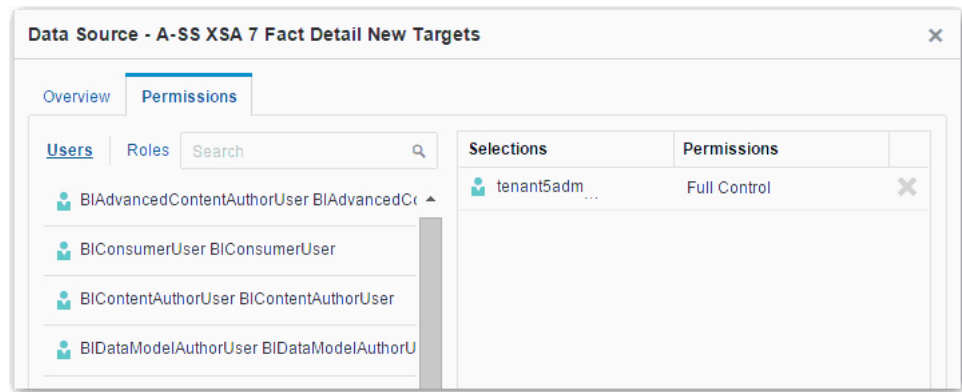
Removing Data that You Added

You can remove data that you've added from an external source.

If you remove data, then it's removed from the project. Removing data differs from deleting data. See Deleting Data Sources.

1. In the Data Sources pane, right-click the data that you want to remove.
2. Select **Remove from Project** to remove data from the data sources list.

Deleting Data Sources

You can delete data sources when you need to free up space on your system.

Deleting permanently removes the external source and breaks any projects that use this data source. You can only delete external sources. You cannot delete subject areas that you have included in projects or analyses. Deleting data differs from removing data. See Removing Data that You Added.

1. In the Data Sources pane in Oracle Visual Analyzer or the Subject Areas pane of Oracle Business Intelligence, right-click the data that you want to remove.
2. Select **Delete** to erase the data from storage and delete the data source.

Managing Data Sources

You can use the Data Sources page to see all of the available data sources.

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

1. On the Home page, click **Data Sources**.
2. On the Data Sources page, locate the data source that you want to manage, and click **Options**. The options available in the drop-down list depend on the data source type.
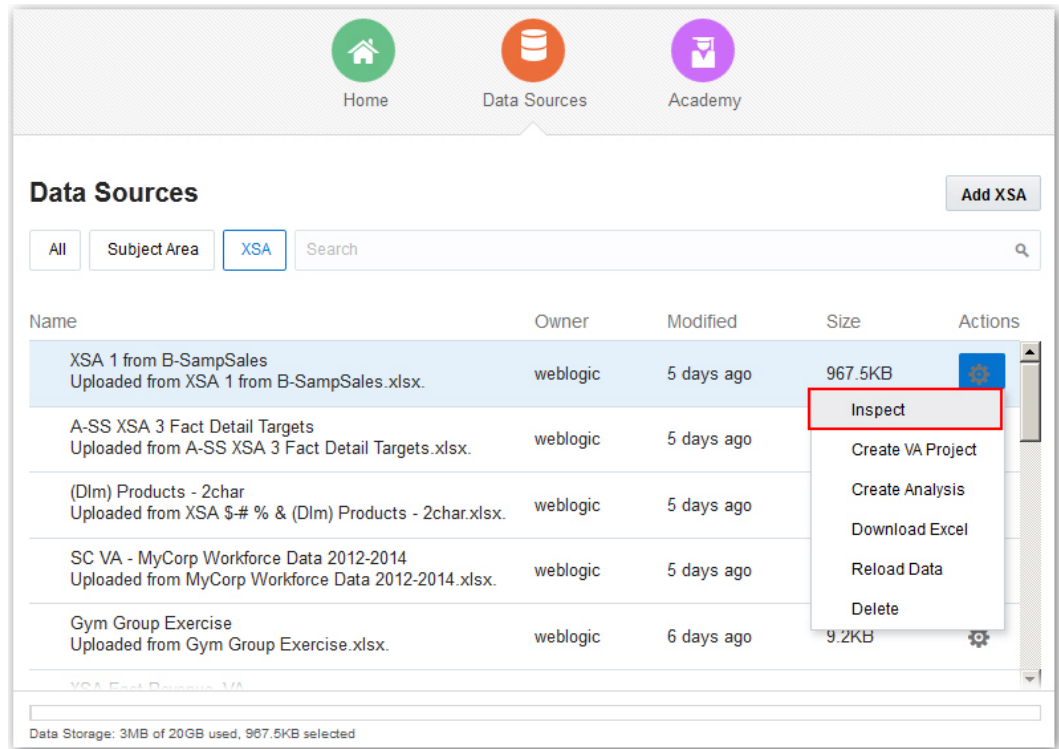
3. Optionally, use the **Inspect** option to review data source columns and change the data source properties. For example, you can change the Product Number column's aggregation type to Minimum.
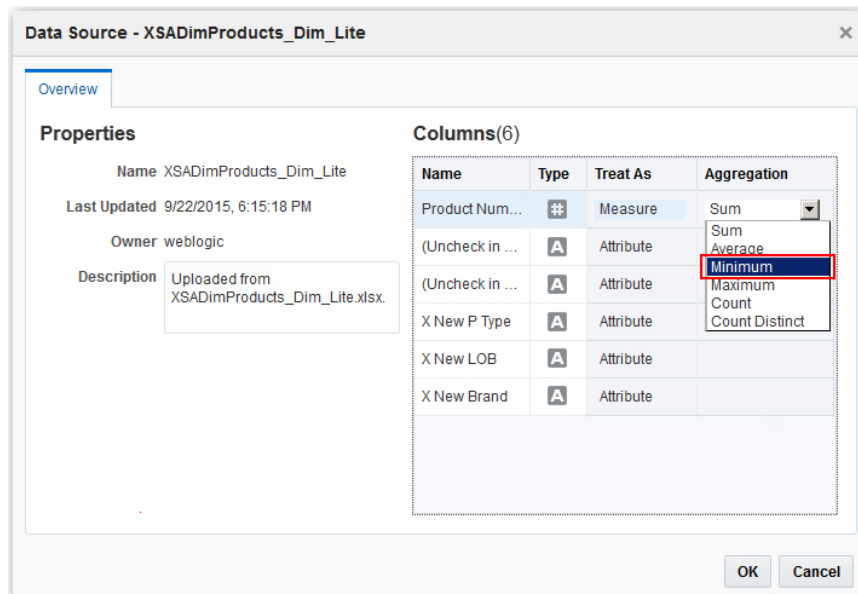
4. Optionally, use the **Inspect** option to change whether to treat data source columns as measures or attributes.

   You can't change how a column is treated if it's already matched to a measure or attribute in the data model. For more information about removing matches, see Blending Data That You Added.

5. Optionally, use the **Inspect** option to change the Query Mode for a database table. The default is **Live** because database tables are typically large and shouldn't be copied to cache. If your table is small, then select **Auto** and the data is copied into the cache if possible. If you select **Auto**, then you have to refresh the data when it's stale.

6. Optionally, update data for a data source created from a Microsoft Excel file or Oracle Applications by clicking **Options** and selecting **Reload Data**.

> **Note:**
>
> If you have Full Control permissions, you can grant permissions to others and delete uploaded data sets, but be careful not to delete a data file that is still a data source for reports. See Deleting Data that You Added.

A

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	Description
BETWEEN	Determines if a value is between two non-inclusive bounds. For example: `"COSTS"."UNIT_COST" BETWEEN 100.0 AND 5000.0` BETWEEN can be preceded with NOT to negate the condition.
IN	Determines if a value is present in a set of values. For example: `"COSTS"."UNIT_COST" IN(200, 600, 'A')`
IS NULL	Determines if a value is null. For example: `"PRODUCTS"."PROD_NAME" IS NULL`
LIKE	Determines if a value matches all or part of a string. Often used with wildcard characters to indicate any character string match of zero or more characters (%) or any single character match (_). For example: `"PRODUCTS"."PROD_NAME" LIKE 'prod%'`

Conditional Expressions

You use conditional expressions to create expressions that convert values.
The conditional expressions described in this section are building blocks for creating expressions that convert a value from one form to another.

> **✎ Note:**
>
> - In `CASE` statements, `AND` has precedence over `OR`
> - Strings must be in single quotes

Expression	Example	Description

`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` (Switch)	`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`
		Also referred to as `CASE (Lookup)`. The value of the first expression is examined, then the `WHEN` expressions. If the first expression matches any `WHEN` expression, it assigns the value in the corresponding `THEN` expression.
		
		If none of the `WHEN` expressions match, it assigns the default value specified in the `ELSE` expression. If no `ELSE` expression is specified, the system automatically adds an `ELSE NULL`.
		
		If the first expression matches an expression in multiple `WHEN` clauses, only the expression following the first match is assigned.

Functions

There are various types of functions that you can use in expressions.

Topics:

- Aggregate Functions
- Analytics Functions
- Calendar Functions
- Conversion Functions
- Display Functions
- Evaluate Functions
- Mathematical Functions
- String Functions
- System Functions
- Time Series Functions

Aggregate Functions

Aggregate functions perform operations on multiple values to create summary results.

Function	Example	Description
Avg	`Avg(Sales)`	Calculates the average (mean) of a numeric set of values.
Bin	`Bin(UnitPrice BY ProductName)`	Selects any numeric attribute from a dimension, fact table, or measure containing data values and places them into a discrete number of bins. This function is treated like a new dimension attribute for purposes such as aggregation, filtering, and drilling.
Count	`Count(Products)`	Determines the number of items with a non-null value.
First	`First(Sales)`	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.
Last	`Last(Sales)`	Selects the last non-null returned value of the expression.
Max	`Max(Revenue)`	Calculates the maximum value (highest numeric value) of the rows satisfying the numeric expression argument.
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.
Min	`Min(Revenue)`	Calculates the minimum value (lowest numeric value) of the rows satisfying the numeric expression argument.
StdDev	`StdDev(Sales)` `StdDev(DISTINCT Sales)`	Returns the standard deviation for a set of values. The return type is always a double.
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.
Sum	`Sum(Revenue)`	Calculates the sum obtained by adding up all values satisfying the numeric expression argument.

Analytics Functions

Analytics functions allow you to explore data using models such as trendline and cluster.

Function	Example	Description
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.

Function	Example	Description
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.
Outlier	`OUTLIER((product, company), (billed_quantity, revenue), 'isOutlier', 'algorithm=mvoutlier')`	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.
Regr	`REGR(revenue, (discount_amount), (product_type, brand), 'fitted', '')`	Fits a linear model and returns the fitted values or model. This function can be used to fit a linear curve on two measures.
Evaluate_Script	`EVALUATE_SCRIPT('filerepo://obiee.Outliers.xml', 'isOutlier', 'algorithm=mvoutlier;id=%1;arg1=%2;arg2=%3;useRandomSeed=False;', customer_number, expected_revenue, customer_age)`	Executes an R 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.

Calendar Functions

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

Function	Example	Description
Current_Date	`Current_Date`	Returns the current date.
Current_Time	`Current_Time(3)`	Returns the current time to the specified number of digits of precision, for example: HH:MM:SS.SSS If no argument is specified, the function returns the default precision.
Current_TimeStamp	`Current_TimeStamp(3)`	Returns the current date/timestamp to the specified number of digits of precision.
DayName	`DayName(Order_Date)`	Returns the name of the day of the week for a specified date expression.
DayOfMonth	`DayOfMonth(Order_Date)`	Returns the number corresponding to the day of the month for a specified date expression.
DayOfWeek	`DayOfWeek(Order_Date)`	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.

Function	Example	Description
DayOfYear	`DayOfYear(Order_Date)`	Returns the number (between 1 and 366) corresponding to the day of the year for a specified date expression.
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.
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.
Minute	`Minute(Order_Time)`	Returns a number (between 0 and 59) corresponding to the minute for a specified time expression.
Month	`Month(Order_Time)`	Returns the number (between 1 and 12) corresponding to the month for a specified date expression.
MonthName	`MonthName(Order_Time)`	Returns the name of the month for a specified date expression.
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.
Now	`Now()`	Returns the current timestamp. The `Now` function is equivalent to the `Current_Timestamp` function.
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.
Second	`Second(Order_Time)`	Returns the number (between 0 and 59) corresponding to the seconds for a specified time expression.
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
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.
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_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.

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Function	Example	Description
Year	Year(Order_Date)	Returns the year for the specified date expression.

Conversion Functions

Conversion functions convert a value from one form to another.

Function	Example	Description
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). Use Cast to change to a Date data type. Don't use ToDate.
IfNull	IfNull(Sales, 0)	Tests if an expression evaluates to a null value, and if it does, assigns the specified value to the expression.
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.
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.
To_DateTime	SELECT To_DateTime ('2009-03-0301:01:00', 'yyyy-mm-dd hh:mi:ss') FROM sales	Converts string literals of dateTime format to a DateTime data type.

Display Functions

Display functions operate on the result set of a query.

Function	Example	Description
BottomN	BottomN(Sales, 10)	Returns the *n* lowest values of expression, ranked from lowest to highest.
Filter	Filter(Sales USING Product = 'widget')	Computes the expression using the given preaggregate filter.
Mavg	Mavg(Sales, 10)	Calculates a moving average (mean) for the last *n* rows of data in the result set, inclusive of the current row.

Function	Example	Description

Msum	`SELECT Month, Revenue,`
	`Msum(Revenue, 3) as 3_MO_SUM`
	`FROM Sales`
		Calculates a moving sum for the last *n* rows of data, inclusive of the current row.
		
		The sum for the first row is equal to the numeric expression for the first row. The sum for the second row is calculated by taking the sum of the first two rows of data, and so on. When the *n*th row is reached, the sum is calculated based on the last *n* rows of data.

NTile	`Ntile(Sales, 100)`	Determines the rank of a value in terms of a user-specified range. It returns integers to represent any range of ranks. The example shows a range from 1 to 100, with the lowest sale = 1 and the highest sale = 100.
Percentile	`Percentile(Sales)`	Calculates a percent rank for each value satisfying the numeric expression argument. The percentile rank ranges are from 0 (1st percentile) to 1 (100th percentile), inclusive.
Rank	`Rank(Sales)`	Calculates the rank for each value satisfying the numeric expression argument. The highest number is assigned a rank of 1, and each successive rank is assigned the next consecutive integer (2, 3, 4,...). If certain values are equal, they are assigned the same rank (for example, 1, 1, 1, 4, 5, 5, 7...).

Rcount	`SELECT month, profit,`
	`Rcount(profit) FROM sales`
	`WHERE profit > 200`
		Takes a set of records as input and counts the number of records encountered so far.

Rmax	`SELECT month, profit,` `Rmax(profit) FROM sales`	Takes a set of records as input and shows the maximum value based on records encountered so far. The specified data type must be one that can be ordered.
Rmin	`SELECT month, profit,` `Rmin(profit) FROM sales`	Takes a set of records as input and shows the minimum value based on records encountered so far. The specified data type must be one that can be ordered.

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.

TopN	`TopN(Sales, 10)`	Returns the *n* highest values of expression, ranked from highest to lowest.

Evaluate Functions

Evaluate functions are database functions that can be used to pass through expressions to get advanced calculations.
Embedded database functions can require one or more columns. These columns are referenced by %1 ... %N within the function. The actual columns must be listed after the function.

Function	Example	Description
Evaluate	`SELECT EVALUATE('instr(%1, %2)', address, 'Foster City') FROM employees`	Passes the specified database function with optional referenced columns as parameters to the database for evaluation.
Evaluate_Aggr	`EVALUATE_AGGR('REGR_SLOPE(% 1, %2)', sales.quantity, market.marketkey)`	Passes the specified database function with optional referenced columns as parameters to the database for evaluation. This function is intended for aggregate functions with a `GROUP BY` clause.

Mathematical Functions

The mathematical functions described in this section perform mathematical operations.

Function	Example	Description
Abs	`Abs(Profit)`	Calculates the absolute value of a numeric expression.
Acos	`Acos(1)`	Calculates the arc cosine of a numeric expression.
Asin	`Asin(1)`	Calculates the arc sine of a numeric expression.
Atan	`Atan(1)`	Calculates the arc tangent of a numeric expression.
Atan2	`Atan2(1, 2)`	Calculates the arc tangent of y/x, where y is the first numeric expression and x is the second numeric expression.
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.
Cos	`Cos(1)`	Calculates the cosine of a numeric expression.
Cot	`Cot(1)`	Calculates the cotangent of a numeric expression.
Degrees	`Degrees(1)`	Converts an expression from radians to degrees.
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.
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.
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.
Log	`Log(1)`	Calculates the natural logarithm of an expression.
Log10	`Log10(1)`	Calculates the base 10 logarithm of an expression.
Mod	`Mod(10, 3)`	Divides the first numeric expression by the second numeric expression and returns the remainder portion of the quotient.

Function	Example	Description
Pi	`Pi()`	Returns the constant value of pi.
Power	`Power(Profit, 2)`	Takes the first numeric expression and raises it to the power specified in the second numeric expression.
Radians	`Radians(30)`	Converts an expression from degrees to radians.
Rand	`Rand()`	Returns a pseudo-random number between 0 and 1.
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.
Round	`Round(2.166000, 2)`	Rounds a numeric expression to n digits of precision.
Sign	`Sign(Profit)`	This function returns the following: • 1 if the numeric expression evaluates to a positive number • -1 if the numeric expression evaluates to a negative number • 0 if the numeric expression evaluates to zero
Sin	`Sin(1)`	Calculates the sine of a numeric expression.
Sqrt	`Sqrt(7)`	Calculates the square root of the numeric expression argument. The numeric expression must evaluate to a nonnegative number.
Tan	`Tan(1)`	Calculates the tangent of a numeric expression.
Truncate	`Truncate(45.12345, 2)`	Truncates a decimal number to return a specified number of places from the decimal point.

String Functions

String functions perform various character manipulations. They operate on character strings.

Function	Example	Description
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.
Bit_Length	`Bit_Length('abcdef')`	Returns the length, in bits, of a specified string. Each Unicode character is 2 bytes in length (equal to 16 bits).
Char	`Char(35)`	Converts a numeric value between 0 and 255 to the character value corresponding to the ASCII code.
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.

Function	Example	Description
Concat	`SELECT DISTINCT Concat ('abc', 'def') FROM employee`	Concatenates two character strings.
Insert	`SELECT Insert('123456', 2, 3, 'abcd') FROM table`	Inserts a specified character string into a specified location in another character string.
Left	`SELECT Left('123456', 3) FROM table`	Returns a specified number of characters from the left of a string.
Length	`Length(Customer_Name)`	Returns the length, in number of characters, of a specified string. The length is returned excluding any trailing blank characters.
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.
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.
Lower	`Lower(Customer_Name)`	Converts a character string to lowercase.
Octet_Length	`Octet_Length('abcdef')`	Returns the number of bytes of a specified string.
Position	`Position('d', 'abcdef')`	Returns the numeric position of $strExpr1$ in a character expression. If $strExpr1$ isn't found, the function returns 0.
Repeat	`Repeat('abc', 4)`	Repeats a specified expression n times.
Replace	`Replace('abcd1234', '123', 'zz')`	Replaces one or more characters from a specified character expression with one or more other characters.
Right	`SELECT Right('123456', 3) FROM table`	Returns a specified number of characters from the right of a string.
Space	`Space(2)`	Inserts blank spaces.
Substring	`Substring('abcdef' FROM 2)`	Creates a new string starting from a fixed number of characters into the original string.
SubstringN	`Substring('abcdef' 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.
TrimBoth	`Trim(BOTH '_' FROM '_abcdef_')`	Strips specified leading and trailing characters from a character string.
TrimLeading	`Trim(LEADING '_' FROM '_abcdef')`	Strips specified leading characters from a character string.
TrimTrailing	`Trim(TRAILING '_' FROM 'abcdef_')`	Strips specified trailing characters from a character string.

Function	Example	Description
Upper	Upper(Customer_Name)	Converts a character string to uppercase.

System Functions

The USER system function returns values relating to the session.
It returns the user name you signed in with.

Time Series Functions

Time series functions are aggregate functions that operate on time dimensions.
The time dimension members must be at or below the level of the function. Because of this, one or more columns that uniquely identify members at or below the given level must be projected in the query.

Function	Example	Description
Ago	SELECT Year_ID, Ago(sales, year, 1)	Calculates the aggregated value of a measure from the current time to a specified time period in the past. For example, AGO can produce sales for every month of the current quarter and the corresponding quarter-ago sales.
Periodrolling	SELECT Month_ID, Periodrolling (monthly_sales, -1, 1)	Computes the aggregate of a measure over the period starting x units of time and ending y units of time from the current time. For example, PERIODROLLING can compute sales for a period that starts at a quarter before and ends at a quarter after the current quarter.
ToDate	SELECT Year_ID, Month_ID, ToDate (sales, year)	Aggregates a measure from the beginning of a specified time period to the currently displayed time. For example, this function can calculate Year to Date sales.
Forecast	FORECAST(numeric_expr, ([series]), output_column_name, options, [runtime_binded_options])	Creates a time-series model of the specified measure over the series using either Exponential Smoothing or ARMIA and outputs a forecast for a set of periods as specified by numPeriods.

Constants

You can use constants in expressions.
Available constants include Date, Time, and Timestamp.

Constant	Example	Description
Date	DATE [2014-04-09]	Inserts a specific date.
Time	TIME [12:00:00]	Inserts a specific time.
TimeStamp	TIMESTAMP [2014-04-09 12:00:00]	Inserts a specific timestamp.

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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.